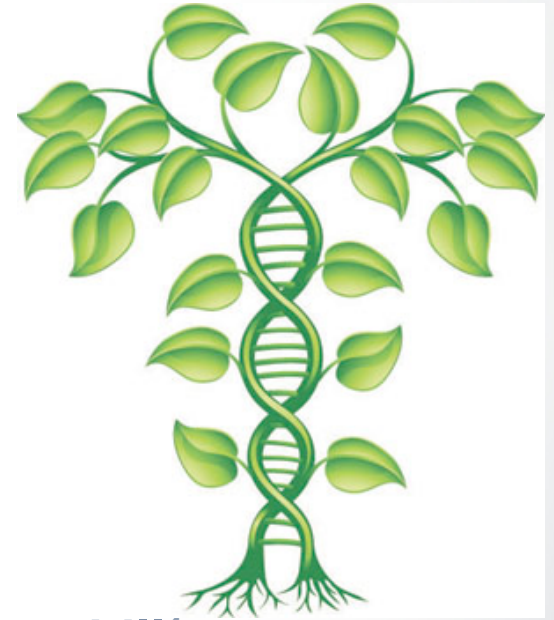


Anticipating Responsible Innovation: Genetically Modified Trees and Conceptualizations of Technological, Regulatory, and Cultural Futures



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GENETIC
ENGINEERING
+ SOCIETY
CENTER (GES)RESEARCH
COLLABORATION
HISTORY PROJECT
EVENTS
CALENDAR
ABOUT US

SEARCH



WHO + WHAT

The GES program is unique example of engaged scholarship that serves as a regional, national, and international hub of interdisciplinary, research analysis and inclusive dialogue surrounding opportunities and



Fellows

Find out about our fellows and the research they are doing for the Center



Sloan Grant

We were awarded a Sloan Grant to do research on Synthetic Biology!



