

Management Guide for the Production of Switchgrass for Biomass Fuel in Southern Iowa

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Prepared by Alan Teel, Extension program specialist, and Stephen Barnhart and Gerald Miller, Extension agronomists. Revised by Stephen Barnhart.

Switchgrass, a perennial warm-season grass native to all parts of Iowa and the Midwest, has become a biomass fuel crop for energy generation in southern Iowa. It has excellent burn qualities, is easily managed, and attains reasonable yields without high rates of nitrogen fertilizer. Switchgrass adapts well to numerous soils and climatic conditions, allowing it to grow on both the loess and till-derived soils of southern Iowa as well as on the soils in other parts of the state. Switchgrass also provides good habitat for wildlife.

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Varieties and Seed

Because switchgrass seed varies greatly in purity and germination, it often is sold on the basis of its pure live seed (PLS) percentage. Seed lots with equal amounts of PLS may differ in their volume of bulk seed. Consider this when calibrating seeding equipment.

Newly harvested switchgrass seed can have a high percentage of dormancy. Acceptable germination levels often are achieved after one year of storage. For newly harvested seed, a dormancy rating of 10 percent or less is excellent. Planting high dormancy seed in February or early March can help break seed dormancy and improve stand establishment.

At the present time, Cave-In-Rock is the recommended variety for biomass planting in Iowa. This variety has, however, been shown to be susceptible to a fungal, smut disease that can reduce plant vigor and yield. In addition, recent trials in

Iowa show that while the southern-origin, lowland varieties Alamo and Kanlow may be higher yielding, they present a higher risk of winterkill and winter injury than do locally adapted varieties. Other varieties are being evaluated.

Establishment

Most switchgrass is planted in mid-April to late May using 5 to 6 pounds of PLS per acre. There has been some grower success with dormant planting in late November and December, after all chances of fall germination are past. Growers have also had some success with surface sowing or frost seeding in February and March.

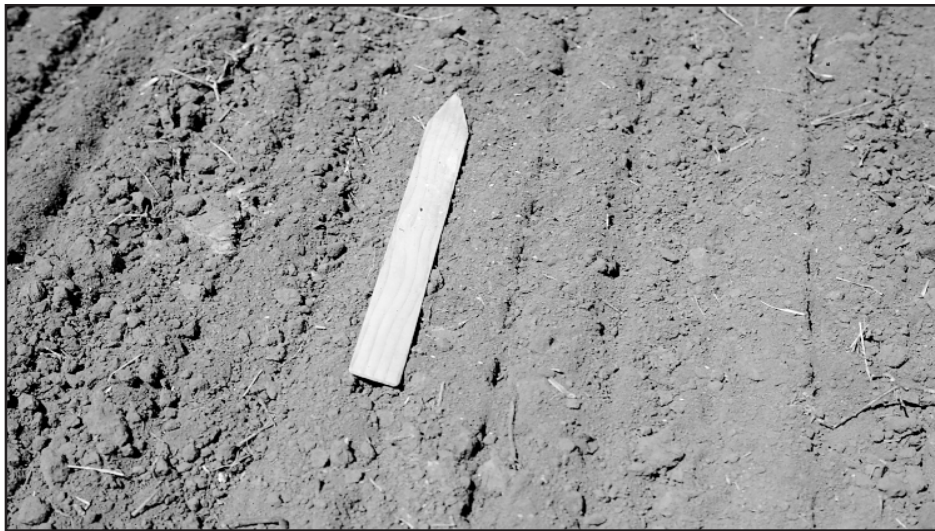
The two most common approaches are to plant into a tilled seedbed or into a herbicide-killed sod using no-till planting equipment. Whichever method is used, test the soil the autumn before planting and use soil test recommendations to apply proper amounts of phosphorous, potassium, and lime. Phosphorous and potassium levels should be in the optimum or medium range and soil pH should be 6.5 or above.

Seeding into Tilled Seedbeds

A packing device is required for seeding into a tilled seedbed. A firm seedbed, in which a footprint is barely visible, often requires two or more passes with the packing device. Place seed 1/4 inch to 1/2 inch deep. Deeper seed placement will result in poor emergence and a thin stand.

