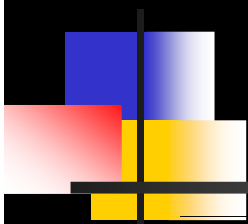


Giant Reed

As a Dedicated Biomass Crop



Panel Presentation
Biomass R&D Initiative
Technical Advisory
Committee Meeting
Arlington, VA
April 1, 2010



Participants

David Bransby, Auburn University

Moderator and first speaker

**Topic: Overview and Summary of
research on Giant Reed at Auburn
University**



Participants

Peter Chanin, White Technology LLC

Second speaker

Topic: Status of Giant Reed relative to state and federal invasive species lists, and work being conducted by White Technology LLC



Participants

Peter Gillies, TreeFree Biomass Solutions

Third speaker

**Topic: Proper, regulated management of
Giant Reed as a dedicated energy crop,
and work being conducted by TreeFree
Biomass Solutions**



Participants

John Lydon, USDA ARS

Fourth speaker

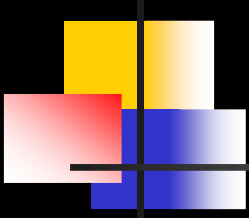
**Topic: Research by USDA ARS on
biological control of Giant Reed in
Texas**



Panel Objectives

- **Alert the Biomass R&D Initiative TAC on opportunities offered by Giant Reed as a dedicated biomass crop.**
- **Examine scientific evidence regarding claims of invasivity.**
- **Update the committee on efforts and progress being made in both the public and private sector to develop Giant Reed as a dedicated biomass crop.**
- **Update the committee on efforts by USDA on biological control of Giant Reed.**
- **Seek input from the committee on how to proceed with development and commercialization of Giant Reed as a dedicated biomass crop.**

Overview of Giant Reed as a Dedicated Biomass Crop and Research at Auburn University



David Bransby, Auburn University

Issues to be addressed:

- Crop biology
- Current and future uses
- Advantages over other biomass crops
- Public and private entities working on Giant Reed as a biomass crop
- Research results from Auburn University
- Some observations of the concept of “invasivity”
- Research needs

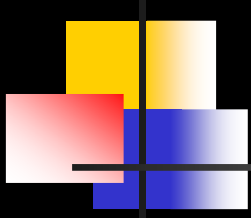


Biology

- **Native to India, but widely spread throughout the tropics, sub-tropics and Mediterranean regions of the world**
- **Sterile plant, produces no viable seed, but does produce flowers**
- **Needs to be established by vegetative propagation**
- **Produces large, but short rhizomes (under-ground stems, like bulbs)**
- **Does not spread like bamboo**

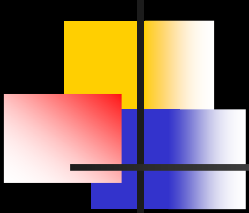


Biology



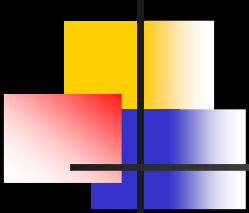
- **Requires well drained soils**
- **Adapted to a wide range of soils, including saline soils**
- **Capable of very high yields, with low inputs**
- **This probably facilitated by beneficial associations with microorganisms, especially endophytic and micorrhizal fungi**
- **Exceptional soil carbon sequestration in rhizomes**
- **Can be controlled with Roundup**





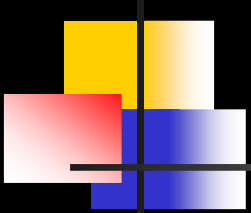
Six-month old plants in Alabama planted with
cane from California





