

Agroforestry: From Genes to Landscape and Beyond

Shibu Jose

H.E. Garrett Endowed Professor and Director



The Center for Agroforestry
University of Missouri

A Global Center for Agroforestry, Entrepreneurship and the Environment



The Center for Agroforestry

The Center for Agroforestry at MU was established in 1998, but the UMCA-ARS partnership started earlier

One of the leading centers of its kind in the temperate world

9 faculty

2 Outreach Specialists

4 Research Technicians

1 Farm Manager

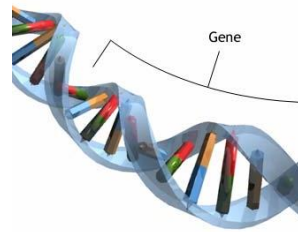
5 Postdocs

12 Graduate Students

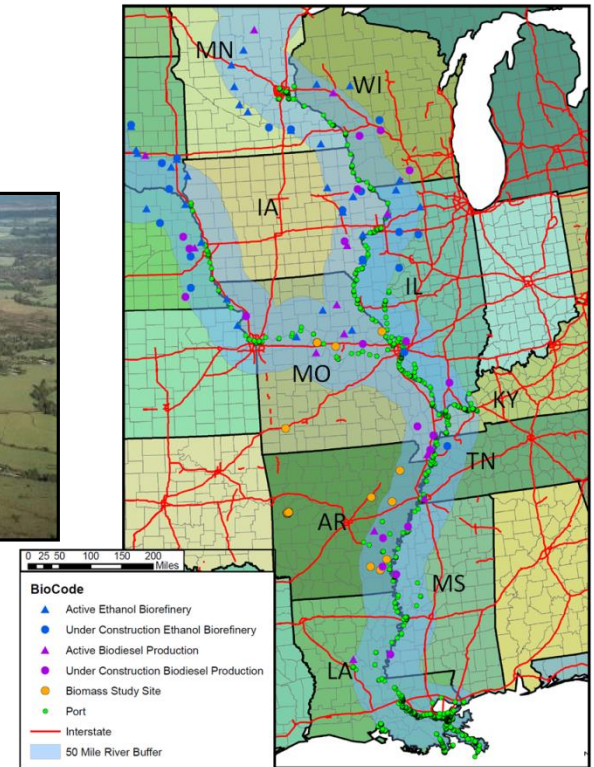
44 Online Graduate Students

Overview of Research

Driven by our mission: Discover, integrate and apply new agroforestry knowledge and technologies to promote **economic, environmental** and **social vitality** to make a better Missouri (small rural farms), U.S. and world



Basic Science



Applied Research at multiple Scales

Diversifying Farm Income

One of a kind
genomics-assisted
tree improvement
program (e.g. 4X
nut meat Yield)



Bucks Unlimited
Oak™
– A success story
Show-Me
Switchgrass



Diversifying Farm Income

- ◆ Chinese Chestnut - \$6000 /acre/year
beginning 7th yr

Castanea mollissima

(Fagaceae)



- ◆ Pecan - \$3000 /acre/yr
beginning 8th yr

Carya illinoensis

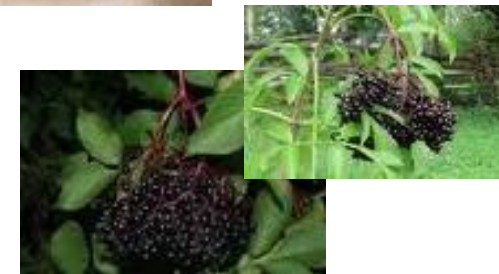
(Juglandaceae)



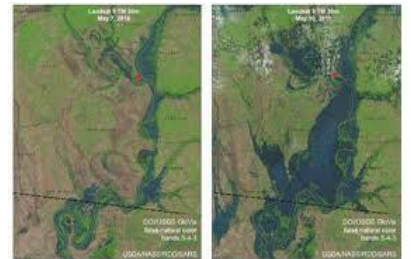
- ◆ Elderberry - \$6000 – 12,000 /acre/yr

Sambucus Spp.

