OAK RIDGE National Laboratory

Panel 3: Common Ground and Opportunities for Collaboration

Keith L. Kline, Oak Ridge National Laboratory
Oak Ridge, Tennessee, USA

International Workshop on Adequacy of Data for Conducting Risk Assessments of Sustainable Wood Sourcing Practices for Wood Pellet Exports
01-03 May

Athens, GA

ORNL is managed by UT-Battelle, LLC for the US Department of Energy

U.S. DEPARTMENT OF ENERGY

Acknowledgements: Kristen Johnson and Jim Spaeth, US DOE Bioenergy Technologies Office.

The views and opinions expressed are of the authors' and not necessarily representative of any institution or agency.

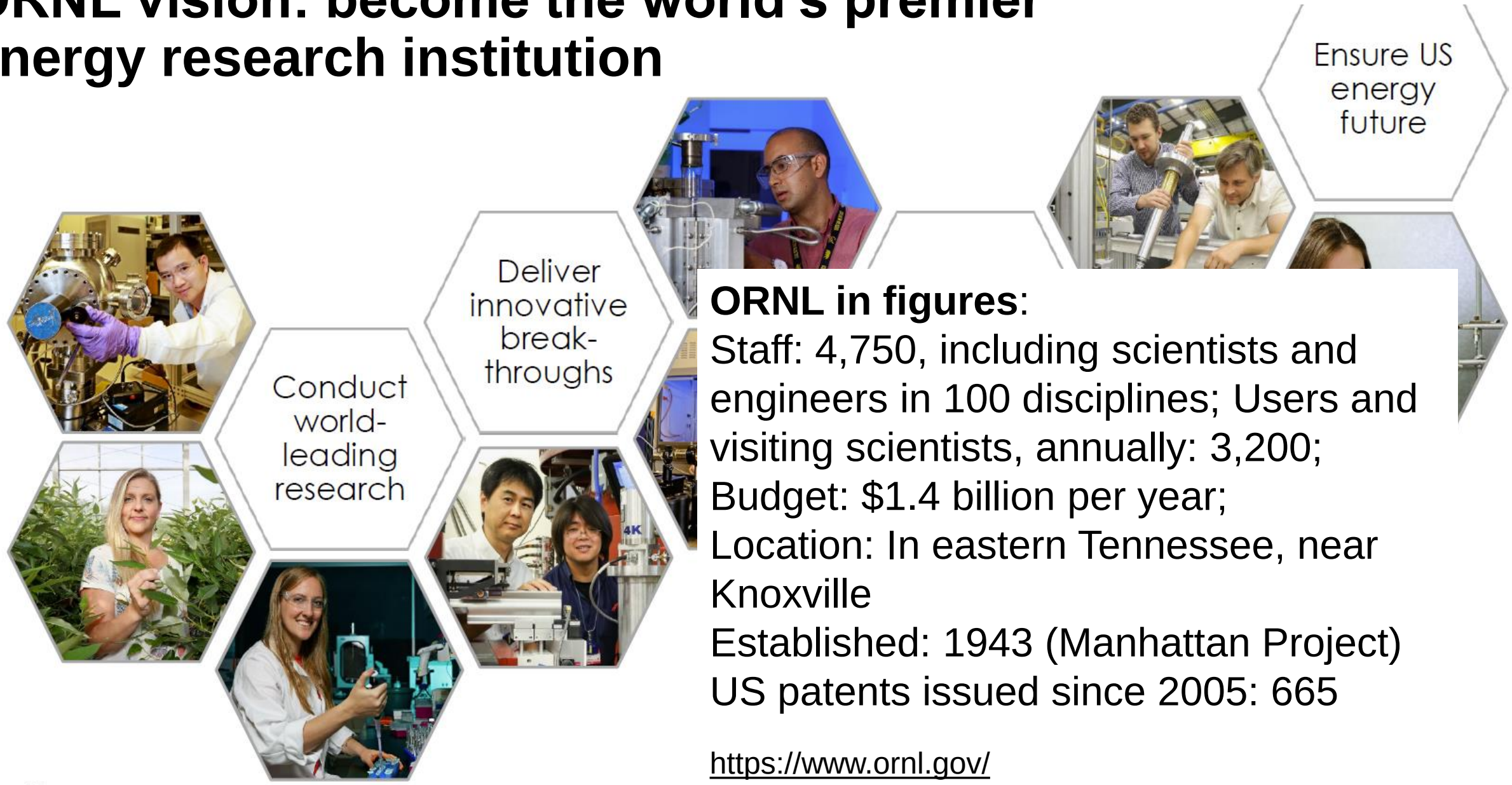
ORNL's mission

Deliver scientific discoveries and technical breakthroughs needed to realize solutions in energy and national security and provide economic benefit to the nation

