CBES
Center for BioEnergy Sustainability

Bioenergy Study Tour of the Southeastern U.S.
April 11-14, 2016

Exploration of Sustainability Tradeoffs within an East Tennessee Switchgrass-to-Ethanol Production System

A summary of two DOE-sponsored ORNL studies completed through collaboration with:

USDA United States Department of Agriculture National Institute of Food and Agriculture

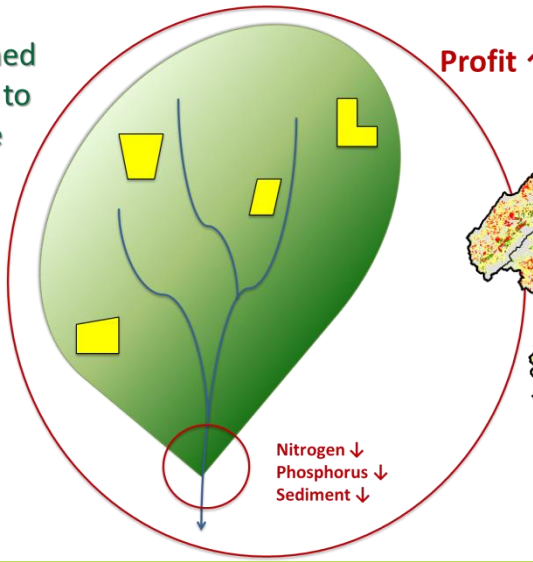
IBSS Southeastern Partnership for Integrated Biomass Supply Systems

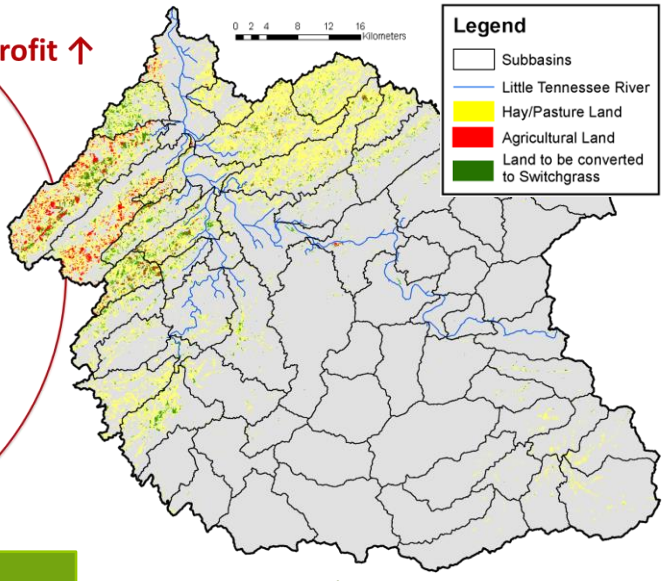
THE UNIVERSITY of TENNESSEE UT INSTITUTE of AGRICULTURE

GENERA ENERGY Delivering Sustainable Biomass Solutions

A watershed approach to landscape design

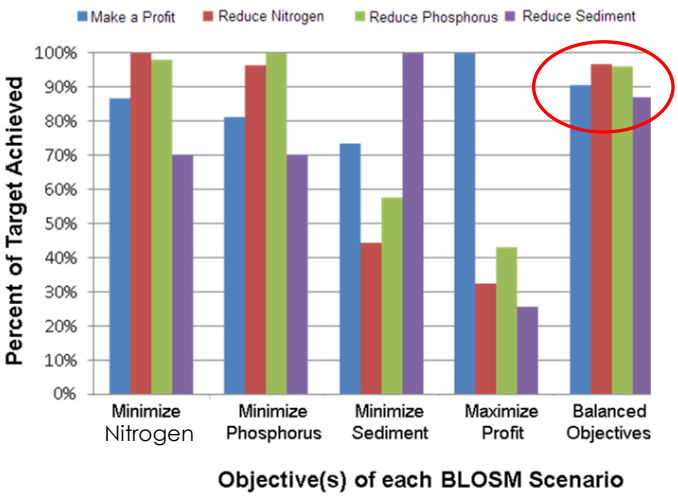
Which crop configuration maximizes sustainability objectives while achieving target production?





Lower Little Tennessee Watershed

Parish, ES, M Hilliard, LM Baskaran, VH Dale, NA Griffiths, PJ Mulholland, A Sorokine, ME Downing, R Middleton, and NA Thomas. 2012. Multimetric Spatial Optimization of Switchgrass Plantings Across a Watershed. *Biofuels, Bioproducts & Biorefining* 6(1):58-72.



Evaluating Environmental & Economic Tradeoffs

Biomass Location for Optimal Sustainability Model (BLOSM) was used to test the hypothesis that landscape design of cellulosic bioenergy crop plantings may improve water quality (i.e., decrease concentrations of total suspended sediment, total phosphorus, and total nitrogen) while simultaneously realizing profits for farmer-producers and meeting a target feedstock production goal.

BLOSM was used to consider six potential switchgrass (*Panicum virgatum*) planting configurations for the Lower Little Tennessee watershed. Each scenario was designed to maximize different sustainability goals.