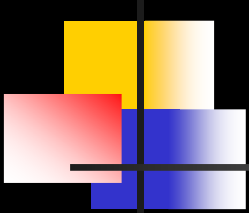
Giant Reed





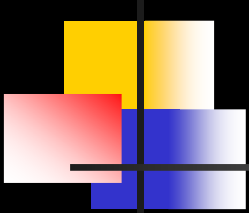
Mature cane in California





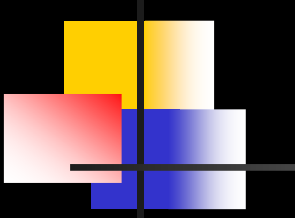
Giant Reed rhizome





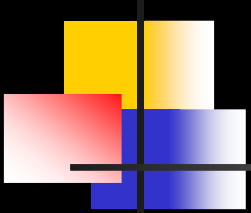
Planting Giant Reed in fall





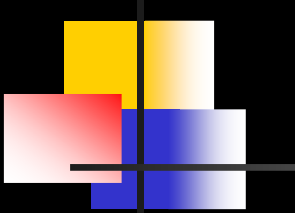
Cane starting to shoot





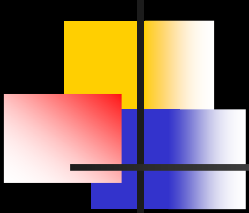
Multiple shoots





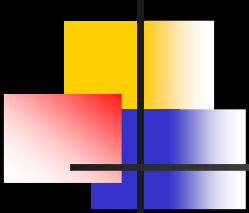
Young rhizomes developing





Shoots emerging in spring

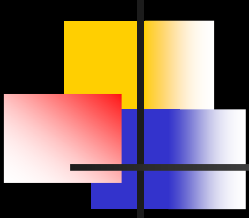




Mature cane in Alabama



Uses



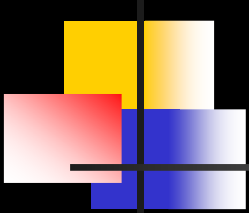
Current:

- **Musical instrument reeds**

Future:

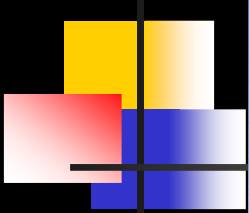
- **Pulp and paper**
- **Rayon**
- **Biopower and Biofuels**
- **Composite boards like particle board**
- **Industrial chemicals**
- **Pharmaceuticals**





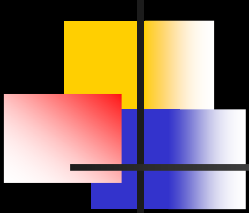
Harvesting cane for musical instrument
reeds in California





Drying cane to make musical instrument reeds in California

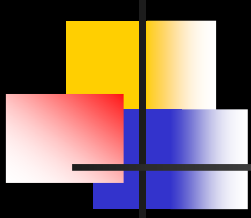




Yields of over 50 tons/acre are reported in the literature, but



Advantages over other Biomass Crops



- **Very high yields**
- **Low (No) inputs**
- **Exceptional soil carbon sequestration - 4X switchgrass**
- **Higher bulk density**
- **Multiple products**
- **Adaptation to saline soils and saline water**





Public and Private Sector R&D

Public sector:

- Auburn University
- Washington State University
- University of Washington
- University of South Carolina
- State of Alabama (\$100,000 grant)
- USDA, ARS, Tifton, GA

Private sector:

- TreeFree Biomass Solutions
- White Technology LLC
- Biomass Investment Group
- Strong interest from paper companies like Boise and Weyerhaeuser





R&D in Other Countries

- **Australia**
- **China**
- **Europe**
 - **Portugal**
 - **Spain**
 - **France**
 - **Italy**
 - **Greece**





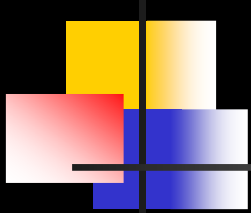
Research at Auburn University

Started in 1999

Included:

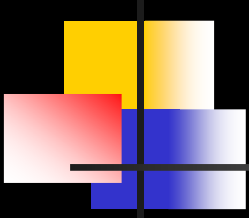
- **Yield of Californian types vs. Alabama types vs switchgrass**
- **Cutting frequency**
- **Effects of rainfall on yield**
- **Observations re invasivity**
- **Soil carbon sequestration in rhizomes**
- **Initiation of commercial scale fields**
- **Some pulping work**





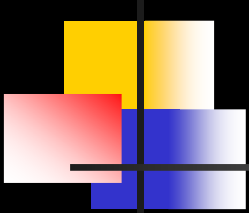
Switchgrass in foreground (20 yr)
Giant Reed in background (10 yr)





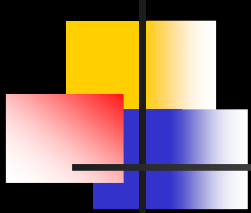
**Switchgrass
vs. Giant Reed Height**





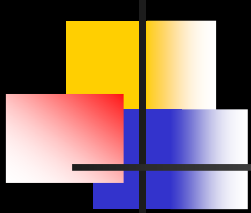
Cut once a year (left)
Cut twice a year (right)