(Adoxaceae)



Agroforestry for Climate Change Mitigation and Adaptation



More than 130,000 acres of Missouri farmland under water (Birds Point Levee breach, May 2011)

Tree Buffers >500 ft can protect levees

Diversification = Resilient Farmscapes



Example: Flood and Drought Tolerant Biomass Sorghum



Completed in 2012-13
(MU - Flood Tolerance Screening)



Initial Screening for Flood and Drought Tolerance (tested over 300 lines)

3 - 6 tons/ac



Initiation of Mapping Population by crossing parents with contrasting phenotypes



High-throughput analysis of gene expression



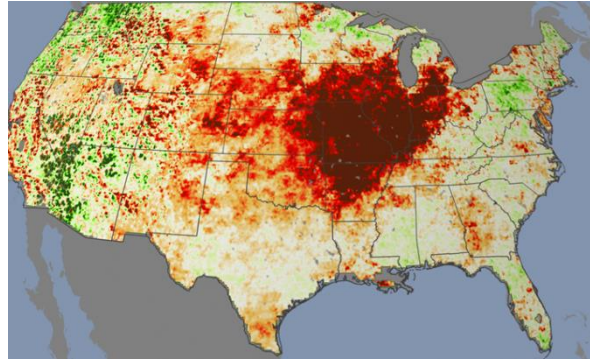
>500% Increase in Biomass Yield

10-20 tons/ac

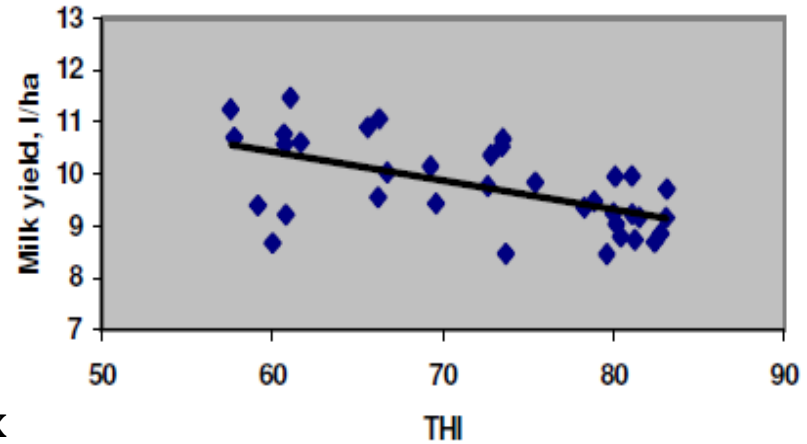


Over 10 million acres in MO alone!

Can Agroforestry Help the Cattle Industry?

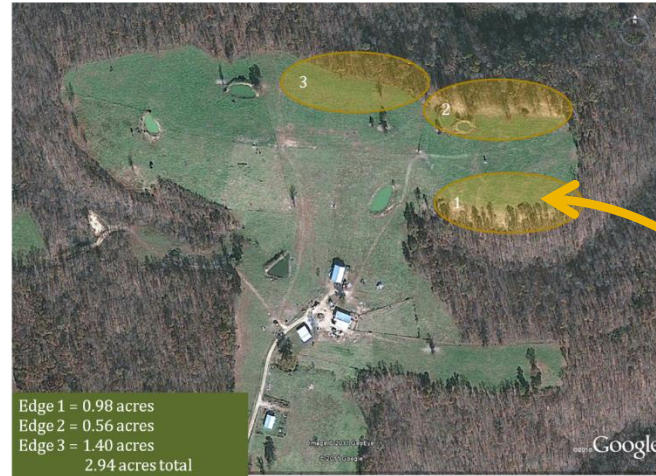


2012 August- Heat Stress Index



\$2 billion lost annually!!

Success Story!