Integrating and applying 23 core capabilities, spanning the range from basic to applied, to deliver mission outcomes

https://www.ornl.gov/

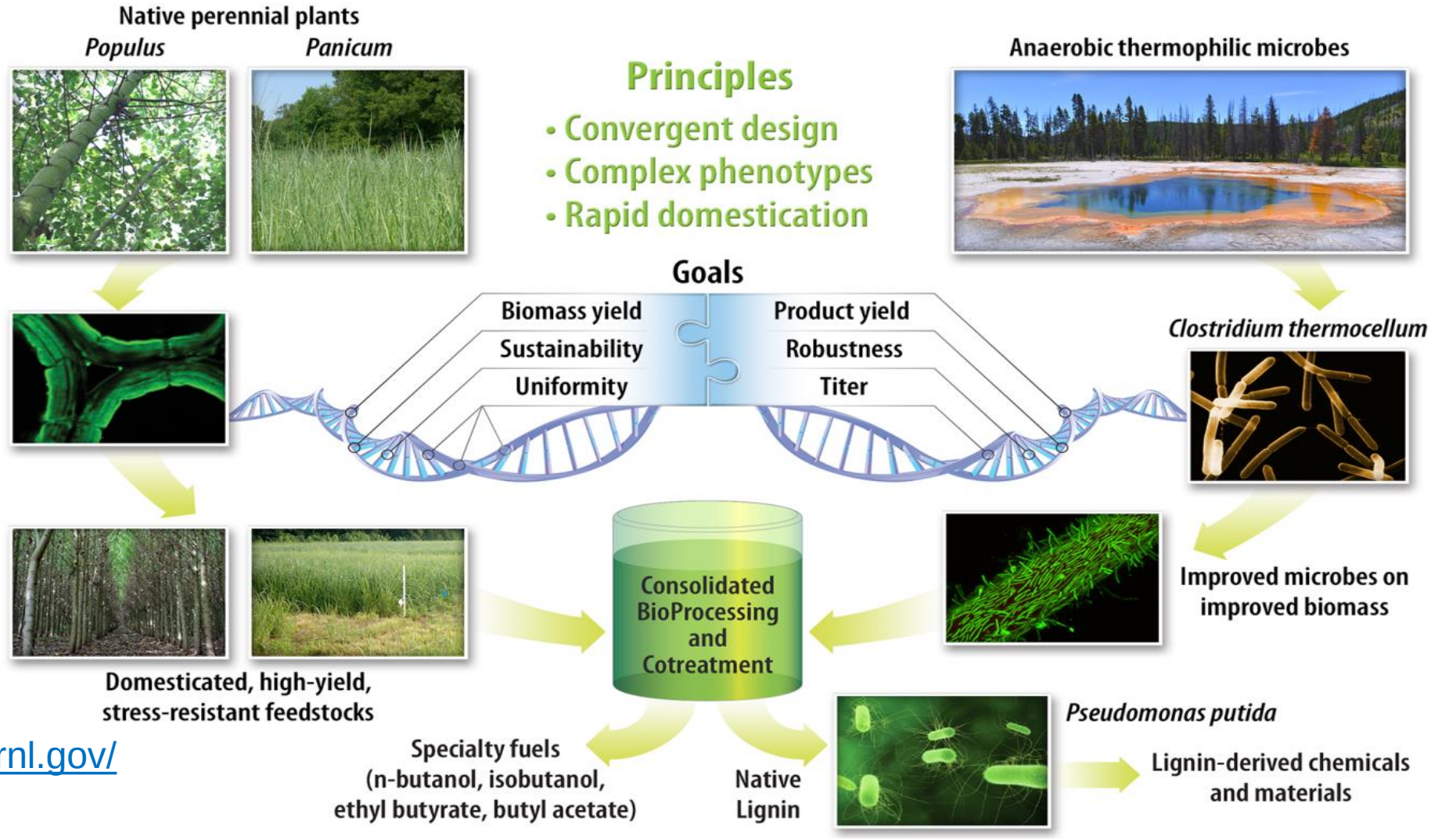
ORNL vision: become the world's premier energy research institution



ORNL in figures:
Staff: 4,750, including scientists and engineers in 100 disciplines; Users and visiting scientists, annually: 3,200;
Budget: $1.4 billion per year;
Location: In eastern Tennessee, near Knoxville
Established: 1943 (Manhattan Project)
US patents issued since 2005: 665

https://www.ornl.gov/

ORNL Center for Bioenergy Innovation Goal:
Accelerate domestication of novel plants and microbes to enable high-impact advances across the bioenergy supply