Cut once a year (right)
Cut every 2 years (left)

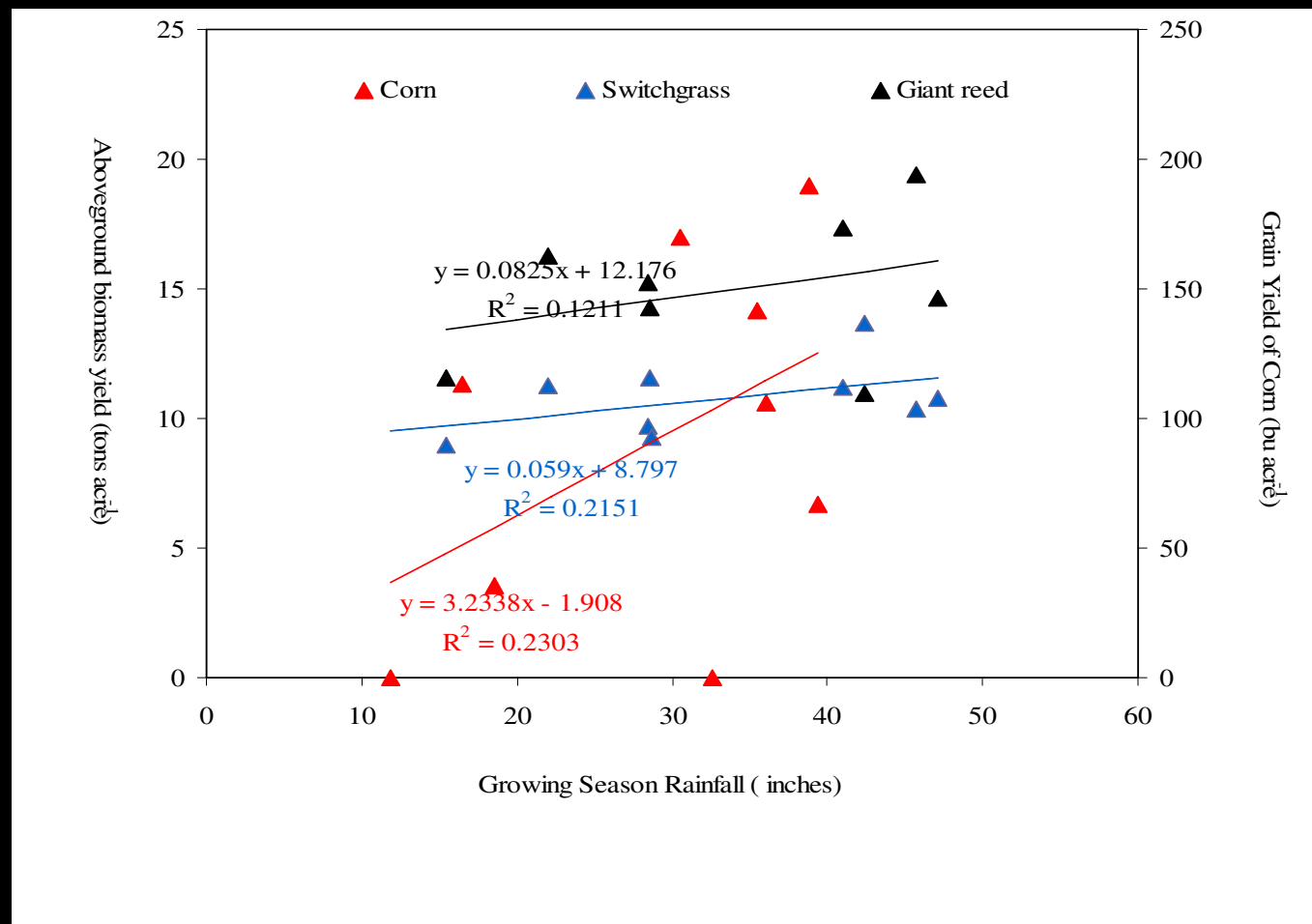




Cut once a year in summer (left)
Cut every 2 years (right)