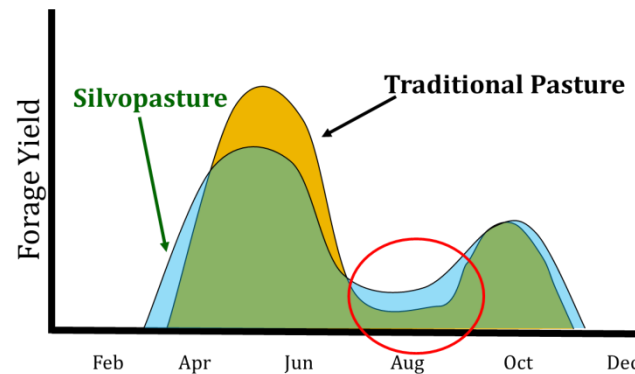


Thinning + Forage
Establishment=\$3500
(\$1200 per acre; 2.9
acre total for 3 areas)

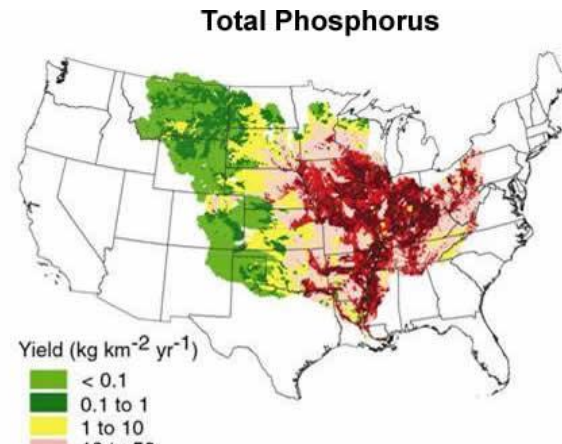
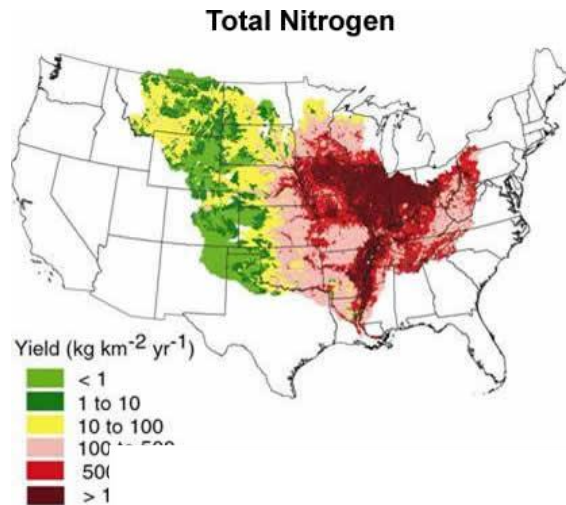


\$10,920 increase in profit from
84 head operation

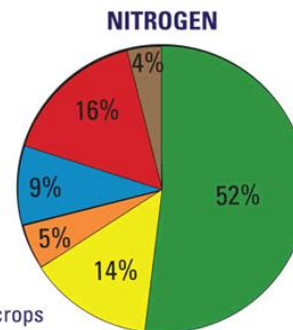
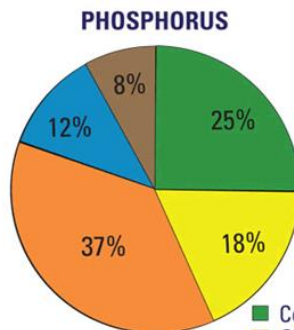
B/C Ratio = 3.2



Agroforestry for the Environment!



