

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



Planter easily transported to field



Tractor lifts planter off transport



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 untilled 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 disking site prep required
- Slow speeds (1/2 to 2 acres/hr)



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

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