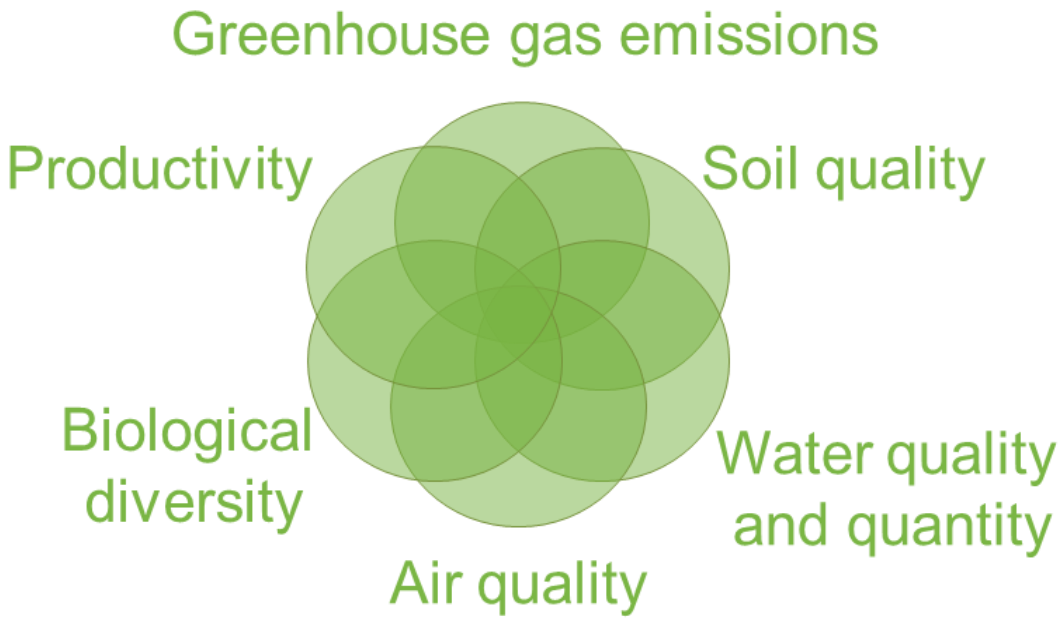
https://cbi.ornl.gov/

OAK RIDGE National Laboratory

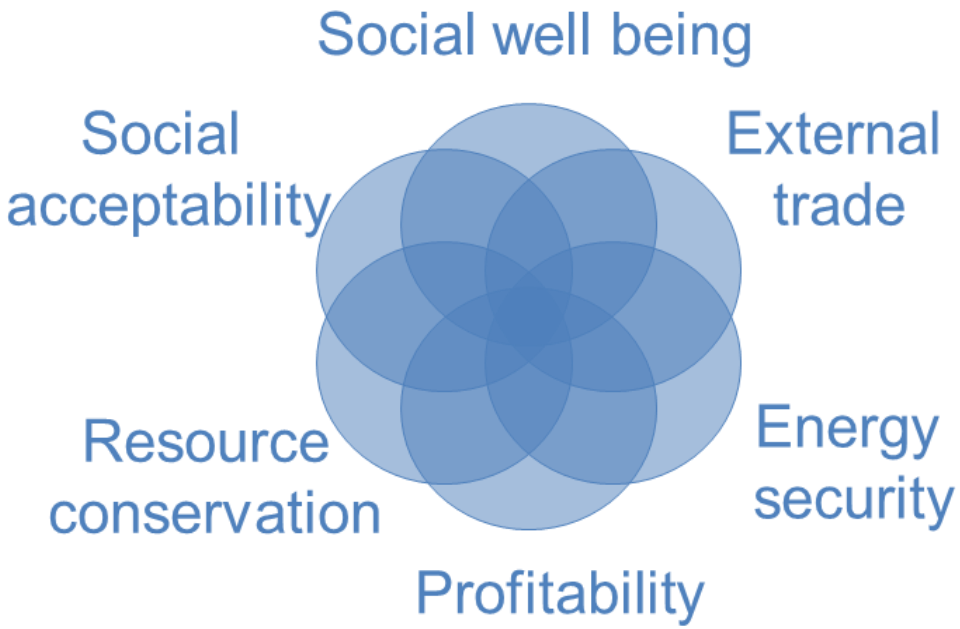
U.S. DOE Commitment to *Sustainability*

- BioEnergy Technology Office (BETO) Strategic Plan (https://www.energy.gov/eere/bioenergy)
- **Vision**: A thriving and *sustainable* bioeconomy fueled by innovative technologies
- **Mission**: Developing and demonstrating transformative, *sustainable* bioenergy technologies for a prosperous nation
- ***Sustainability* Goal:** Understand and promote the positive economic, social, and environmental effects and reduce the potential negative impacts of bioenergy production activities.
- ***Effects and indicators*** are context-specific (Efroymson et al. 2013).

ORNL Role: Quantifying effects and trade-offs associated with bioenergy options; communicating to enhance benefits