Proper weed control management during the seeding year can greatly improve switchgrass establishment. Manage weeds with a post-emergence application of four ounces per acre of Pursuit® in a 2 percent solution of ammonium sulfate (17 pounds





A properly packed seedbed.

per 100 gallons of water) and nonionic surfactant solution. Apply this solution in 7 to 10 gallons of water per acre. Iowa currently has a 24-C special local needs label that allows the use of Aatrex, atrazine for the establishment of switchgrass for biomass. The special use label allows 2 quarts/acre to be broadcast and preplant incorporated or broadcast at planting, prior to the emergence of weeds. Follow all label safety and use restrictions when using any pesticide or herbicide.

An alternative method of weed control is clipping, which requires mowing the field to a 4- to 5-inch stubble whenever weeds reach 6 to 10 inches tall. Some annual weeds will persist. It may be necessary to mow several times early in the seeding year.

Control broadleaf weeds with an appropriately labeled broadleaf herbicide and follow label directions.

Because weeds are detrimental to switchgrass seedling establishment, do not apply nitrogen fertilizer or manure during the seeding year.

No Till Establishment

When seeding into the residue of a previous crop, control existing weeds with glyphosate (Round-up,) at the rate of 1 to 1 1/2 quarts/acre in a 2 percent ammonium sulfate solution and a surfactant. Apply this mixture just prior to or just after seeding and before the switchgrass seed has germinated. Depending on the temperature, germination may take 10 to 14 days.

When seeding into an existing pasture, hay meadow, or CRP sod, mow vegetation to a height of

2 to 4 inches in mid-August of the preceding growing season. When the regrowth reaches a height of 4 to 6 inches in late summer, apply a non-selective herbicide such as Round-up, 2 percent ammonium sulfate solution, and surfactant. The following spring, evaluate the field for vegetative control skips. If necessary, repeat the treatment in late April to mid-May. Seed after vegetation control is accomplished.

When planting switchgrass with no-till equipment, adjust for the correct seed depth (1/4 inch to 1/2 inch) and ensure the packing wheels are working properly.

Management In Production Years

If an acceptable stand was achieved in the seeding year, apply 90 to 120 pounds of nitrogen annually to assure productive yields. After three years of production, test the soil to determine the need for additional phosphorous and potassium.

Harvest should occur two to three weeks after a killing frost (four or more hours below 28 degrees Fahrenheit) through March 31. The moisture content of switchgrass at harvest should be 15 percent or less so baling can immediately follow a mower/conditioner or windrower. For ease of transportation and handling, all switchgrass biomass is being baled under contract in large rectangular bales (3 feet x 4 feet x 8 feet).

Harvest height leaves a 6-inch stubble. This prevents crown and lower stem injury, allows collection of snow, and provides cover for wildlife. Iowa State University animal ecology researchers have surveyed bird communities in switchgrass biomass fields and have found that different species of birds favor different vegetation types, and that maintaining a mixture of harvested and unharvested switchgrass is more beneficial to birds in southern Iowa than maintaining only harvested or unharvested field habitats.

Finish cultural weed control in late spring before switchgrass is 12 inches in height.

Stand Renovation

Identifying the reason for low-yielding switchgrass stands is the first step in the renovation process. Several possibilities for lower yields include inadequate stand density (less than one switchgrass plant per square foot), low fertility levels, weed competition, plant disease, or any combination of these factors.

Determine low fertility levels by testing the soil and correct them by applying recommended amounts of phosphorous, potassium, lime, and nitrogen. Recent research shows that producer yields also are related to the crop suitability rating (CSR) of the site, with lower yields expected from low CSR sites, even with adequate stands, fertility, and management.

Weed competition can be more difficult to address. Weeds may become an established problem in the seeding year or they may gradually invade stands as they thin. Thinning can result from improper harvest management, low fertility, or conditions such as harvest damage, rodent burrowing, and erosion that cause bare soil. Correcting the cause of thinning can improve weed control.

Though herbicides may offer a method of weed control, very few are labeled for use with switchgrass.

Burning has been successful in controlling weeds in some situations, especially controlling perennial weeds and brush. In some cases, burning can increase the vigor and productivity of the stand. Burn in late winter or early spring before new switchgrass plants are actively growing. Burning is a high-liability management practice. Before burning, check with the county Natural Resource Conservation Service or wildlife conservation representative for assistance in developing a safe and legal burn plan.



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