Varietal Forestry and Renewable Energy

25 x ’25 Roundtable Forum

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Atlanta, GA
Varietal Forestry & Renewable Energy

- New genetic technology for forestry
- True varietals with consistent performance
- Built on 50 years of tree breeding
- Tissue culture based propagation technology
- Features for Renewable Energy
  - Highest growth rates…more wood sooner
  - Improved wood quality…higher energy yields
  - Homogeneous feedstock for energy…efficient conversion
CellFor

- **Business Model**: Seed technology company serving all timberland owners and managers.
- **Product**: Produces elite varietal conifer seedlings using proprietary tissue culture technology.
- **Company**: 115 employees with locations in Victoria, Atlanta, Conway AR, Raleigh NC
- **Structure**: Privately held by investors including: ATP, CSFB, BDC, Growth Works, DuPont, and others.
- **Customer Base**: 75 customers consisting of C-corps, REITs, TIMOS and NIPF’s. Includes top 15 landowners in US.
CellFor Plantings 2000 - 2007

Over 600 Forest Stands in 120 counties
CellFor Elite Varieties Adoption

Cumulative Acres

<table>
<thead>
<tr>
<th>Years</th>
<th>FY04-07</th>
<th>FY04-08</th>
<th>FY04-09YTD</th>
<th>FY04-09</th>
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</thead>
<tbody>
<tr>
<td>Cumulative</td>
<td>17,111</td>
<td>34,660</td>
<td>62,519</td>
<td>122,620</td>
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FY04-07 FY04-08 FY04-09YTD FY04-09
What is Varietal Forestry?

Variety (aka clone, line)
- Collection of individuals all with the same genotype (same DNA)
- Methods:
  - Tissue culture, rooting, etc.
  - No genetic engineering involved

Varietal Forestry
- Operational deployment of tested varieties
- Reforestation on an operational scale
- Usually 1 genotype per forest stand
- Limited number of varieties deployed
Varietal Forestry with Eucalyptus

Stand and product uniformity
Rationale for Varietal Forestry

- **Yield Gain**: maximum gain possible without genetic engineering
- **Uniformity**: values are substantial and may exceed that of growth gains.
- **Log & Wood Quality**
- **Value & Return & Risk Reduction**
Rationale: Yield Gain

Varieties & Other Levels of Genetic Gain

- Unrogued orchard
- Rogued orchard
- Family blocks
- Full-sibs: CMP
- Full-sibs: veg. prop.
- Varieties

% gain

0 10 20 30 40 50
Yield Gain
CellFor Varieties
Excellent Field Performance
Mississippi 8/2006
Variety CF L3576

20 Months

32 Months
Field Performance: 0-362
Perry FL

July, 2004 7 months
Sept. 2005 21 months
July, 2007 43 months
Q3802 – 43 months
Q3802 at Age 6: 50 tons/acre
Rationale: Uniformity
CV% Diam & Height Reduced by 30%
Uniformity: Coastal GA
CellFor Process
CellFor Production Process: 3 Steps

- Multiply Plantable Germinants (PGs)
- PG to Miniplug
- Mini-plug to Seedling (Bare root)
CellFor Process:
Selection & Multiplication of Elite Trees with Somatic Embryogenesis

- Selected Parents
- Seeds
- Embryo Cultures
- Frozen Storage of Cultures
- Selection of Best Embryo Cultures (seeds)
- Somatic Embryogenesis
  - Production of trees from selected seeds
- Clonal Trials
Female Flower Isolation Bags – CellFor Breeding Services Contract with Forest Capital Partners LLC. Louisiana
Seed From Crosses Among Elite Parents: The Foundation
Loblolly Tissue Extrusion: 100 days
Immature Somatic Embryos
Cryogenic Storage
Mature Somatic Embryos: Needles primordia clearly visible
Additional Features of Varietals
Disease Frees Trees: more cellulose

USDA rust screening
2003, 2004, 2005 data

Variety or control

Susceptible
Moderately resistant
Resistant
Very resistant

Infection (%)
Wood density for sampled commercial lines
Combined 2005 and 06 data (2000 and 2001 test series)

Higher Wood density: Higher Energy Yield:
Uniformity: More Efficient Energy Conversion
Varietal Forestry & Renewable Energy…
Natural Partners
Questions?

Thank You.