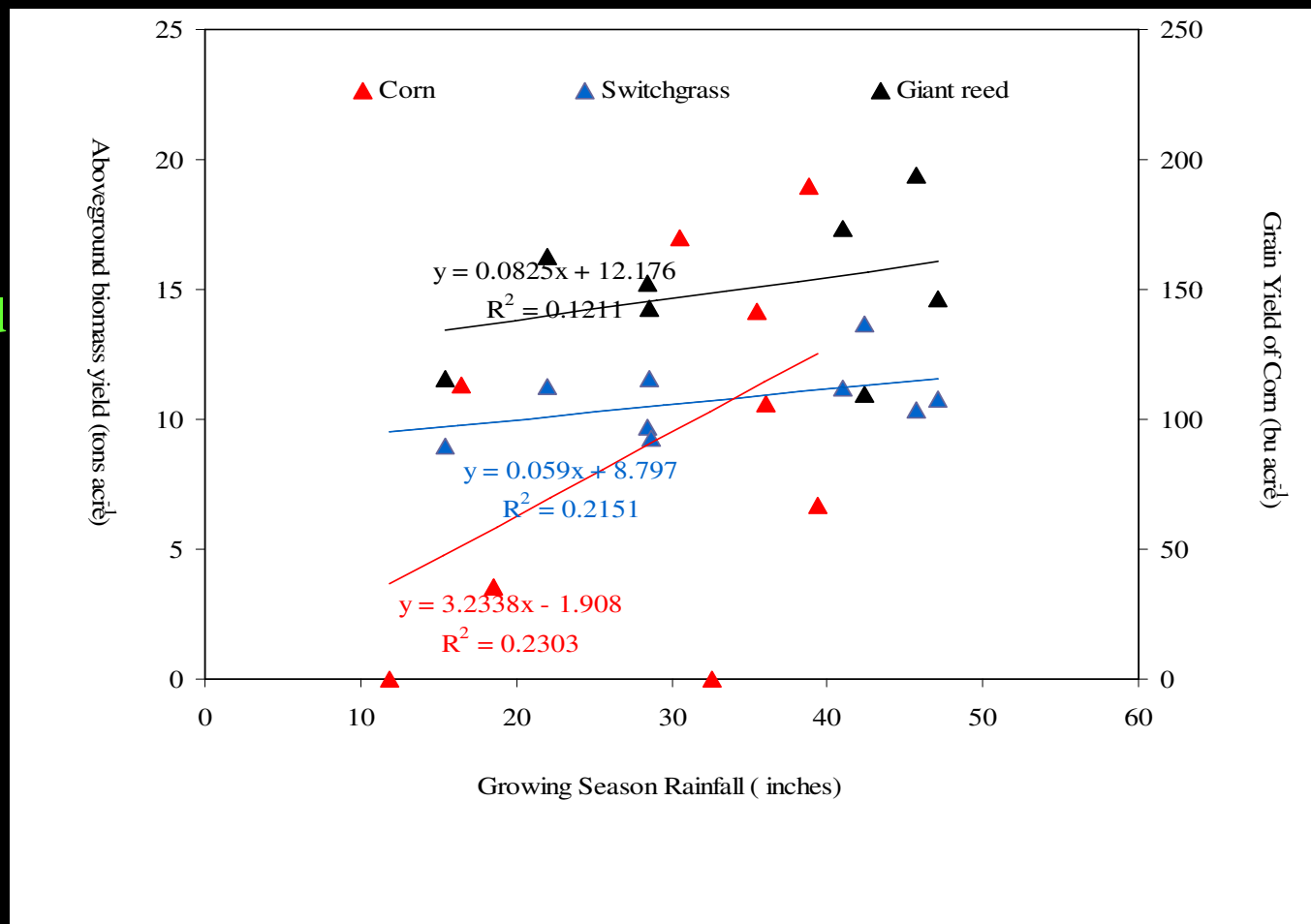


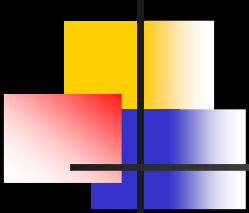
Giant Reed, Switchgrass and Corn yields against rainfall