Sources of nutrients delivered to the Gulf of Mexico

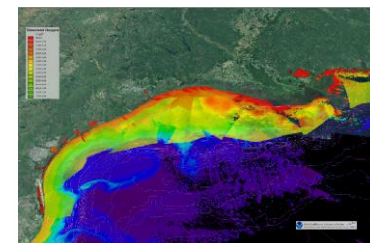


Sources

- Corn and soybean crops
- Other crops
- Pasture and range
- Urban and population-related sources
- Atmospheric deposition
- Natural land

80% of P from Ag

71% of N from Ag

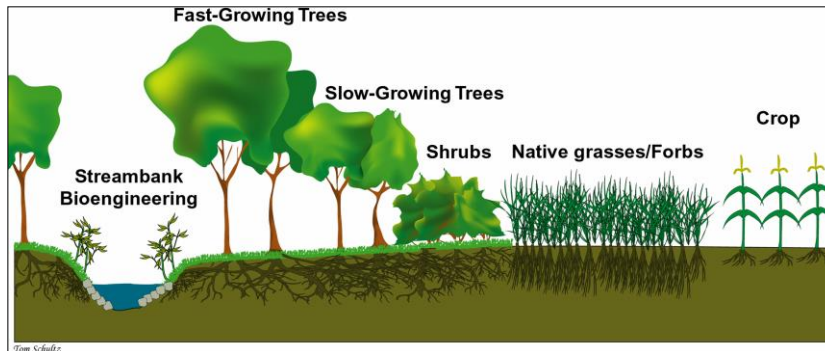
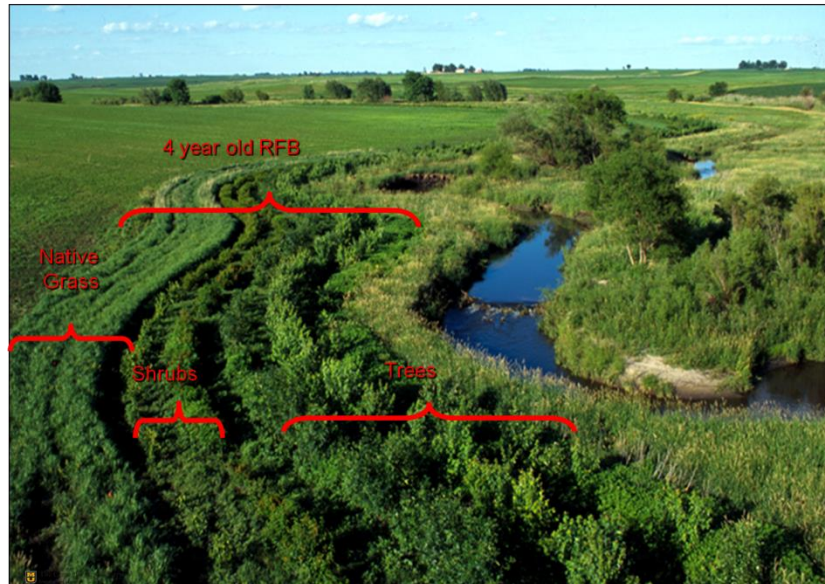


Agroforestry Can Reduce Nutrient Loading!