U.S. DEPARTMENT OF ENERGY

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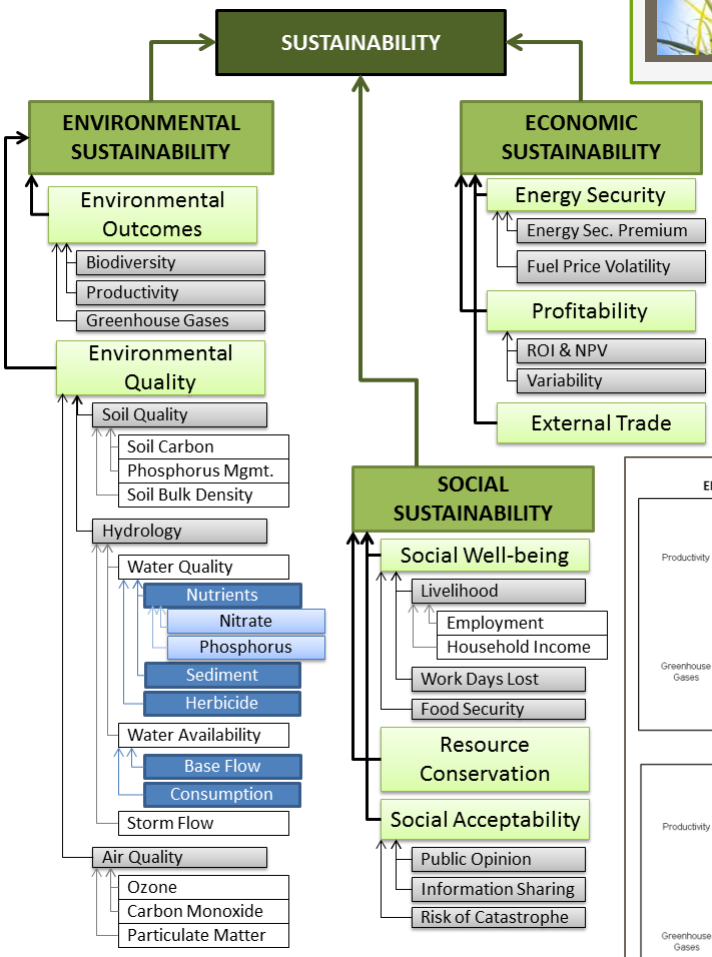
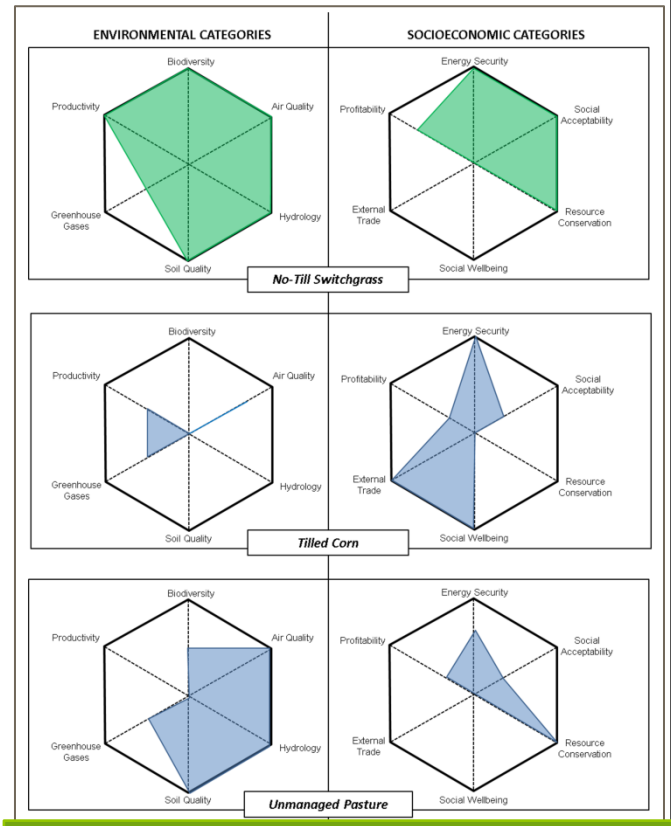
OAK RIDGE National Laboratory

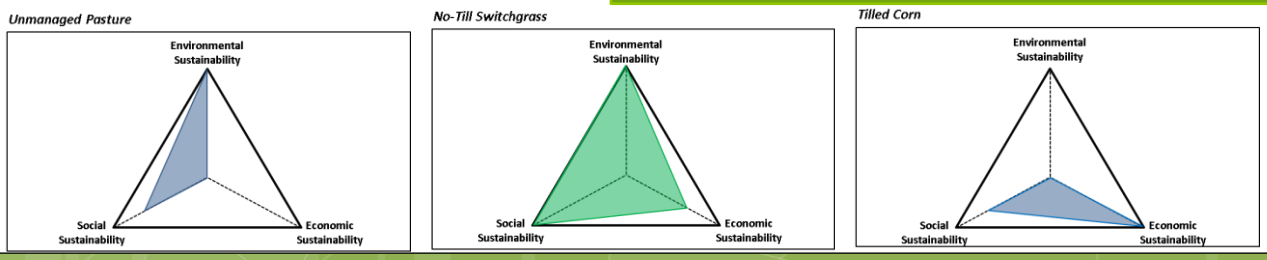


A variety of indicator data collected by Tennessee researchers were used to assess the sustainability of a 5-year demonstration-scale switchgrass-to-ethanol production system centered on Vonore, TN relative to two alternative agricultural business-as-usual scenarios of unmanaged pasture and tilled corn production.



A Multi Attribute Decision Support System (MADSS) model was constructed to evaluate the overall progress toward sustainability for this bioenergy system relative to the two alternative scenarios. Twelve categories of 35 sustainability indicators were aggregated within the MADSS, and relative environmental and socioeconomic sustainability ratings were developed for each scenario based on a combination of empirical data, literature review and expert opinion. Switchgrass production was shown to be sustainable within this local East Tennessee context.

Parish, E. S., V. H. Dale, B. C. English, S. W. Jackson & D. D. Tyler. 2016. Assessing multimetric aspects of sustainability: Application to a bioenergy crop production system in East Tennessee. *Ecosphere* 7(2):e01206. 10.1002/ecs2.1206



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