Fall, 2010

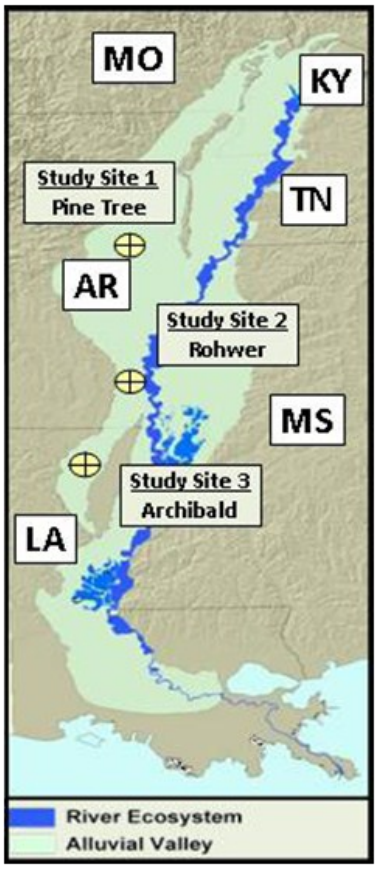
SCAS
Switchgrass and Cottonwood Agroforest Study
Bioenergy in the Lower Mississippi River Valley

Volume 1, Issue 1

Switchgrass/Cottonwood Agroforest Study—A Potential Bioenergy Feedstock Cropping System

The long-term goal of the Switchgrass/Cottonwood Agroforest Study (SCAS) is to develop ecologically and economically viable agroforest cropping systems suitable for producing cellulosic bioenergy feedstocks on marginal agricultural land in the Lower Mississippi Alluvial Valley (LMAV). Marginal lands in this region will likely be the most appropriate areas for bioenergy production since they will have the least impact on the production of current agricultural crops in the LMAV. One of the first steps to achieving the goal of this project was the establishment in 2009 of a study to evaluate the ability of eastern cottonwood and switchgrass to produce cellulosic bioenergy feedstocks as well as important ecosystems services such as wildlife habitat and nitrogen retention. Research sites were established at the (1) University of Arkansas Pine Tree Branch Station, (2) University of Arkansas Rohwer Research Station and (3) The Stevenson Farm near Archibald, LA. Individual stands of cottonwood and switchgrass as well as alley cropped switchgrass and cottonwood agroforests were established at three sites on poorly or some what poorly drained agricultural land that had been in or recently converted from row crop production. In addition to switchgrass and cottonwood, a regionally common row crop rotation (soybean-grain sorghum) is also being grown at each site.

Alley cropped cottonwood & switchgrass June, 2010



Location of research sites

The alley cropped switchgrass and cottonwood were established in parallel 49 and 66 foot allies to provide two different agroforest compositions, one dominated by cottonwood (67%) and one dominated by switchgrass (67%). Biomass production, biofuel quality, production economics, carbon sequestration, greenhouse gas emissions, nitrogen loss, and small mammal populations of these cropping systems are being determined and compared among the various cropping systems. Field days, fact sheets, and other materials are provided to landowners and resource managers with up to date information on the project. A local advisory committee made up of landowners, land managers, and UA county extension agents have been organized for each site. These committees will help direct research, develop outreach efforts, and provide local expertise to project personnel.

Soybean crop– summer, 2009

Cottonwood Leaf Beetle

Several insects can cause damage to cottonwood trees. One of the most serious pests in young, pure cottonwood plantations is the cottonwood leaf beetle (*Chrysomela scripta* F.). This insect feeds on the terminal tissues and leaders of the infected trees, which results in a reduction of vigor and important height growth during early tree establishment. Initial evidence of infection is ragged foliage along outer portions of the tree and brown patches due to young larvae feeding on green leaf tissue. Where infestations are high, the leaf will be skeletonized and terminals will die and turn black. A significant infestation of cottonwood leaf beetles occurred at the Rohwer site during the early summer of 2010. An inventory of the trees at this site (June 7, 2010) indicated that over 50% of the trees had been infecsed with the cottonwood leaf beetles. Larvae as well as adults beetles were observed. After review of the potential control methods, 8 oz./acre of Provado® (imidacloprid, 1-[(6-Chloro-3-pyridinyl)methyl]-*N*-nitro-2-imidazolidinimine) was aerially applied within one week of the inventory. Control was close to complete and the trees rapidly recovered from the defoliation. We do not expect those insects to pose a threat in the future at this site since average height of these trees is 9-11 ft.