50 to 80% total N
41 to 92% NO₃-N

46 to 93% total P
28 to 85% dissolved P

\$320 million MRBI program

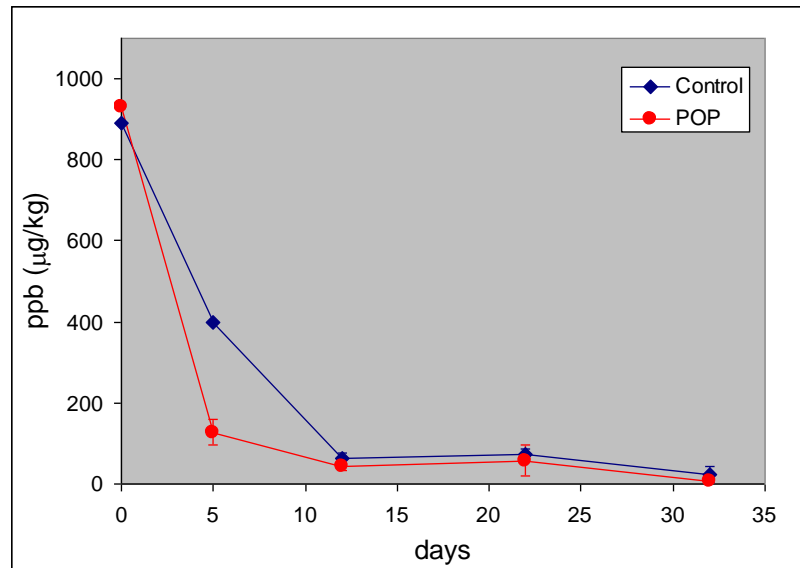


Lin et al., 2000; 2003;
Udawatta et al., 2006
Schultz et al., 2009

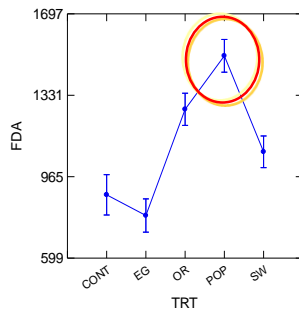
Veterinary Antibiotics – Microbial Degradation

Enhanced Rhizodegradation of Antibiotic (Sulfamethazine) by Poplar

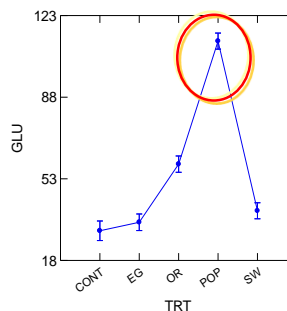
Via Increased Microbial Enzyme Activities (FDA, fluorescein diacetate hydrolytic; GLA, glucosaminidase, GLU, β -glucosidase)