IGERT

Find out what is going on with the NSF funded Genetic Pest Management IGERT

<http://research.ncsu.edu/ges>

GM Tree Typology



Fruit/Nut



Biomass/Fiber



Restoration/Conservation

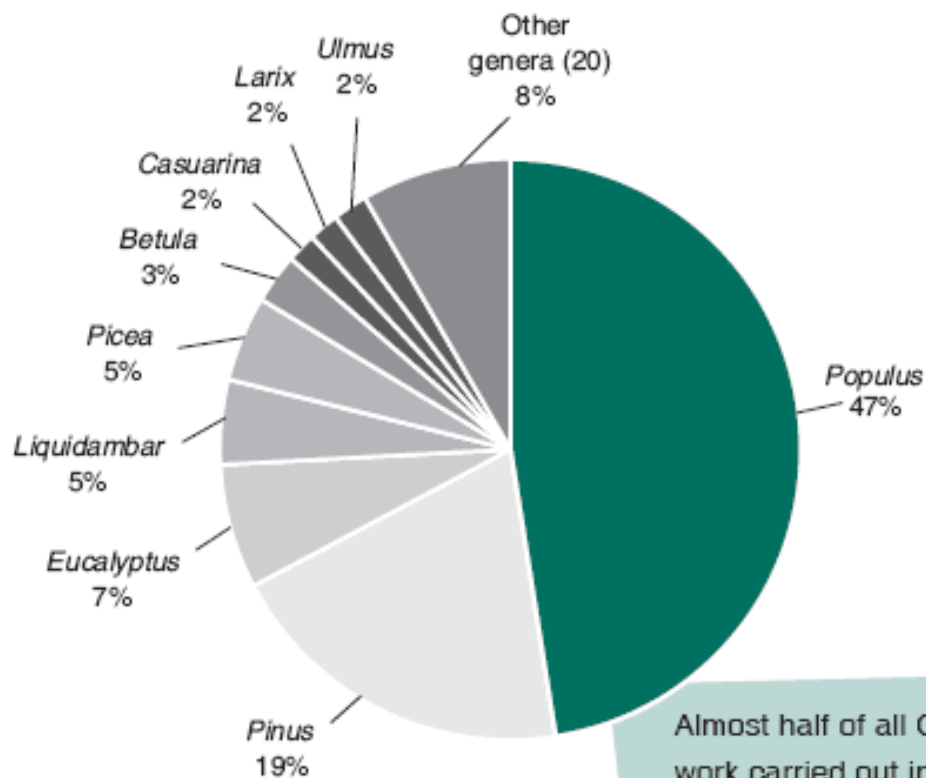
Fruit/Nut



Global News



Biomass/Fiber



Almost half of all GM work carried out in the world on forest trees has focused on poplar.



Biomass/Fiber



FuturaGene's eucalyptus is approved for commercial use in Brazil

São Paulo, April 9, 2015 – The Brazilian National Technical Commission on Biosafety (CTNBio) today approved the commercial use of the yield enhanced eucalyptus developed by FuturaGene, a wholly owned subsidiary of Suzano Pulp and Paper. Field experiments conducted since 2006 at various locations in Brazil have demonstrated an approximate 20% increase in yield compared to its equivalent conventional variety.

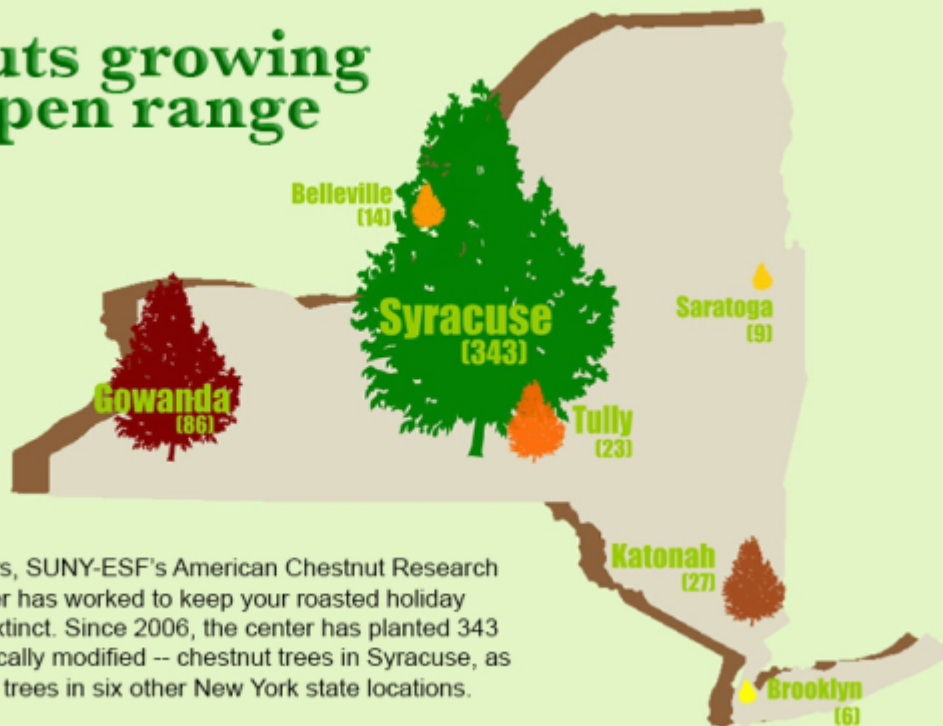
This is the first genetically modified (GM) eucalyptus event to be approved worldwide and

