Establishing and Maintaining Perennial Grass Crops for Energy: 
*Emphasis on Switchgrass*

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Opportunities for Perennial Grasses as Feedstock
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- Choices of species to match climates - cool temperate to tropical; humid to semiarid
- Wide soil tolerances – spatially and seasonally
- Environmental benefits:
  - C sequestration
  - erosion control
  - wildlife habitat
SPECIES
Reed canarygrass – cool-season grass

Grass pellets for heating

Cornell Univ.
SPECIES

Switchgrass – temperate warm-season
SPECIES

Miscanthus – temperate warm-season
Giant miscanthus
Hybrid miscanthus

Miscanthus
Good soil water-holding capacity, lowlands, cool to warm humid zone.

Switchgrass
Very wide adaptation to upland and most lowland, extend to semi-arid zone.
SPECIES

Other tall-growing perennials, tropical origin

Energy cane – subtropical to tropic
Giant reed – warm temperate to subtropical
Bamboo – warm temperate to tropical
Guineagrass – tropical
Elephantgrass – tropical
Energy cane
USDA-ARS, Booneville, AR

Giant reed (arundo)
Switchgrass Establishment

Challenges to achieving a uniform, competitive stand the first year:
1) dormancy of seeds
2) small, slow-growing seedlings
3) weed competition
Where Will Switchgrass Be Productive?

Soil conditions – Class I, II, III

Slope:  8% or less
Rooting depth:  at least 3 ft.
Runoff potential:  low to medium
Permeability:  moderate to fast
Available H₂O:  moderate to high
Erosion hazard:  low to moderate
Drainage:  moderate to better
Surface texture:  silt-loam or finer
Subsoil texture:  wide range as long as roots can penetrate
Establishment

Germination rate – prefer > 65%
Dormancy rate – not listed, varies

Seeding rate – 6 to 7 lbs/acre of PLS
% Pure Live Seed = germination \times \text{purity}

Exa. – seeding rate of 6 lbs/acre PLS
% Pure Live Seed is 75
Seed to plant = 6 / 0.75 = 8 lbs
Planting

Conventional tillage - fine, firm seedbed
Settle soil by rolling or rain.
Burn-down herbicide to kill weed seedlings
¼ to ½ inch deep planting.
OR broadcast and roll.

Drawbacks
Numerous field trips
Timing of field operations around weather
Depth control
Seedling rows
2-ft. spacing
No-till Planting

No-till planting into row-crop residue
  Burndown herbicide in spring
  Drill with small seedbox

No-till planting into pasture/hay field
  Previous year – reduce thatch by haying, grazing, burning.
  Spring – glyphosate to kill perennials.
  Repeat glyphosate on perennials.
  Burn down annuals
  No-till drill, sod-drill
Crabgrass

Bermudagrass
Weed Control

Glyphosate for control of perennials
Glyphosate, glufosinate, paraquat for annuals

Stale seedbed –
  firm, fine seedbed
  burndown herbicide, then drill

Preemergence –
  imazethapyr  Pursuit, Newpath 1 oz/acre

Postemergence –
  Broadleaves – atrazine, metsulfuron, basagran
  Grasses – nicosulfuron, sulfosulfuron
Weed Control

Notes on weed control:

Delay planting and do multiple burndowns into late spring, esp. in johnsongrass and broadleaf signalgrass areas.

Don’t worry about thin stands of annual grasses. In Year 2, switchgrass will outcompete.

Not all these herbicides have label clearance, so be careful about recommendations. Some states have special use label.
Miscanthus Establishment

Sterile hybrid produces no seeds, so planting is by cuttings (sprigs, rhizomes).
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Burning Questions?