Giant Reed, Switchgrass and Corn yields against rainfall

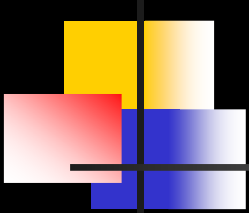
NOTE:
No Fertilizer
for Giant Reed





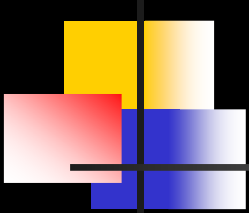
Harvesting Rhizomes Fall, 2009





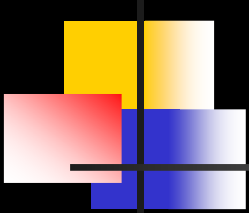
Harvesting Rhizomes Spring 2010





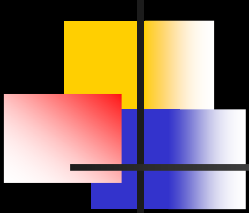
**Half the Rhizomes from 1 sq meter
40 tons/acre – 4X switchgrass**





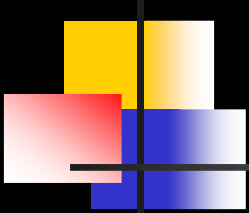
**Rhizomes from 1 sq meter
40 tons/acre – 4X switchgrass**





40 tons/acre – 4X switchgrass
Does not include roots

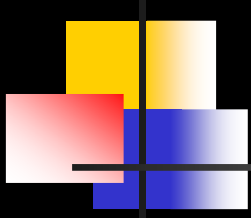




Huge carbon credits!



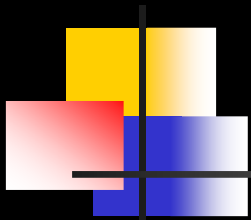
Bulk Density



- Pounds per cubic foot
- Critically important for:
 - hauling
 - storage
 - feeding into plant

White Technology acknowledged for funding this research





Bulk Density (lb/cu ft)



Switchgrass

2.49



Miscanthus

2.24



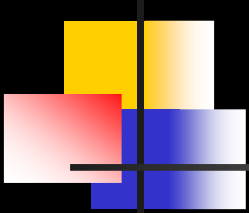
Giant Reed

6.53

White Technology acknowledged for funding this research



Bulk Density (lb/cu ft)



Switchgrass

2.49



Miscanthus

2.24



Giant Reed

6.53

White Technology acknowledged for funding this research





Observations re “Invasivity”

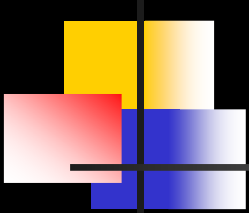
- **Invasivity is an extremely poorly defined science – not really a science at all!**
- **Multiple definitions of an invasive plant – no standards**
- **Invasivity is site-dependent**
- **Almost any plant will be invasive in riparian areas (areas adjacent to streams and rivers that are prone to flooding)**



Observations re “Invasivity”

- **Giant Reed does not produce seed, so cannot be any more invasive than energy cane and miscanthus**
- **It has become invasive along the Rio Grande in Texas, and in riparian areas around LA, southern California**
- **If energy/sugar cane or miscanthus were planted in such locations, they would be just as invasive**
- **If grown away from riparian areas, many case studies show it is not invasive**

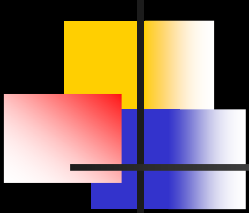




A 30-acre field of 7-yr-old Giant Reed
on a private farm in Alabama
- no evidence of invasivity

TreeFree Biomass Solutions acknowledged for funding this research



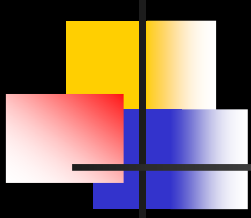


A 16-acre field of 7-yr-old Giant Reed
on the Alabama Dept. of Corrections'
Farm - no evidence of invasivity

TreeFree Biomass Solutions acknowledged for funding this research



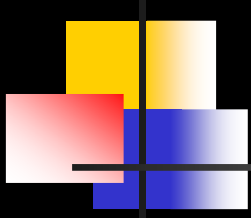
Research Needs



- **Low cost propagation procedure**
- **Improved genetics**
- **Improve understanding of roles of endophyte and micorrhiza**
- **Harvesting technology**
- **Development of effective regulation and control metrics**
- **Further development of uses**



Conclusions



- **Giant Reed offers substantial opportunities and advantages over other candidate biomass crops**
- **If properly regulated, the crop poses virtually no threat of becoming invasive**