Restoration/Conservation



www.masschestnut.org

Chestnuts growing on an open range

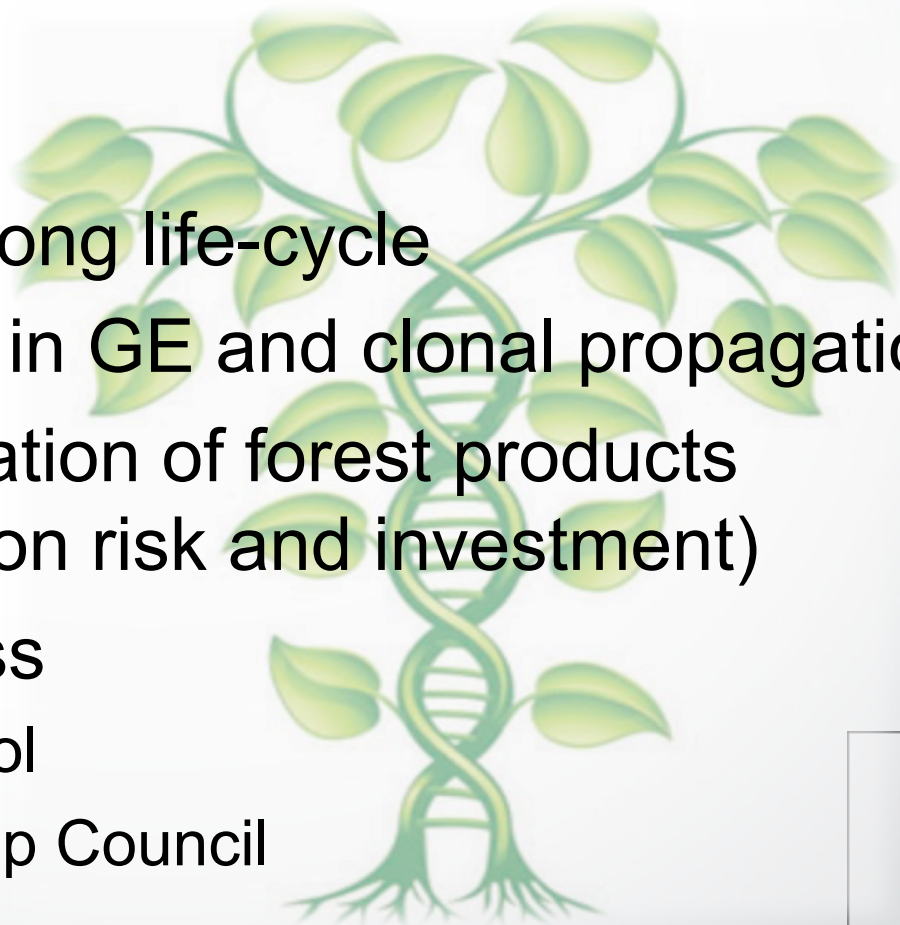


For more than 20 years, SUNY-ESF's American Chestnut Research and Restoration Center has worked to keep your roasted holiday favorites from going extinct. Since 2006, the center has planted 343 transgenic -- or genetically modified -- chestnut trees in Syracuse, as well as more than 150 trees in six other New York state locations.

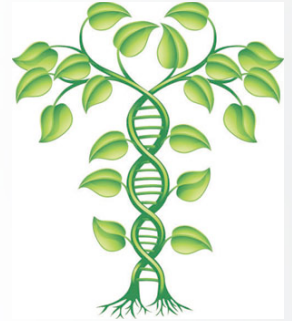
www.thenewshouse.com

What has slowed the development and deployment of GM trees?

- Size
- Slow maturation, long life-cycle
- Technical hurdles in GE and clonal propagation
- Vertical dis-integration of forest products industry (impacts on risk and investment)
- Regulatory process
 - Cartagena Protocol
 - Forest Stewardship Council



Research Questions



1. In what ways do forest biotechnologists anticipate “technological rejection,” and how does this affect their practice?

Anticipating technological rejection

“In the past several years, out of public view, [Kress] has considered DNA donors from all over the tree of life, including **two vegetables, a virus and, briefly, a pig**. A synthetic gene, manufactured in the laboratory, also emerged as a contender. **Concerns about public perception and potential delays in regulatory scrutiny** put a damper on some promising leads. But intent on his mission, Mr. Kress shrugged off signs that national campaigns against genetically modified food were gaining traction. Only in recent months has he begun to face the full magnitude of the **gap between what science can achieve and what society might accept...**

...If we don't have consumer confidence, it doesn't matter what we come up with.”

