

Applying Genomic Knowledge to Forest Trees by Gene Editing and Transformation Market and Regulatory Obstacles

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Workshop on Societal, Economic and Regulatory
Influence the Application of Genomics

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Theme 1 – Rapid tech advancement

- Breeding of forest trees is slow and hard
 - Delayed reproduction
 - Inbreeding unavailable due to genetic load
 - Large breeding populations, high genetic variation
 - Quantitative traits predominantly
 - Highly variable environments, costly and imprecise
 - Products often of low refinement (pulp, wood, energy)
- New methods offer refinement and new options that sexual breeding cannot – value is highly context dependent
 - RNAi – specific gene/s suppression
 - CRISPR – specific gene/s mutation
 - GMO – addition of new genes/traits, accelerated reproduction

Theme 1 – Rapid tech advancement

Issues with new methods

- Markets bigger barrier than government regulation in many places ?
 - Market barriers stricter, include all CRISPR products to date
 - Profit, self-interest drive strong anti-biotech labeling and social media information
- Difficulty of traceability for many CRISPR products create added problems for markets and regulation?
- CRISPR blurs the distinction between biotech and breeding technically
 - But concerned public lacks trust in food safety, technology, companies more generally so not clear how much it matters to ultimate acceptance



Theme 2: Concerns & Societal Acceptance

How important is the motive/intent behind the application of the technology?

- Quite important, as well as who controls it and their trustworthiness
- American Chestnut studies at Oregon State show much greater support by US public for restoration compared to productivity enhancement GE traits in forestry

Theme 2: Concerns & Societal Acceptance

Most difficult-compelling counter-arguments against biotech?

- The system of production (most farms, tree plantations) is the problem, thus fixes to their problems cannot be part of a real solution
- Humans are the problem, we don't wish to do anything to expand their influence over nature
- The social package is the problem, corporate secrecy, control of technology, patents, inadequate regulation, corrupt politics

Theme 2: Concerns & Societal Acceptance

Role for public engagement? How?

- Essential to have trusted organizations and individuals who can speak/counter myths, hyperbole of benefit
- Given scale of commercial benefit and national stake, its hard to have a sufficient scale of engagement to matter from public sector
- Given complexity of issues (well beyond science), its hard for science experts to be fully knowledgeable or deal with “system” issues

Theme 3: R & D choices

What gets attention?

- Clear regulatory choke-hold for biotechnologies
 - Explosion of CRISPR products and research when regulation can be evaded or approval obtained simply (Calxyt and many others)
- Technologies to apply methods to more minor crops that do not get corporate attention, find ways around regulatory chokeholds, mainly have breeder vs. science communities
 - NSF interest in transformation, gene editing, and genomic methods for novel science communities (EDGE and others)
 - Means for much wider access, efficient user interfaces, greater smartness, for advanced phenomic and bioinformatic tools – much of it still dauntingly complex or costly for non-specialists (NSF, DOE and others)

Theme 3: R & D choices

Benefits as well as risks?

- Social and regulatory reform studies/efforts?
- Regulatory paradigm shift for a climate crisis, science illiterate world?
 - Rapid, risk taking and urgent modality, vs. “60s thinking” and “precautionary” mode?
- Radical changes in social media “freedom of information” rules ? How?

Theme 4: Roles & Trust

Scientist roles, values, credibility, trust

- Greater advocacy for what are clear science principles and findings?
 - Certification and GMO ban in forestry one example
 - Climate change advocacy now widespread in science community
 - Cannot rely on NGOs? Many/most environmental and social NGOs are not reliable advocates for science, except when it fits their ideological views and fund-raising?
- Measured advocacy for social/policy/value choices
 - Inform and educate on tradeoffs and choices, uncertainties
- Much more widespread professional science advocacy activities should be tolerated, promoted and rewarded
 - Not just in science publications
 - Include government scientists?
 - In areas of expertise only – policy needed about this
 - On the science vs. social choices – policy needed on this
 - Major social media efforts rewarded



A petition to certifiers to allow field research

Petition in Support of Forest Biotechnology Research

Petition	Committee of Scientists	Examples of Biotech Trees	Background Literature	FAQ	Pubs-Press	
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Drone image of an rDNA-modified poplar plantation in the USA

The goal of this petition is to urge forest certification systems to better align their certification criteria with scientific findings in biotechnology.