McBride et al. (2011)
Ecological Indicators
11:1277-1289



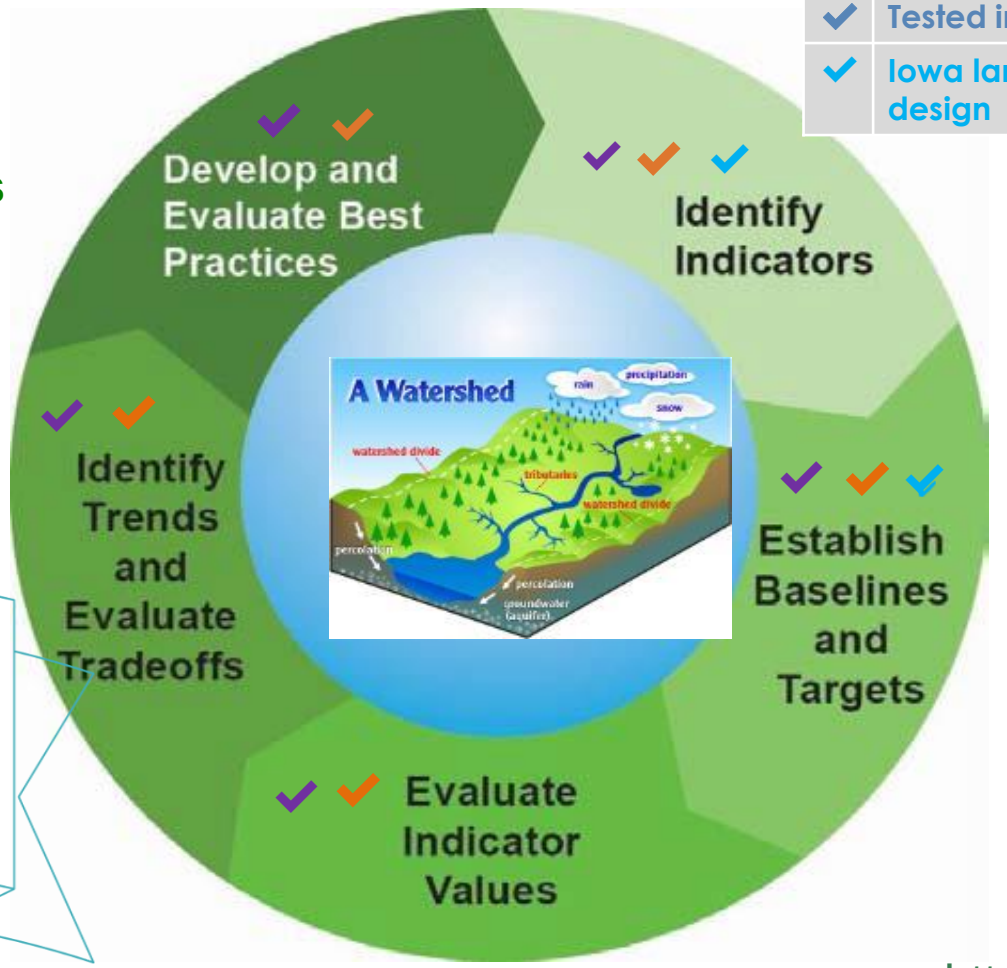
Dale et al. (2013)
Ecological Indicators
26:87-102.

Quantify effects by applying scientific approaches to site-specific conditions.
Communication is key: provide decision-relevant, credible information to help bioenergy systems incorporate continual improvement (Dale et al. 2015)

Overview of Approach: working with partners to identify improved practices

Code for checks	
✔	Reviewed
✔	Tested in East TN
✔	Iowa landscape design

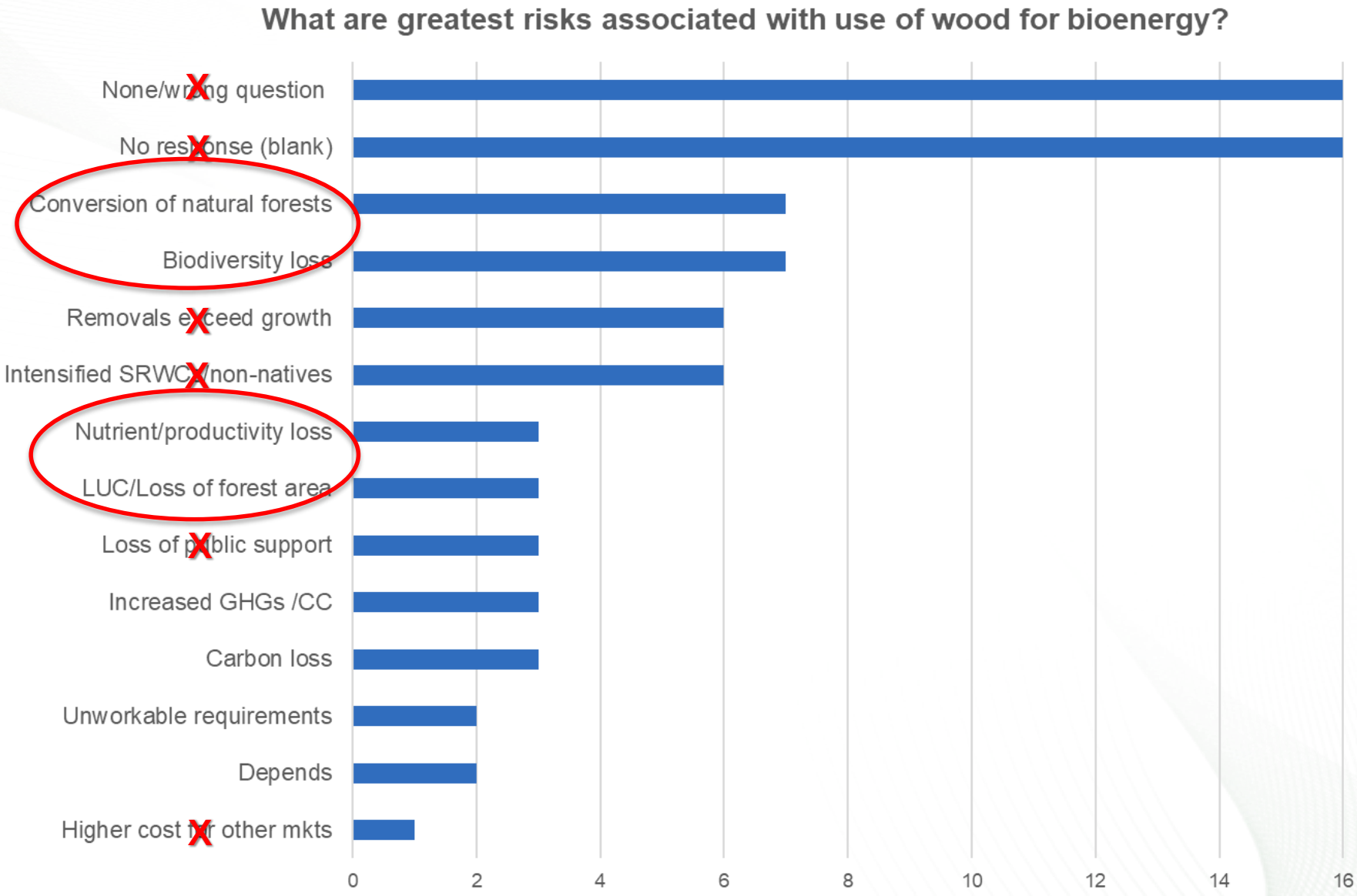
Adoption of practices depends on credibility with land owners & managers & their willingness to change