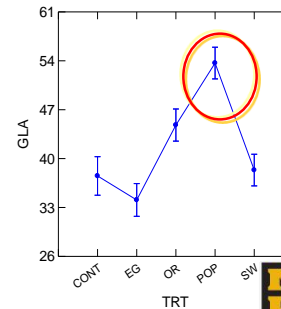
Least Squares Means



Least Squares Means



Least Squares Means



Lin and Goyne, Lin et al. 2010

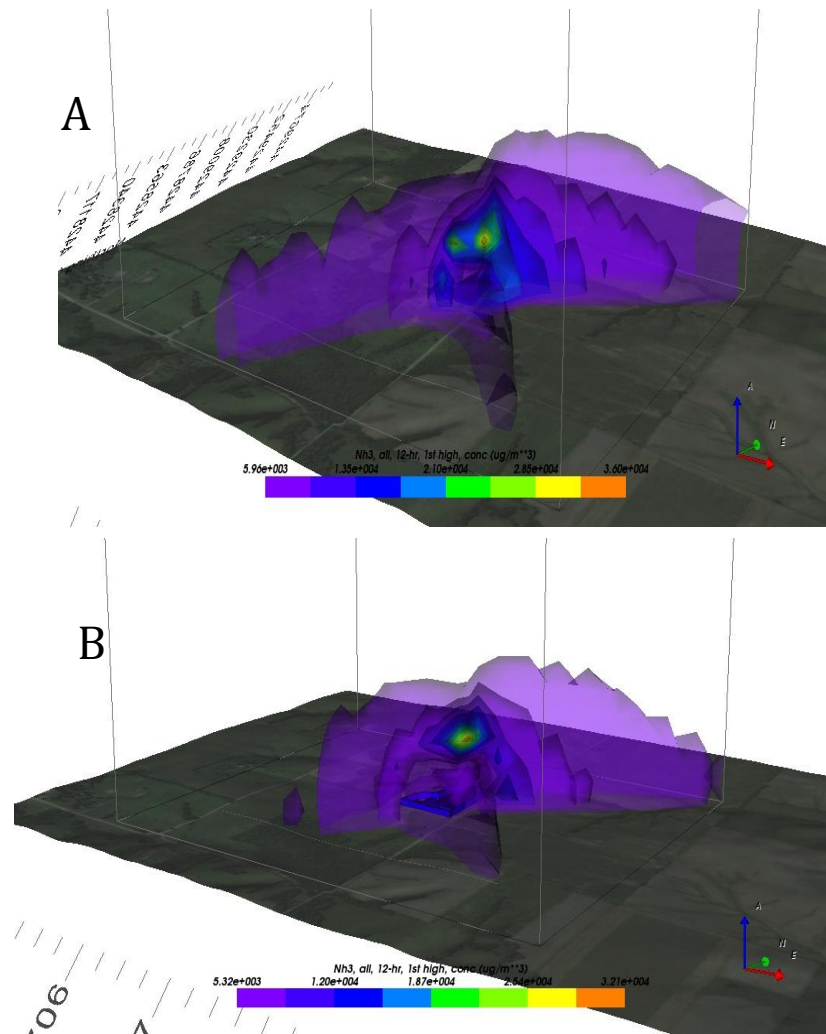


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Agroforestry for Air Quality:

VEB: 27% Reduction in NH_3



12 hr AERMOD model simulation showing 3-D dispersion of NH_3 without VEB (A), and with a fully developed VEB (B) – 27% Reduction

Lin et al. 2012

Socio-Economics and Marketing

Agroforestry markets and marketing

Regional and national level studies

Economic decision support tools

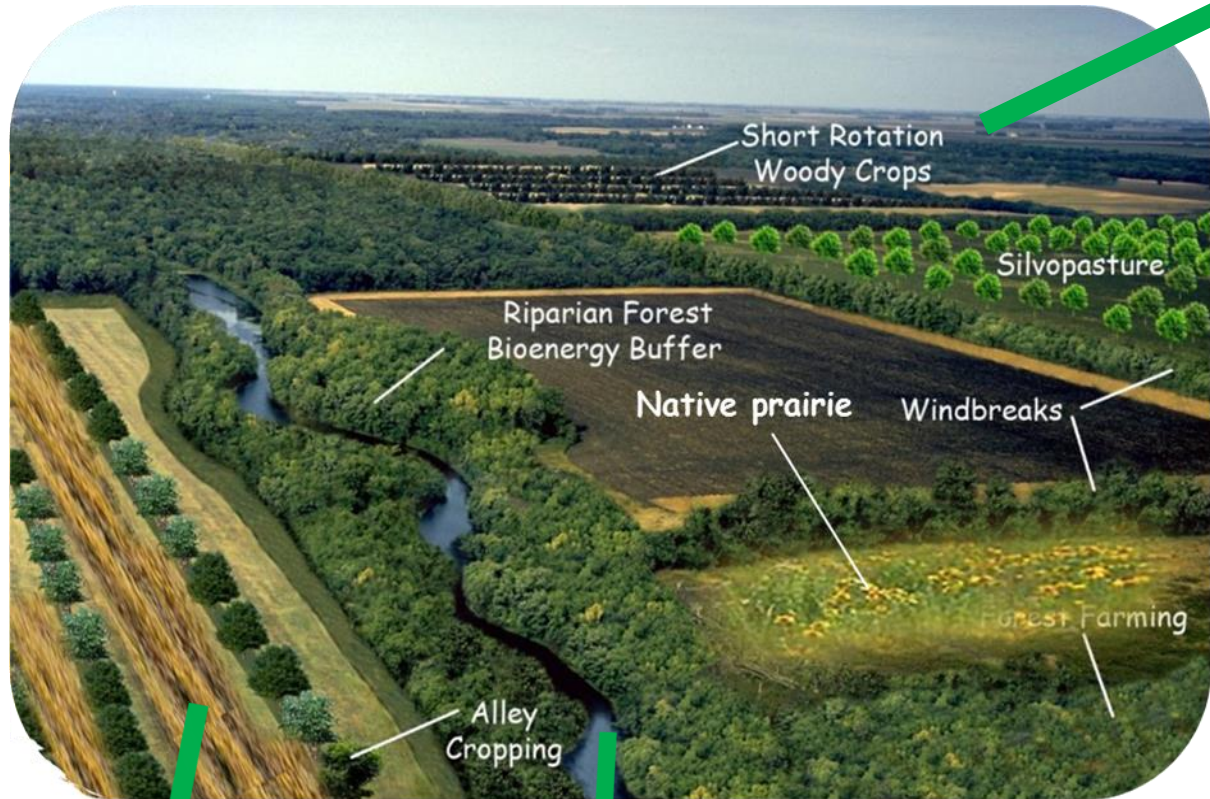
Valuing ecosystem services

Life Cycle Analysis

Developing Apps



Outreach: Making Agroforestry Part of a Multifunctional Working Landscape!



