Hybrid Poplar Production Using Energy Performance System’s Injection Tree Planter
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Project Objective:
Demonstrate efficient and effective mechanization of hybrid poplar establishment

Strategy:
• Design and build a high-speed planting machine capable of establishing poplar slips in untilled cropland with very accurate spacing
• Find good farmland not tilled, a high-yield clone, and good quality slips
• Find and apply best herbicides for site preparation and weed management in tree farms

Planting Research Objectives
• Demonstrate good injection results
• Slip depth, damage, sprouting success
• Demonstrate accuracy of GPS guidance system
• Demonstrate potential for high planting speed

Planter Details
30 foot width, 6 planting rows for 5 ft spacing
Injectors operated by hydraulics
Injector spacing can be varied
Springs were made of heavy rubber for initial test
Slip specification of 5/16 to 7/8 inch diameter

Advantages of EPS Planter Design
• Cuttings injected rather than pushed into soil
  • No plowing or tilling required
  • No pre-marking required
  • Good cutting/soil contact
  • Injection possible on hard ground
• GPS Guidance System on Tractor
  • Assures desired spacing in and between rows
  • Eliminates pre-marking
• Multiple Row Planter – Number of rows Adjustable
  •Reduces passes over field
  • Increases planting speed
• Addition of Automated Slip Feeder Possible
  • Reduces manpower requirements

Positive Results
20 acres were injection planted - validating slip injection concept

Machine planted slips were accurately placed at 5’ x 5’, Hand planted slips averaged 5’ x 5.3’

Both machine and hand planted slips of NM6 clone showed normal survival and sprouting (99% vs 96%) in tilled and untiiled field areas

Lessons Learned & Solutions
1) Injector spring design
• Design planting speed was not achieved due to materials failure of rubber spring.
• Spring has been redesigned to use a metal spring with a hydraulic over compressed gas injector.

2) GPS tracking
• Row offsets occurred when planting stopped and restarted using 2007 GPS technology.
  • Much better tractor mounted GPS systems are available in 2012 that would resolve that problem.

3) Slip size specification
• Skips occurred if slips were too large or small
  • Solution is to require specified slip size from nursery or to sort prior to planting.

Characteristics of Common Options:
Hand Planting
• High manpower intensity
• Back bending labor
• Spacing approximated
• Pre-marking required
Semi-Mechanized Planting
• High manpower intensity
• Workers ride machines
• Slot opener and packer wheels
• Spacing approximated
• Pre-marking useful
Both
• Plowing and diskng site prep required
• Slow speeds (1/2 to 2 acres/hr)

Summary of Progress
• Designs for multi-row planter were produced
• Planter was built and used under operational conditions
• Test demonstrated potential of machine injection; tree survival and growth was similar to hand planted sections of field
• Slip injection mechanism and materials have been redesigned