Quantify effects of integrating cellulosic bioenergy production in commercial production landscape

https://cbes.ornl.gov/

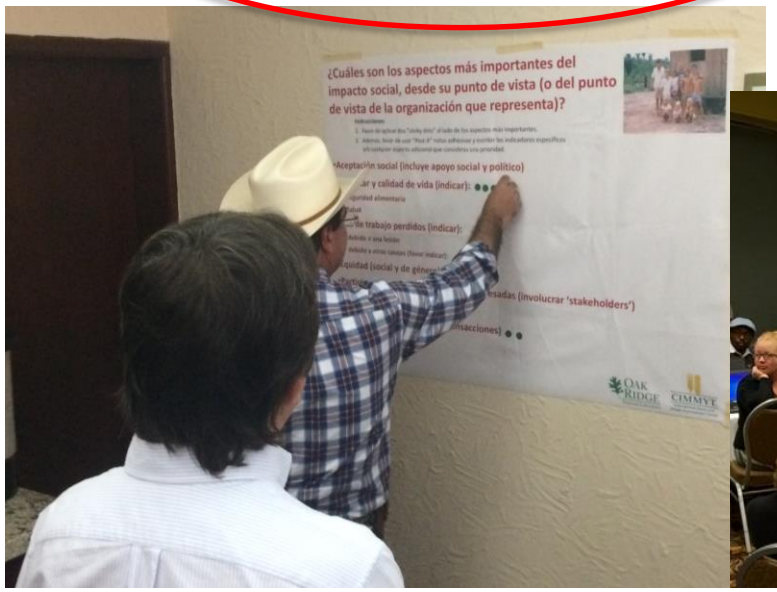
Common ground?

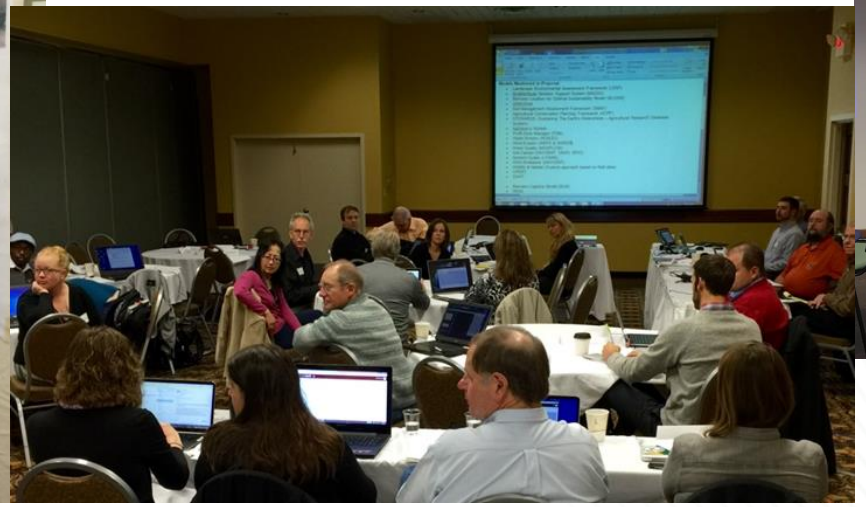


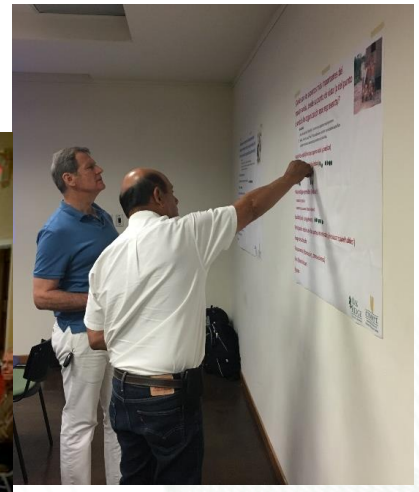
Kline KL – tabulated from 01 May 2019 workshop participants; Athens GA. N = 61

