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Reserach Team Studies Biofuel Cropping System to Increase Crop Profitability

Project Title: Sustainability of a Short-Rotation
Woody Biofuel System Compared to Grass Biofuel
and Grain Cropping Systems

Coordinator: Hank Stelzer

Location: Columbia, MO

SARE Grant: \$198,321

Duration: 2011-2013

To read the full project report, go to
www.sare.org/projects and search for
project number LNC11-337.

The North Central region has over 11 million acres of claypan and claypanlike soil areas that are disproportionate sources of nonpoint pollution and soil quality degradation when used for grain production.

Hank Stelzer wanted to determine whether a short-rotation willow biofuel cropping system on claypan soil could improve crop profitability, but establishing a willow crop during the 2011 and 2012 growing seasons on a Centralia, Missouri, research site was especially difficult because of severe drought.

On April 5, 2011, 13,000 willow cuttings approximately 25 cm long were hand-planted on three 0.85-acre plots. Planting was ideal, and by early June about 90 percent of the cuttings produced growing plants. Early-season weed control seemed to be sufficient.



Agricultural Research Service (ARS) scientist Newell Kitchen (kneeling) and graduate student Dianthe Hingson inspect 5-month-old willow plants at the project's research site in Centralia, MO.

Photo by Hank Stelzer.

During the dry and hot weather in late summer, about 40 percent of the plants died. The condition of the surviving plants ranged from poor to good.

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Replacement cuttings approximately 50 cm long were planted in early April 2012. Again, planting conditions were ideal and the cuttings were pushed into moist soil. Weed control continued with targeted spraying using glyphosate and mowing.

The heat and dry conditions in 2012 were more extreme than in 2011. By the end of the summer, all but a few of the replants from that spring were dead and an additional 20 percent of the first year's plantings also had died. At the end of the 2012 growing season, only 35 to 40 percent of the plants were alive. The condition of these plants ranged from poor to good, but wood growth from the 2012 growing season was minimal.

Although these two growing seasons made it especially difficult to establish the willow crop, the consensus of the research team was that the droughty nature of upland claypan soils will make it extremely difficult to establish a viable short-rotation willow biofuel cropping system.

The farmer advisory board supported the research team's conclusion. Board members suggested that farmers would be reluctant to try the willow cropping system because of the outcome of this project.

In October and November 2012, the research team began to consider alternative bioenergy crops such as Miscanthus, a perennial grass, as a replacement for the willow cropping system. The research team believes that farms and educators will continue to increase their knowledge of the soil-enhancing benefits of producing bioenergy crops on claypan soils and will learn how to produce these crops.

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