Cottonwood Leaf Beetle
http://www.ento.okstate.edu/ddd/insects/leafbeetle.htm

Cottonwood leaf beetle larvae and skeletonized leaf

Additional information on this pest can be found in the following publications and website: (http:/www.entomology.umn.edu/cues/cwlb/index.html, Insects and Diseases of Cottonwood. USDA; Southern Forest Experiment Station;.Gen. Tech. Rep. SO-8.1975. 41 p.).

Small Mammal Monitoring

Small mammal trap at Rowher

Converting current agricultural crops to bioenergy crops such as cottonwood or switchgrass has the potential to change wildlife habitat and thus wildlife populations. Small mammals (mice, voles, rats, and shrews) are a key component of the food chains in the LMAV. / The diets of these mammals consists of plant material and insects. They disperse seed and are a major source of food for predators such as fox, coyote, hawks, and owls. As part of the SCAS, small mammal populations and movements are being monitored. Late this summer a grid of traps was set at each site for one week to determine to what degree each cropping system (soybean rotation, cottonwood, switchgrass, switchgrass/cottonwood agroforest) was utilized by the small mammals. Movements of selected individuals were monitored using radio telemetry. A total of 233 individuals representing 5 species were trapped. Overall the greatest number of individuals (96) was trapped in the 100% switchgrass cropping system and the least (13) in the 100% cottonwood cropping system. The vast majority of the small mammals were caught at the Stevenson's Farm (Archibald, LA) site.

Cotton rat with radio collar

Movement of the small mammals during this sampling period was limited to the area where they were initially trapped. This was likely due to the hot and dry climatic conditions during the trapping period.

Facet Herbicide and Cottonwood Damage

The herbicide Facet® is marketed by BSAF as a broad spectrum herbicide used in rice production. The active ingredient of this herbicide is quinclorac: 3,7-dichloro-8-quinolinecarboxylic acid. Cottonwood appears to be highly susceptible to this herbicide and we observed damage to the cottonwood planted on several of the SCAS study sites from this herbicide. The worst incident occurred in the early summer of 2010 at the Pine Tree Research Station in St. Francis, Co. Several rice fields are located within 300-400 ft. of the Pine Tree study site. Initial indications of damage were observed in mid-May with cupping and yellowing of leaves. Interestingly, the different clones planted at the site showed varying degrees of susceptibility to the herbicide. Damage occurred most rapidly and was most severe on the SC720 clone. When growing conditions are suitable, cottonwood trees recover rapidly from this damage. However, drought conditions during the summer of 2010 coupled with the herbicide damage significantly reduced tree growth and vigor. We recommend that landowners planting cottonwood should try to avoid areas directly adjacent to rice fields to reduce the potential of damage from this herbicide.

Typical cupping and yellowing of cottonwood foliage as a result of Facet drift.

Initial yellowing of SC720 clone (middle of picture) prior

Getting the Word Out

Providing information to landowners, land managers, and policy makers is an important part of the SCAS. In July the first ever "Bioenergy" Field Day was conducted at the Pine Tree Research Station. Over 70 people attended the field day. This was impressive since temperatures were in the high 90's for most of the day. The field day consisted of both indoor and outdoor activities. Along with SCAS personnel, individuals from UA Extension and School of Forest Resources discussed using different tree species for bioenergy feedstock production and demonstrated mobile pyrolysis equipment for converting on farm feedstocks to liquid fuel. The field days was organized by Dr. Jon Barry from the UA Extension as well as the SCAS advisory committee from the Pine Tree Research Station.

Dr. Phil Tappe discusses ecosystem services from agroforests

Dr. Sammy Sadaka demonstrated biothermal conversion of cellulose feedstocks to liquid fuels

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