“A Race to Save the Orange by Altering Its DNA.”
The New York Times (July 27, 2013)

Anticipating technological rejection

- GM loblolly pine with increased wood density
- Outside scope of USDA regulation (APHIS letter)
- Donor, recipient, nor method of transformation involve a plant pest



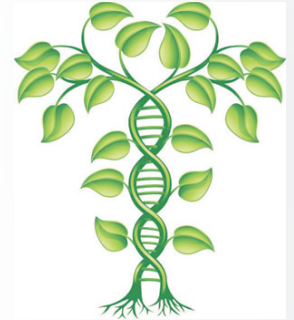
Anticipating technological rejection

- TedX talk by Powell
- Partnership with American Chestnut Foundation
- Crowdfunding as public engagement
- Tri-partite strategy
 - Conventional backcrossing, cisgenic, transgenic



National Geographic

Research Questions



1. In what ways do forest biotechnologists anticipate “technological rejection,” and how does this affect their practice?
2. Will proponents of GM trees successfully disrupt anti-GMO discourse by invoking pro-environmental and anti-corporate narratives?

Disrupting anti-GMO narratives?

Gravity of the Monsanto Effect



www.wakingtimes.com



Disrupting anti-GMO narratives?

Forest biofuels and biomass



Highlights

[View the new FuturaGene film about the socio-environmental benefits of the genetically modified eucalyptus](#)
September 30, 2014

[Public Hearing discusses biosafety aspects related to FuturaGene's genetically modified eucalyptus](#)
September 04, 2014

Yielding the Future – Innovating a Sustainable Path for a Better Future

In a world challenged by growing population, diminishing resources and climate change, FuturaGene's technologies address critical challenges of plant yield enhancement and yield protection. We harness biotechnology to ensure the security and sustainability of Fiber, Fuel, and Feed. We believe that the key to sustainable agriculture lies in continuous improvement and protection of yield and processability of crops, thus maximizing output, whilst minimizing all inputs such as land, water and fertilizer.

After developing as an independent company since its inception in 1993, FuturaGene was acquired, in July 2010 by Suzano Papel e Celulose S.A., a Brazilian company and the second largest producer of eucalyptus pulp in the world. As a wholly owned subsidiary of Suzano, FuturaGene will continue its worldwide biotech activities with enhanced resources driving its mission to be a world leader in plant

Disrupting anti-GMO narratives?

Forest biofuels and biomass

- More wood from less land...
 - but increase in plantations?
- Less chemical inputs...
 - like herbicide-tolerant crops?
- Carbon-fixing trees to fight climate change...
 - but how will those C numbers really work out?
- Higher yields to make biofuels competitive...
 - but what about biodiversity and water?
 - and what about pollen drift?



Image credit: Wikimedia Commons

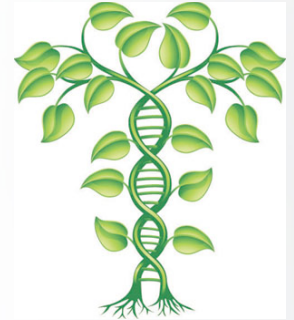
Disrupting anti-GMO narratives?

GM American chestnut

- Restoration narrative
 - Heritage species
 - Ecological function
 - Disease as crisis
 - Trials on mining reclamation sites
- No profits or patents
- But they are *meant* to spread



Research Questions



1. In what ways do forest biotechnologists anticipate “technological rejection,” and how does this affect their practice?
2. Will proponents of GM trees successfully disrupt anti-GMO discourse by invoking pro-environmental and anti-corporate narratives?
3. What can we learn about “responsible innovation” from an NGO committed to promoting the “responsible use” of forest biotechnology?



