

RENEWABLE AND ALTERNATIVE ENERGY FACT SHEET

NEWBio Energy Crop Profile: Switchgrass

Switchgrass, *Panicum virgatum*, is a warm-season bunch grass native to the tall grass prairie region that is found across much of the eastern and southern United States. Commonly grown as a conservation crop or for forage and wildlife benefits, in recent years it has gained importance as an energy crop because of its high yields, adaptability to marginal lands, and relatively low establishment and management costs.



Switchgrass harvest using hay mowing equipment. Photo courtesy of Daniel Ciolkosz.

Switchgrass is a hardy deep-rooted perennial grass that grows as high as 6 feet and can produce an annual crop for up to 20 years. Switchgrass does well on a wide variety of soil types, including wet, shallow, or rocky soils, and is drought tolerant. Its deep roots can break through tough soil layers, improving long-term soil structure. It is also excellent for wildlife habitat, providing seeds, browse, and shelter for a variety of species.

Many varieties of switchgrass are distinguished as either upland or lowland species based on the location from which they originate. Upland species can grow on drier landscapes, are naturally more cold tolerant, and are found in northern parts of

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the country in areas not subject to flooding. Lowland types come from the warmer floodplain regions in the south and are known to have better yields. Both types grow well in our region—the key is finding a cultivar that matches specific site conditions. Currently, average annual yields are 4–6 tons per acre, but there is substantial work on selecting and breeding improved cultivars. Common varieties in the Northeast include ‘Timber’, ‘Cave in Rock’, and ‘Kanlow’.

Planting

Switchgrass is grown from seed and can be broadcast planted or drilled. Typically, the seed is planted in late spring, after the soil has warmed, at a rate of 8 and 12 pounds per acre. When drilled and broadcast, respectively switchgrass seedlings are not aggressive. Therefore, weed control prior to planting is important.

Establishing the Crop

Switchgrass is slow to establish, taking three years to develop into a harvestable stand in most locations. In the first year, seedlings focus on root development, which means that aboveground competition between it and weeds can be an issue. Switchgrass is a warm-season grass that does not begin to grow until later in the spring. Weed control and/or mowing are important initially, and fertilization is not recommended since it benefits weed growth. Thereafter, it is generally maintenance free, except for occasional applications of nitrogen as needed. Switchgrass tolerates low-fertility conditions but responds well to nitrogen applications after establishment.

Harvest

Conventional hay mowing and baling equipment is used for harvesting switchgrass. If the biomass is being used for bioenergy, harvesting is typically done in the winter after first frost or in the early spring before growth is initiated. Spring harvesting can reduce biomass yield significantly, but stand vigor and yield consistency are better in subsequent years due to nutrients being returned to roots during the dormant season.

Crop Uses

Switchgrass biomass can be condensed into fuel pellets for combustion, or it can be used as a feedstock for cellulosic biofuel production. Bioenergy markets for switchgrass are emerging. Nonenergy possibilities for switchgrass include use as a low-grade feed and for animal bedding.



Switchgrass pellets can be used as a fuel for heat, power, or liquid fuel production. Photo courtesy of Daniel Ciolkosz.

Economics

Total costs for planting, annual maintenance, and harvesting switchgrass average about \$1,000 per acre over the first five years. Depending on the yield, breakeven prices can vary from \$40 to \$80 per ton at the farm gate. The largest expenses include one-time establishment costs and annual harvesting.

NEWBio Project Work

Switchgrass trials and breeding for the NEWBio project are now being carried out in the Northeast. Ernst Biomass, a NEWBio project partner, harvests and pelletizes more than 2,500 acres of switchgrass in northwestern Pennsylvania.

Summary

Currently, switchgrass is the most commonly grown perennial grass energy crop in the United States. It is adaptable to a wide range of conditions, and numerous cultivars are available to select from. Switchgrass requires little maintenance, no annual planting, and only one harvest per year. Established from seed, it is less costly to plant than miscanthus or willow, but once established, it provides attractive rates of return if a market is available for the harvested crop.



Bales of switchgrass in field. Photo courtesy of Daniel Ciolkosz.

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For more information on the NEWBio project, visit www.newbio.psu.edu and Penn State Extension's Renewable Energy website, extension.psu.edu/natural-resources/energy.



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