Opportunities for common ground & collaboration

- Prerequisite conditions
  - Common goals
  - Local champions
  - Multiple levels of committed support, resources
- Potential topics
  - Reference scenario – protocol (guidelines)
  - Causal analysis for LUC – teasing out attribution based on weight of evidence








Thank you!
Photo: ORNL

References and related reading

- 2016 *Billion-Ton Report. Volume 2: Advancing Domestic Resources for a Thriving Bioeconomy. Volume 2. Environmental Sustainability Effects of Select Scenarios:* https://energy.gov/eere/bioenergy/downloads/2016-billion-ton-report-volume-2-environmental-sustainability-effects
- BT16 Resource Assessment for US biomass supplies volume 1: https://energy.gov/eere/bioenergy/2016-billion-ton-report
- Dale B et al. 2014. Take a closer look: biofuels can support environmental, economic and social goals. ES&T48(13):7200-7203
- Dale VH et al. 2013. Indicators for assessing socioeconomic sustainability of bioenergy systems: A short list of practical measures. Ecological Indicators 26: 87-102. http://dx.doi.org/10.1016/j.ecolind.2012.10.014
- Dale VH et al. 2016. Incorporating bioenergy into sustainable landscape designs. *Renewable & Sustainable Energy Reviews* 56:1158-1171. http://authors.elsevier.com/sd/article/S1364032115014215
- Dale VH et al.(2017) for Biomass & Bioenergy Special Issue on Biofuels and Ecosystem Services: Selecting indicators of changes in ecosystem services due to cellulosic-based biofuels in the midwestern US.
- Efroymson RA et al. 2013. Environmental indicators of biofuel sustainability: What about context? Environmental Management 51(2): 291-306. http://web.ornl.gov/sci/ees/cbes/Publications/Efroymsonetal2012biofuelindicatorcontextEMfinal10%201007_s00267-012-9907-5.pdf
- FAO (2015a) Hunger Map 2015. FAO Statistics Division, Rome. Available: http://www.fao.org/hunger/en/
- FAO (2015b) Forty-second Session Report, Committee on World Food Security, Rome, Italy, 12-15 October 2015. Global Strategic Framework for Food Security & Nutrition (GSF) Available at: http://www.fao.org/3/a-mo187e.pdf Last Accessed 10/10/2015.
- FAO, IFAD, WFP (2013) The State of Food Insecurity (SOFI) in the World 2013 -The multiple dimensions of food security. And FAO, IFAD, WFP (2014) SOFI Strengthening the enabling environment for food security and nutrition. FAO Rome. And FAO, IFAD, WFP (2015) SOFI Meeting the 2015 international hunger targets: taking stock of uneven progress. FAO, Rome, Italy
- Kline KL, Dale VH (2008) Biofuels, causes of land-use change, and the role of fire in greenhouse gas emissions. Science, 321, 199.
- Kline KL, Dale VH, Lee R, Leiby P (2009) In Defense of Biofuels, Done Right. Issues in Science and Technology, 25(3), 75-84
- Kline KL, Oladosu GA, Dale VH, McBride AC (2011) Scientific analysis is essential to assess biofuel policy effects. Biomass and Bioenergy, 35, 4488-4491
- Kline KL (2014) Advanced School on Present and Future of BioEnergy, ESPCA–FAPESP–University of Campinas, 10-17 October, 2014. Campinas, SP Brazil.
- Kline KL et al. (2017) Reconciling biofuels and food security: priorities for action. GCB-Bioenergy. http://onlinelibrary.wiley.com/doi/10.1111/gcbb.12366/full
- Kline Dale and Parish (2018) The importance of reference conditions in assessing effects of bioenergy wood pellets produced in the southeastern United States. World Biomass 2018/2019. DCM Productions, United Kingdom. http://www.dcm-productions.co.uk
- Milà i Canals L, Bauer C, Depestele J, Dubreuil A, Knuchel RF, Gaillard G, et al. 2007. Key elements in a framework for land use impact assessment within LCA. Int J Life Cycle Assess 12:5–15. http://dx.doi.org/10.1065/lca2006.05.250
- McBride A et al. (2011) Indicators to support environmental sustainability of bioenergy systems. *Ecological Indicators* 11(5) 1277-1289.
- Oladosu, G., and Msangi, S. (2013). Biofuel-food market interactions: a review of modeling approaches and findings. Agriculture, 3(1), 53-71.
- Parish ES et al. (2012) Multimetric spatial optimization of switchgrass plantings across a watershed. *BioFPR*. 6(1):58-72
- Parish ES, Kline KL, Dale VH, Efroymson RA, et al., (2013) Comparing Scales of Environmental Effects from Gasoline and Ethanol Production. Environmental Management 51(2):307-338
- IRENA (Jeff Skeer) (2016) Boosting Biofuels: Sustainable paths to greater energy security. www.irena.org
- Rainforest Alliance (2008) Impact of FSC Certification on Deforestation and the Incidence of Wildfires in the Maya Biosphere Reserve. http://www.rainforest-alliance.org/forestry/documents/peten_study.pdf