Institute of Forest Biotechnology

Bioscience

Science • Dialogue • Stewardship

- Responsible Use[®]: Forest Biotechnology Principles – responsibleuse.org
- Forest Fuels[®]: Unlocking the potential of fuels made from trees
- Heritage Trees[®]: Species Protection through biotechnology (Forest Health Initiative)

<http://www.forestbiotech.org/>



Institute of Forest Bioscience

Advocating a cisgenic strategy

A banner for the Forest Health Initiative. The top half features a dense green forest with the text "Forest Health Initiative" in white serif font. The bottom half has a dark blue background with the text "Exploring Biotechnology to Protect Forest Health" in light blue serif font. A small orange button labeled "Comment Now" is on the right. Below the blue section are three orange boxes labeled "Biological Science", "Policy", and "Social & Environmental".

Forest Health Initiative

Exploring Biotechnology to Protect Forest Health [Comment Now](#)

A collaborative effort to advance the country's understanding and role of biotechnology to address some of today's most pressing forest health challenges. The initiative will initially focus on restoring a test species and an icon of eastern U. S. forests – the American chestnut – whose numbers were virtually wiped out during the past century by chestnut blight. While working to restore the American chestnut as the test tree, the program will explore new approaches to enhance the health and vitality of other trees, forests, and forest ecosystems. The Initiative will use a holistic approach to address emerging forest health threats by assessing not just the science but the societal and regulatory issues concurrently.

Biological Science Policy Social & Environmental

“Responsive?”...or a technological gateway

Thank you!

Comments welcome: jason_delborne@ncsu.edu



Forest Health Initiative

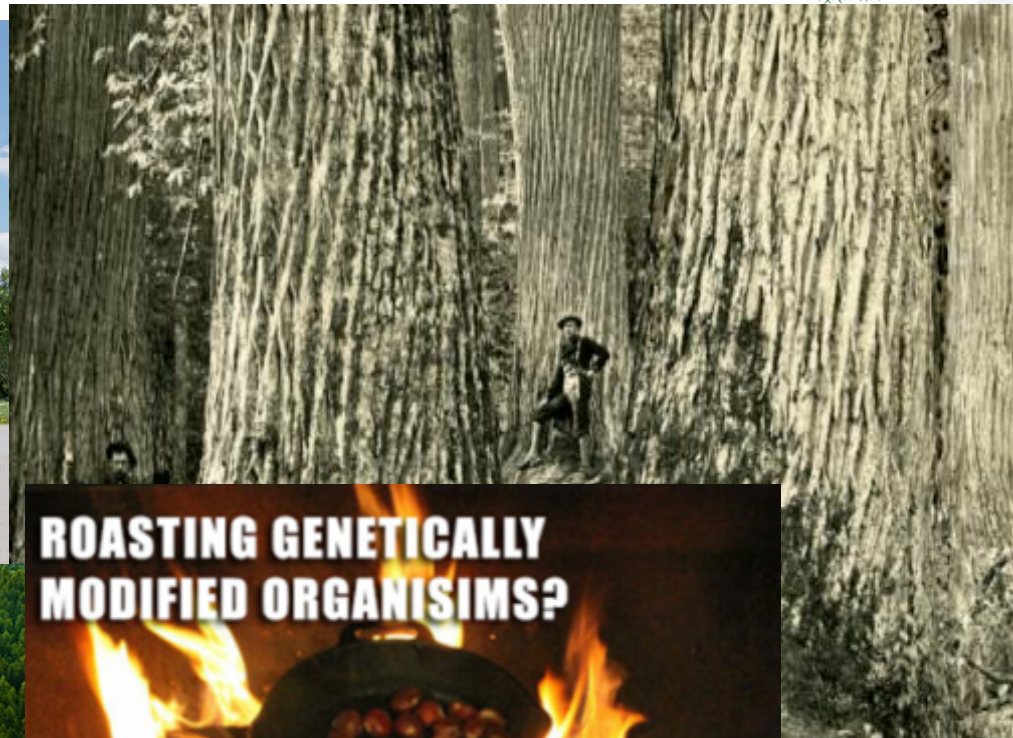
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Biological Science

Policy

Social & Environmental



**ROASTING GENETICALLY
MODIFIED ORGANISMS?**

THAT'S NUTS.

GEES
CENTER

NC STATE UNIVERSITY