Impemented by the Alliance for Science at Cornell University, USA



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Petition seeks review of international policies banning biotech trees

JANUARY 8, 2019

Endorsed by the largest scientific society of plant biologists in the world



American Society of Plant Biologists

ASPB has studied and endorsed the petition.

members to support a petition to change certification rules for forests to enable field research on biotech (gene edited, genetically engineered) trees. Amazingly, all of the private certification systems have a complete ban in place that extends to research, at a time when forest health is in growing crisis due to expanding pests and climate change. Biotech is not a panacea, but its also too powerful to ignore—and can sometimes provide powerful solutions where other approaches fail. The petition follows the release of a major report on [The Potential for Biotechnology to Address Forest Health](#) from the USA National Academy of Sciences that has identified biotechnologies as a key tool for helping to manage forest health and associated pest epidemics.

ASPB has studied and endorsed the petition.

Alerts to tens of thousands of scientists sent by American Association for the Advancement of Science - AAAS (worlds largest general scientific society)

 AAAS | Policy Alert



Petition Launched to Change Certification of Biotechnology Forest Research

A [committee of forest biotechnologists](#) from around the world, which includes several AAAS honorary fellows, have [launched a petition](#) to change certification rules for forests to enable field research on gene-edited and genetically engineered trees. Currently, private certification systems include a ban on research using biotechnology tools in forest research. The petition comes on the heels of a [recent report](#) from the National Academies that discusses the importance of biotechnology research to help improve forest health. For additional background, visit the [petition website](#). ([BACK TO THE TOP](#))

1,161 signatures, majority PhDs

Support modern forest biotechnology research

📅 May 30 2018 👤 Cornell Alliance for Science ⏸ Closed on Jun 11 2019



<https://www.gopetition.com/petitions/petition-in-support-of-modern-forest-biotechnology.html>

Letter published in Science about it (September 2019)

Engineering, and Medicine recently completed an in-depth study on forest health and biotechnology, concluding that the potential benefits are numerous and rapidly increasing (12). Our forests are in dire need of assistance, and GE trees hold tremendous potential as a safe and powerful tool for promoting forest resilience and sustainability.

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standard-pefc-st-2002-2013.



Gene-edited and genetically engineered trees, such as these poplars, should be allowed in certified forests.

Certification for gene-edited forests

Forest certification bodies were established to provide consumers with confidence that they are purchasing

sourced wood products. Over hectares of forests, or about 1 forest area, are certified under the largest certification systems ever, certification bodies have excluded all genetically modified or gene-edited (GE) trees from certification, including from field research lands that is essential for promoting local benefits and impacts of forest biotechnology on communities around the world, with the support of more than 1000 globally active forest certification authorities to a recent detailed call for all forest certification bodies to promptly examine and modify their standards.

The increasing mounting stresses posed by forest pests and climate change (6).

News article also published in Science

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Productivity of eucalyptus plantations could be increased with trees genetically modified for faster growth.
CASADAPHOTO/SHUTTERSTOCK.COM

Scientists say sustainable forestry organizations should lift ban on biotech trees

By [Erik Stokstad](#) | Aug. 23, 2019 , 5:45 PM

What next?

- The petition one part of larger efforts by companies to gain access to biotech while under certification
 - Scientists with very limited leverage here
- The stigma, poor reputation of GMO crops and foods to many in public a key barrier to policy change
- Is this a good or bad model for scientific advocacy?
- What else or what next?