References and related reading

- REN 21 Renewables (2016) and (2014) Global Status Report Paris, REN21 Secretariat. http://www.ren21.net/status-of-renewables/global-status-report/
- Roser M (2015) Our World in Data. www.OurWorldinData.org
- Souza GM, Victoria RL, Joly CA and Verdade M, editors 2015. Scientific Committee on Problems of the Environment (SCOPE), Bioenergy & Sustainability: bridging the gaps. SCOPE 72. Paris, France and Sao Paulo, Brazil. ISBN: 978-2-9545557-0-6. http://bioenfapesp.org/scopebioenergy/index.php
- Sumner DA (2009) Recent commodity price movements in historical perspective. American Journal of Agricultural Economics, 91(5) 1250-1256
- Thurow R, Kilman S (2009) Enough: Why the World's Poor Starve in an Age of Plenty. BBS Public Affairs, New York.
- UNEP (2016) Unlocking the Sustainable Potential of Land Resources: Evaluation Systems, Strategies and Tools. Working Group on Land and Soils, International Resource Panel (IRP UNEP). Herrick, JE, O Arnalds, B Bestelmeyer, S Bringezu, G Han, MV Johnson et al. , ISBN: 978-92-807-3578-9
- USDA Economic Research Service (2015) Definitions of Food Security: Ranges of Food Security and Food Insecurity. U.S. Department of Agriculture
- Woodall et al. 2015. Monitoring Network Confirms Land-Use Change is a Substantial Component of the Forest Carbon Sink in eastern United States
- Dale VH, KL Kline, LL Wright, RD Perlack, M Downing, RL Graham. 2011. Interactions among bioenergy feedstock choices, landscape dynamics and land use. *Ecological Applications* 21(4):1039-1054.
- Dale, VH, RA Efroymson, KL Kline, MH Langholtz, PN Leiby, GA Oladosu, MR Davis, ME Downing, MR Hilliard. 2013. Indicators for assessing socioeconomic sustainability of bioenergy systems: A short list of practical measures. Ecological Indicators 26: 87-102.
- Oladosu D, KL Kline, P Leiby, R Martinez, M Davis, M Downing, L Eaton. 2012. Global economic effects of the US biofuel policy and the potential contribution from advanced biofuels. Biofuels 3(6):703-723. http://www.future-science.com/doi/pdfplus/10.4155/bfs.12.6
- USDOE 2011. U.S. Billion-Ton Update: Biomass Supply for a Bioenergy and Bioproducts Industry. ORNL. http://www1.eere.energy.gov/bioenergy/pdfs/billion_ton_update.pdf
- USDOE State of Technology updates: http://www1.eere.energy.gov/bioenergy/key_publications.html
- Dornburg et al. 2010. Bioenergy revisited: Key factors in global potentials of bioenergy. Energy Environ. Sci., 2010,3, 258-267..
- Efroymson, R. A., V. H. Dale, K. L. Kline, A. C. McBride, J. M. Bielicki, R. L. Smith, E. S. Parish, P. E. Schweizer, D. M. Shaw. 2012. Environmental indicators of biofuel sustainability: What about context? Environmental Management DOI 10.1007/s00267-012-9907-5
- Giglio L., J. T. Randerson, G. R. van derWerf, P. S. Kasibhatla, G. J. Collatz, D. C. Morton, and R. S. DeFries. Assessing variability and long-term trends in burned area by merging multiple satellite fire products. Biogeosciences, 7, 1171–1186, 2010.
- IPCC 2012 Special Report on Renewables and Climate Change Mitigation.
- Kline KL, Dale VH, Lee R, Leiby P. 2009. In Defense of Biofuels, Done Right. Issues in Science and Technology 25(3): 75-84. http://www.issues.org/25.3/kline.html
- Langholtz M, Eaton L and Turhollow A. (in press). 2013 Feedstock Supply and Price Projections and Sensitivity Analysis. (BioFPR 2014).
- McBride A, VH Dale, L Baskaran, M Downing, L Eaton, RA Efroymson, C Garten, KL Kline, H Jager, P Mulholland, E Parish, P Schweizer, and J Storey. 2011. Indicators to support environmental sustainability of bioenergy systems. *Ecological Indicators* 11(5) 1277-1289.
- Parish ES, M Hilliard, LM Baskaran, VH Dale, NA Griffiths, PJ Mulholland, A Sorokine, NA Thomas, ME Downing, R Middleton. 2012. Multimetric spatial optimization of switchgrass plantings across a watershed. *Biofuels, Bioprod. Bioref*. 6(1):58-72.
- Strassburg BBN, Latwiec AE, et al., 2014. When enough should be enough. Improving the use of current agricultural lands could spare natural habitats in Brazil. Glob.Env.Change 28 84-97.

Recommendations: Manage landscapes for more sustainable production, multiple services

- Identify populations at high-risk
  - Address equity: targeted interventions
  - Understand local causes of poverty
  - Invest in rural transformation and value-added processing
- Diversify crops and sources of income
  - Increase system efficiency
  - Provide more reliable demand
- Work with local champions & leaders, government, and civil society to:
  - Develop joint strategies
  - Ensure consistent policies
  - Measure progress
  - Apply adaptive management to achieve common goals

USAID photo - Feed the Future annual report 2015

Kline KL et al. (2017) Reconciling biofuels and food security: priorities for action. GCB-Bioenergy.