....that provides food, fuel and ecosystem services for generations ...

Outreach Programs

20+ field days, farm tours,
workshops etc. per year



CHESTNUT ROAST
A festival of culture and agriculture

October 8, 2016
New Franklin, Missouri

Agroforestry Academy

July 25 - 29, 2016
Columbia, Missouri



 The Center for Agroforestry
University of Missouri

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Outreach Programs

Annual Symposium Series

Over 2000 people attending in 2016



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7TH ANNUAL AGROFORESTRY SYMPOSIUM
The Future of Pollinators: Why Agroforestry Matters
January 28, 2016 | 8:30 a.m. - 5:30 p.m.
Bond Life Sciences Building
University of Missouri

Symposium Schedule

8:00 a.m. Coffee and Registration

8:30 a.m. **Introduction**
Dr. Shibu Jose, Director, The Center for Agroforestry

Welcome and Introduction of Keynote Speaker:
Dr. Thomas Payne, Dean, College of Agriculture, Food and Natural Resources

8:45 a.m. **Keynote Address: Pollinator Conservation in the Balance**
Mr. Scott Hoffman Black, Director, The Xerces Society




Unable to attend in person?
Join us through **live streaming**
<http://goo.gl/AjeQpG>

The Center for Agroforestry would like to thank our generous sponsors:

Outreach Programs

Agroforestry Webinar Series

Launched in 2015 (six per year)



Home Live Webinar Schedule Register Recorded Webinars Contact

Agroforestry in Action Webinar Series


Welcome

Thank you for visiting the Agroforestry in Action Webinar Series, a production of the [Center for Agroforestry at the University of Missouri](#). Presentations in this webinar series explore topics in agroforestry from North America and around the globe, showcasing examples of excellence in practice and research. Live webinars are presented on a monthly basis and are free and open to all. Please see the [live webinar schedule](#) and register in advance to participate.

Upcoming Webinar:

Antonio de Araujo
Agroforestry in Southern Brazil
April 27, 2016 | 11:00 AM (CST)

[REGISTER HERE](#)



AGROFORESTRY
IN SOUTHERN
BRAZIL

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Consultant
ajdearaujo@gmail.com

Agroforestry in Action Webinar
April 27, 2016 | 11:00am (CST)

Online Graduate Program

30 credit online non-thesis M.S.

First of its kind in the world

Target –Working professionals, Peace Corps

8 new courses developed

4 with agroforestry focus

12 credit Graduate Certificate

44 Students Admitted as of Spring 2016 (7 Graduates)



Cathy Watson

Cathy Watson is chief of programme development at the World Agroforestry Centre in Nairobi. Before joining ICRAF in November 2012, she founded and ran two NGOs in Uganda -- Straight Talk Foundation and Mvule Trust. She was made a senior Ashoka fellow for social entrepreneurship in 2006. She has also been a foreign correspondent, working for The Guardian and the BBC, among others. A graduate in biology and Latin American Studies from Princeton, she has almost 30 years of work experience in Africa with a focus on trees, youth, HIV, families, and communication for social change. She is currently pursuing a certificate in agroforestry at the University of Missouri.

The Way Forward

- Long-term, multi-location projects and modeling
- A network of agroforestry research sites (LTAFS)
- A network of agroforestry on-farm demonstration sites
- A National Agroforestry Advisory Council (NAAC) representing all the stakeholders (and more) at the table
- A coalition of universities engaged in agroforestry research/outreach/education
- Public-Private Partnerships for research and outreach

