Crops for
Sustainable Energy

Guidelines to Growing Perennial Grasses for Biofuel and Bioproducts

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Perennial Grass Benefits

Switchgrass, big bluestem, and warm season grassland mixtures provide numerous benefits. Existing field equipment, herbicides, and cultivar improvement promote rapid establishment in the planting year. These grasses typically produce a harvestable yield after frost in the planting year and are near full production in the year after planting if moisture is adequate. Typical baled yield at the field scale after establishment exceeds 5 tons per acre in areas east of the arid section of the country. These grasses can be productive for 10 years or longer with good management.

- Provides multiple uses for bioenergy, grazing, hay, and wildlife
- Productive during drought; can withstand wet conditions
- Reduces soil erosion; increases nutrient cycling
- Stores about one ton of carbon per acre in the soil each year
- Requires less fertilizer and herbicide each year than row crops

Key Management Strategies

Stand Establishment—Switchgrass is productive in areas suitable for dryland corn; it grows best in warm conditions. Plant 2 to 3 weeks before or after optimum corn planting date for your location. Use certified seed. No fertilizer nitrogen (N) should be used the first year.

Seeding—Develop seedbed that promotes good seed-to-soil contact. Use properly calibrated grassland drill; plant at a seeding rate of 30 to 40 pure live seed (PLS) per square foot depending on your latitude.

Controlling Weeds—Weed competition is the most common challenge in managing weeds during establishment. Herbicides and mowing both can be used.

Controlling Insects—Insect control is important, especially in grasses grown for seed. Early detection and control are essential.

Controlling Diseases—Disease control is critical in minimizing yield and quality losses. It is achieved by planting resistant cultivars, using clean seed, fungicide seed treatments, scouting for early detection, and foliar fungicide application.

Harvest—Harvest once each year after killing frost to a 4" stubble. Can be harvested with typical haying equipment.

Storage—Dry the material to less than 20% moisture before baling. Square bales should be covered to maintain physical and chemical properties; covering is optional for round bales.

Perennial Grass Options for the Midwest

Switchgrass

Switchgrass is native to the grasslands of North America east of the Rocky Mountains. "Liberty" is the first bioenergy-specific switchgrass cultivar developed for the Great Plains and Midwest.

New cultivars have been developed that show significant improvement in yield and performance.

Immediately after planting, apply quinclorac-based herbicides such as FacetL® at 32 ounces per acre to control grassy weeds. Do not apply imazapic-based herbicides to newly seeded switchgrass since switchgrass seedlings do not tolerate imazapic.*

Big Bluestem

Big bluestem was the dominant grass in the tallgrass prairie. "Bonanza" and "Goldmine" are two cultivars that have proven to be productive and persistent throughout the Corn Belt. Consult Extension, NRCS, or other professionals for cultivar options in your area to meet your specific needs.

In addition to excellent biomass production, these cultivars have produced average daily gains of 2.8 pounds/head/day when grazed by yearling steers.

Immediately after planting, apply imazapic-based herbicides such as Plateau® at 4 ounces per acre to control grassy weeds.*

Warm-season Grass Mixture

This mixture includes big bluestem, indiangrass, and sideoats grama.

These mixed-species stands increase species diversity and provide more desirable wildlife habitat than single-species stands. Sideoats grama serves as a nurse crop in the establishment year, improving the yield potential in the seeding year.

This mixture is established and managed using the same approach as for big bluestem.

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Always read and follow label instructions for specific herbicides. Herbicides are labeled for specific use, but they are not labeled in all states.

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Using Perennial Grasses in Cattle Operations

- Begin grazing in early June to take advantage of quality forage.
- Harvest hay around the 1st of August to optimize yield and quality.
- Rest pastures 30 to 45 days before first killing frost to promote quality stands.
- Pastures can be grazed during winter but will require protein supplementation.
- Resources are available at http://www.ianrpubs.unl.edu/epublic/live/g1908/build/g1908.pdf.

LINK TO RESOURCES

For these and many other resources dealing with perennial grass production, go to http://www.extension.org/pages/72584**.**

- Switchgrass Establishment and Weed Control
- Planting and Managing Switchgrass as a Biomass Energy Crop
- Control Weeds in Switchgrass (Panicum virgatum L.) Grown for Biomass
- Optimizing Harvest Logistics of Perennial Grasses Used for Biofuel
- Biofuel Quality Improved by Delaying Harvest of Perennial Grass

Keys to reliably establishing warm-season grasses:

- Plant high-quality certified seed of adapted cultivars. Cheap seed is not a bargain.
- Develop a firm seedbed. No-till planting into soybean stubble provides an excellent seed bed.
- Use a well-calibrated grassland drill to dispense at least 30 pure live seed (PLS) per square foot.
- Plant within 2 to 3 weeks of the recommended corn planting date in your area.
- Plant seeds ¼" to ½" deep. Planting deeper often results in poor establishment.
- Control weeds early with pre-emergent herbicides for annual grassy weeds and post-emergent herbicides for broadleaf weeds.
- Do not apply nitrogen (N) fertilizer in the planting year.

Keys to successfully managing established stands:

- After the year of establishment, apply N in late April at 8 to 10 pounds of actual N per ton of expected yield.
- Determine if broadleaf weeds are present early and control with 2,4-D. Broadleaf weed control typically is needed only once every 3 or 4 years after successful establishment.
- Harvest once each year about 2 weeks after the first killing frost.
- Harvest at a 4" stubble height with commercially available haying equipment.
- Wrap round bales with 2 layers of net-wrap to reduce storage losses. Covering square bales during storage reduces dry matter loss and maintains feedstock quality.

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USDA United States Department of Agriculture National Institute of Food and Agriculture

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