Recommendations:

- Measure actual effects:
  - Management practices
  - Rural economic growth
  - Price volatility
- Which options support improved management practices and higher, more stable, long-term incomes? ➔ … these will also improve livelihoods, food security, and soil conservation.
- Get out to the field, listen and enjoy.

Photos: Ron Savage, USAID

Kline et al. (2017) Reconciling biofuels and food security: priorities for action. GCB-Bioenergy.

OAK RIDGE National Laboratory

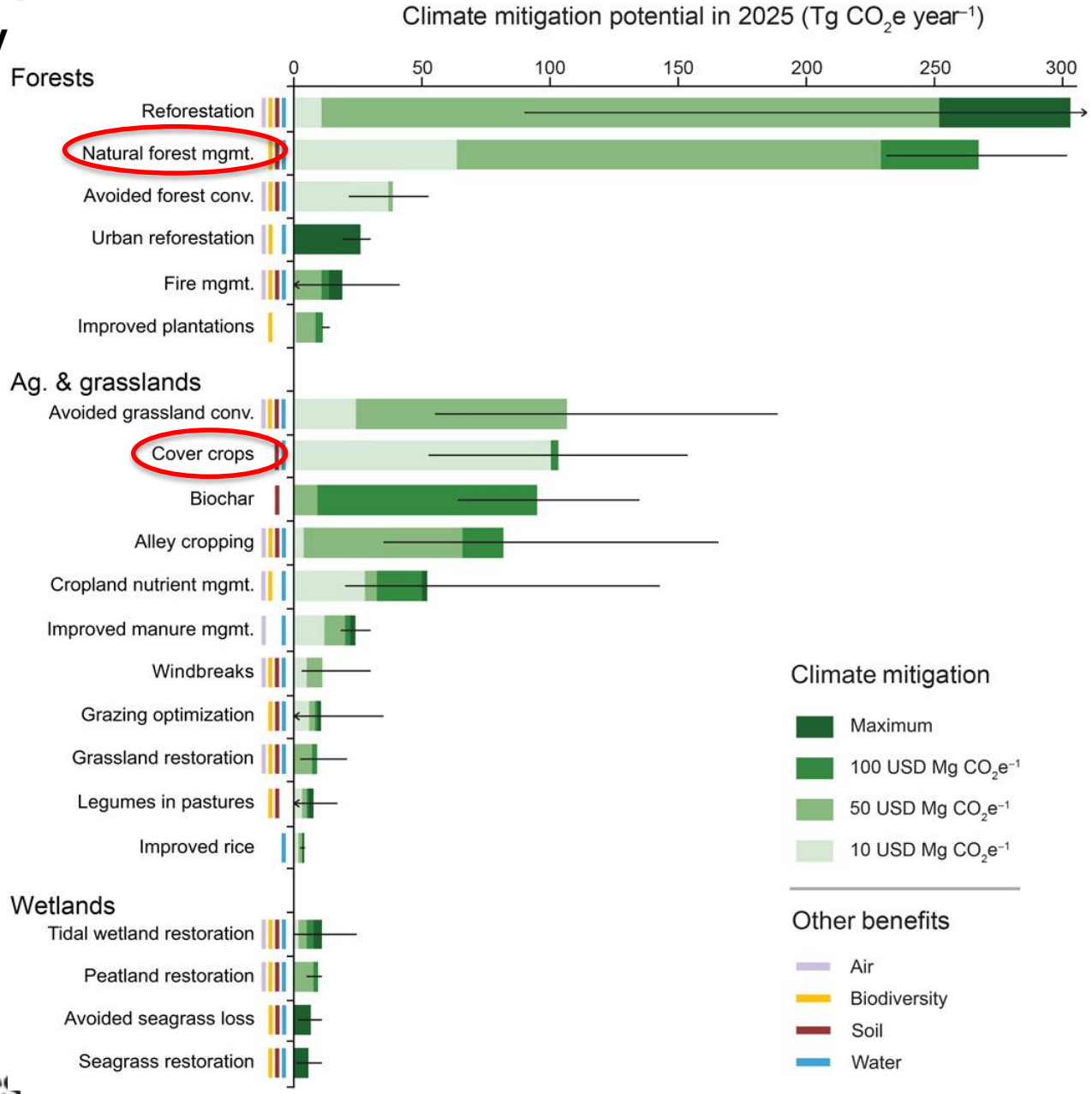
Fig. 1 Climate mitigation potential of 21 NCS in the United States.

Joseph E. Fargione et al. Sci Adv 2018; 4:eaat1869. "Natural Climate Solutions"

Needed: funding & other incentives to do the right thing. Integrating bioenergy can support better resource management.

-Kline et al. 2009. "In defense of biofuels done right"

https://www.osti.gov/biblio/1015016-defense-biofuels-done-right



Science Advances AAAS

Published by AAAS

Copyright Statement and Disclaimer

This material is based upon work supported by the US Department of Energy under the Bioenergy Technologies Office (BETO), and performed at Oak Ridge National Laboratory under contract number DE-AC05-00OR22725. **The views and opinions of the author expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.** Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.