Forest Productivity Research

A View from the Capital Market

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Agenda

I. Structural change in the US forest sector

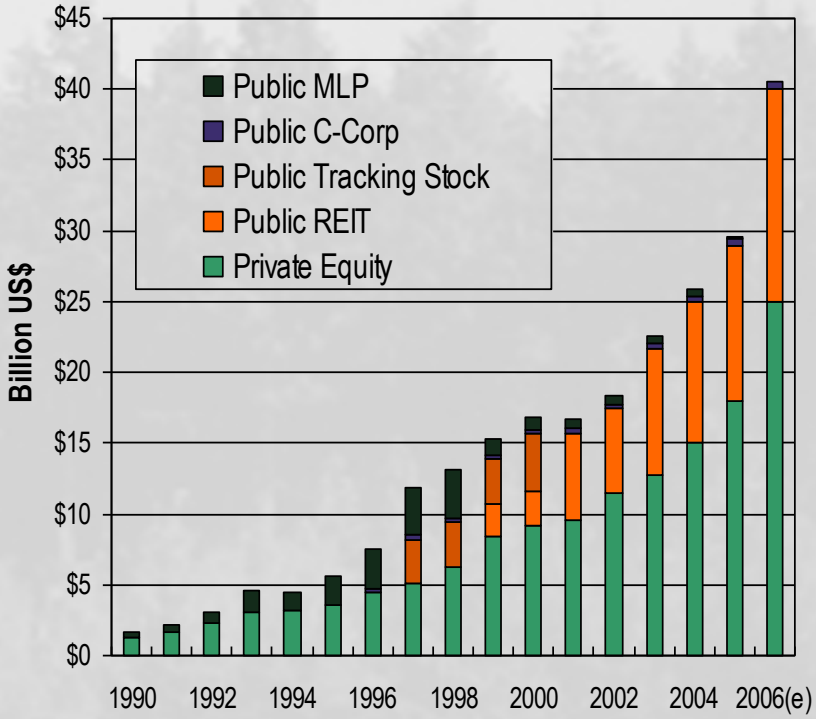
II. The role of forest productivity research in timberland investment

III. Some specific examples

IV. Conclusions: what does this mean for forest productivity research?

I. Structural Change in the US Forest Sector

- **Institutional ownership: 20+%/yr growth since 1980s**
- **Change driven by:**
  - **Tax policy that favors private equity; REITS**
  - **US GAAP: trees don't grow; in fact they depreciate!**
  - **ERISA of 1974: Pension plans forced to diversify**
  - **Academic research demonstrated favorable risk/return profile of timberland**



Source: HTRG Research

I. Structural Change in the US Forest Sector

Some implications

- **Returns have fallen as capital has moved into the asset class**

  "In 2000, Microsoft's market cap was more than all the world's forests" --J. Grantham

  - **Absolute returns have fallen by 300 bps in last three years**
  - **Spreads over 10-yr TIPS have fallen by 350 bps**

- **New owners spend less on R&D than did their integrated predecessors**

II. Role of Productivity Research in Timberland Investment

A. Actual yields lag maximum theoretical yield
   - Theoretical yield based on Loomis and William crop model adapted for trees by John Gordon
   - Genetics comprise about 23% of the improvement, natural stands-to-1980s plantations
   - Critical to match agronomy with tree improvement

Dry Matter Production (Mg/ha/yr)

	Douglas Fir	Loblolly Pine
Natural Stands	5.7	3.6
1980's Plantations	9.4	14.3
2000's Plantations	12.7	19.3
"Target"	25	30
Theoretical Maximum	50?	60?

Source: Farnum, Timmis and Kulp (1983). Estimate for 2000 plantations assumed 1.5%/yr improvement in 1980's technology. Cellfor elite varietals have achieved 125 gt/ha at age 6

II. Role of Productivity Research in Timberland Investment

B. Rates of yield increase range from 1.3%/yr to 3.1%/yr
   - For such an important factor, data are surprisingly poor
   - Economic leverage is enormous—top-line growth flows straight to incremental cash flow

Rate of Productivity Improvement (%/yr)

Southern Pines[a]	2.3-3.1
Poplar[b]	1.6
Eucalypts[c]	2.8
Finland[c]	1.3-2.2

Source: a. Lower estimate adapted from Pait(2007); higher estimate Westvaco observations analyzed by the author. b. Gordon (2006). c. Parsonson (2007) as analyzed by the author. d. Pihlajamaki (2007) as analyzed by the author

II. Role of Productivity Research in Timberland Investment

C. Varietal forestry can add significant value
   - Assumes elite seedlings purchased for $0.35 each
   - Improved returns from incremental yield alone
   - Additional benefits include rust resistance, lack of low forking, stem straightness, improved specific gravity

Incremental IRR from elite varieties (bps)

Site Index 70	93
Site Index 80	180

Source : adapted from McKeand, Abt, Allen, Li and Catts (2006). Assumes 436 SPA, thinned, land purchased at 6% real discount rate interpolated from 5% and 8% results, assumes 0.35/seedling cost

III. Some Examples

- IFIA: "Develop and implement innovative, socially responsible timberland investment strategies for sophisticated investors" (www.ifiallc.com).
- Four examples:
  - Cellfor: the world's leading forest biotechnology company.
  - GreenWood Tree Farm Fund: $175 million investment based on elite hybrid poplar varieties
  - Foresta Capital Group: elite varieties of black walnut and black cherry grown in fertigated plantations established on farmland
  - "Maximum Yield Associates, LLC" with J. Gordon and M. Schott

IV. What does this mean for forest productivity research?

- Structural change in the forest sector changes forest productivity research
  - Need for productivity improvements is more acute than ever
  - But,…"I don't want to invest in R&D; I want to buy knowledge products."
- New opportunities are emerging from capital markets
  - Venture funding for forest productivity research based on selling "knowledge products"
  - "Opportunity" timberland funds embodying productivity research—both results and continued support for focused R&D
- Progress will require a new breed of forest biology entrepreneur