Bioenergy Agroforest in the LMAV
Bioenergy Agroforests in the LMAV

The purpose of the study is to develop bioenergy cropping systems that do not compete with food crops, can grow on marginal lands, and provide other important ecosystem functions in the Lower Mississippi Alluvial Valley.

A diverse group of researchers and investigators came together to implement this study in Arkansas and Louisiana.
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Three marginal agricultural areas were utilized for the study. Previous management included soybean, rice, and pastures.
Three different crops were established; soybeans (C), cottonwood (W), and switchgrass (S).

The cottonwood and switchgrass were also alley cropped together in two separate agroforest mixtures; (WS) 67% cottonwood and 33% switchgrass, (SW) 67% switchgrass, 33% cottonwood.

Two different size of plots (90 x 90 m and 90 x 30m) were established. The larger plots will be used for small mammal monitoring as well as biomass production, carbon sequestration, and nitrogen retention evaluation.
Cottonwood Establishment

Ripping or subsoiling of agricultural fields is mandatory to insure proper root growth and tree survival.

Three different cottonwood clones were planted, a woods run, S7C20, and ST66.

Planting: 2 x 1.5m spacing

Cutting 0.5-2.0 cm in diameter and 35-50 cm in length are planted to establish cottonwood. (tops are painted so that cutting is planted appropriately)
Switchgrass Establishment

Initial soil preparation included herbicide application and phosphorus fertilization. No nitrogen was added because it increases competition by invasive weeds.

Rows of switchgrass emerging mid-summer.

Drills were used to plant Alamo switchgrass at around 10 lbs/acre.
Tree Development

Shoot and leaf emergence.

Initial elongation and foliage production.
Competition control is important to maximize cottonwood growth. Close spacing require protection of the cottonwood from herbicides and innovative equipment.

To the left is a wicking herbicide applicator, used to control morning glories at Pine Tree.
Cottonwood with good competition control

Soybean control

Two meters and still growing

67% Switchgrass & 33% Cottonwood

Trees, Switchgrass, and Soybeans (late August 2009)
Trees, Switchgrass, and Soybeans (2010)

Grain Sorghum
July 2010

Switchgrass June

67% Switchgrass & 33% Cottonwood
During Drought
August 2010
Trees, Switchgrass, and Soybeans (2012)
Measurements

Energy content of the grain and residues are determined for both the soybean.

Soybeans or grain sorghum are harvested from each control plot.

Trash from the harvesting is also collected.
Measurements

Annual sampling of switchgrass in fall
Tree measurement. Height and basal diameter of subset of each of the three clones.
Nitrogen and Carbon

Nitrogen, Carbon, & Water

• Determine the potential for agroforests to retain nitrogen and sequester carbon

Collect soil water as an indication of potential carbon and nitrogen loss - 30 cm depth
Soil, Fine Root, and Residue Sampling

Soil Respiration

• Monthly Sampling
Small Mammal Population and Habitat

- Determine impact of agroforests on small mammal community composition, relative abundance, diversity, and space use
Small Mammals

36 Live Traps installed at each large plot proportionally to area in a crop.
Small Mammals

Radio Collars on a sub-set