

Winning Strategies for Establishing Bioenergy Grass Stands

Kate Withers
Msc., Candidate CCA



Outline

- What is successful establishment? (Set a Goal)
- (Know your Weeds)
- Planting Date (Plan a Planting Date)
- Planting Method (Trust Your Tools)



Establishment – gone wrong...



What is “Successful Establishment”

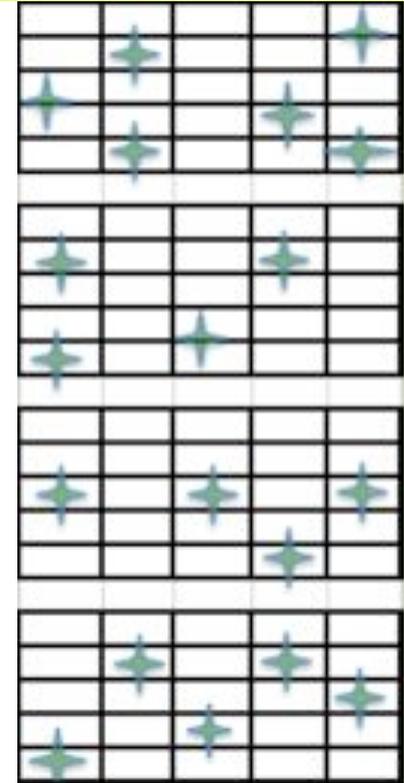
- Good Stand/ Plant Population
- Weed Free environment
- Vigorous seedlings – multiple tillers , good adventitious root growth



What qualifies as successful stand establishment?

- Establishment threshold
- (Schmer et al. 2005, Vogel & Masters 2001)
 - Uses the frequency grid method to determine stand frequency

Low 2nd year yields from stands frequencies of 40% or lower can be directly attributed to low initial stand frequency



Weed Control

Establishment Year

- Fall burn-downs
- spring pre-emergence
- post emergence control

Second-year

- Pre green-up
- Post green-up

Third Year

- ?

Integrated Pest Management?
Non-chemical methods?
Mowing?

Proper weed control is critical – especially for no-till establishment

Establishment: Weed Control

Pictures taken on Sept, 20 2009



Established: 2009



Established: 2009

What happened?

What's in your weed seed bank?

Broadleaf Weeds?

Grassy Weeds?

- Foxtails (cool- season annual)
- Crabgrass, witchgrass, fall panicum (warm season)
- Quackgrass (perennial, rhizomatous spreads with tillage)

● Broadleaf Weeds



Know your Weeds (& when to control them)!

Perennial weeds

- ◉ Quackgrass
- ◉ Dandelion
- ◉ Field bindweed
- ◉ Milkweed
- ◉ Canada thistle
- ◉ Perennial sow thistle

Winter annuals

- ◉ Chickweed
- ◉ Shepherd's-purse
- ◉ Stinkweed/
pennywhistle

Biennials

- ◉ Yellow Rocket

Buy **quality seed** with low weed contamination rates and good PROVEN germination rates (Can't rely on seed tag)!

Plan a Planting Date

- Field Prep complete?
 - Fall Herbicides, P&K App
 - Perennial, biennial weeds controlled?
 - Spring Pre-Emergence Herbicides
 - Tillage?

Plan a planting date

Factor	Understood to Date
Air temperature	- Min 10 °C for germination
	- Seedling growth is optimal between 25 and 30°C
Soil Temperature	- 15 or 20°C Ideal for rapid germination, and seedling metabolism
Precipitation	- Need weekly precipitation events for adventitious root growth Research in Texas - surface must be moist for 3-5d for adventitious root formation

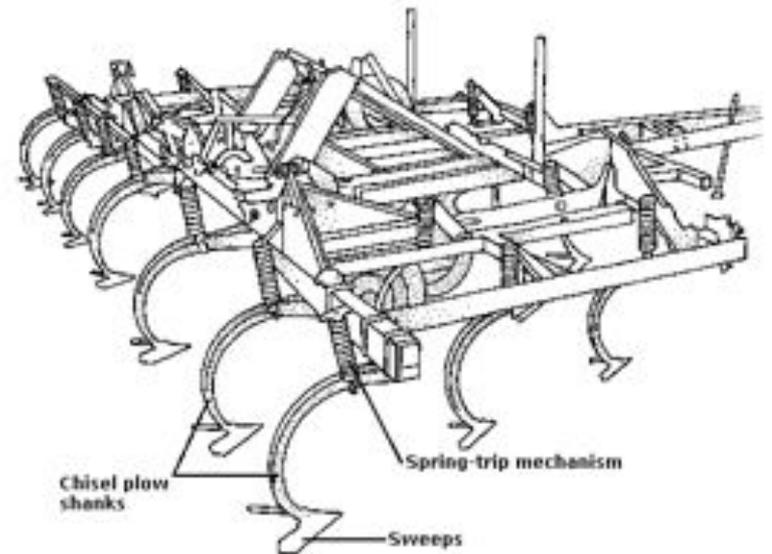
Planting Date: The Data

Seeding Date – Mid Spring

warm soils with adequate precipitation

- All dates more or less reach the establishment threshold of 40%.
- Highest yields in both site-years were planted in the mid-spring.
- Switchgrass is more competitive & can gain more biomass growth prior to onset of reproductive growth.

Trust (& optimize) your Tools



The Data Suggests:

Switchgrass can be no-till established

- stand frequency and yields were less variable
- Further optimization is required (configuring seed drill, weed control, residue management, coulters, openers, press wheels, etc. to ensure good seed to soil contact.

Both a grain drill and a double-roller seeder can be used (with tillage) to establish switchgrass,

- Although the double- seeder roll is susceptible to stand failure under high weed pressure or adverse environmental conditions.

Strategies for Success

- Set a Goal (Aim for 40%)
- Prepare for Success (~optimal Ph, P & K, weed free)
- Know your weeds (herbicide selection & timing)
- Plan a Planting Date (Warm soils, frequent rains)
- Trust Your Tools (Optimize drill configurations, cover & firm the seed)

Acknowledgments



for a cleaner tomorrow

This work was funded and supported by:

- DOE Great Lakes Bioenergy Research Center, Michigan State University (DOE BER Office of Science DE-FC02-07ER64494)
- Ontario Biomass Producers Co-Op

MICHIGAN STATE
UNIVERSITY



U.S. DEPARTMENT OF
ENERGY

