Pine pruning in South Africa: Past, Present & Future
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Pruned Pine Conference
Nelson
New Zealand
29-30 June 2004

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1. PAST

1.1 Historic overview

 Limited natural forests

 Plantation forestry strategy devised by government by 1920’s:
 - supply mining industry
 - job creation & poverty relief
 - import replacement
 - natural forest protection

 Pioneering silvicultural research

 First pruning trials in early 1930’s

 Extensive pruning initiated during 1940’s

 Rapid softwood expansion post WWII
1.1 Historic overview (cont…)

- Major private forestry initiatives driven by large pulp & paper companies from 1970’s (SAPPI & Mondi)
- Introduction of fast growing eucalyptus facilitated establishment of world class pulp & paper industry
- Specialization: pulp vs. sawlog regimes
- Last major forestry expansions during 1980’s
- Due to water scarcity no more planting licenses issued from 1990’s

1.2 Sawlog forestry practices

- Intensive forestry research:
  - Silviculture
  - tree breeding
  - forestry planning
- Sawlog regime objectives:
  - max. vol. of medium to large diameter logs (19 – 45 cm)
  - limit knot size (< 50 mm)
  - avoid loose knots
  - stem straightness (sweep & taper)
- Major objective of pruning was to avoid loose knots!
Typical softwood sawlog regime

<table>
<thead>
<tr>
<th>Typical Growing Regime</th>
<th>Stems per ha</th>
<th>Prune Age</th>
<th>Prune Height</th>
<th>Thin Age</th>
<th>Stems remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishment</td>
<td>1111</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prune</td>
<td>1111</td>
<td>3 yrs</td>
<td>1 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prune</td>
<td>1111</td>
<td>5 yrs</td>
<td>2.5 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prune</td>
<td>1111</td>
<td>7 yrs</td>
<td>5.0 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prune</td>
<td>500</td>
<td>10 yrs</td>
<td>7.0 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thin</td>
<td>1111</td>
<td></td>
<td>10 yrs</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Thin</td>
<td>500</td>
<td></td>
<td>15 yrs</td>
<td>300</td>
<td></td>
</tr>
</tbody>
</table>

Target rotation length 28-33 years

1.3 Resource legacy

- Extensive areas of pruned sawlog plantations
  - around 450,000 ha
- Virtually all sawlog plantations pruned between 2.5 – 7.0 m.
  - around 85% pruned to 5 m or more
- But, of varying quality!
  - clear yield was not the objective
- Clear yield only became an issue during 1990’s
  - following re-emergence of SA into international markets
1.3 Resource legacy (cont…)

- State forestry has always played a dominant supply and price setting role
- State forestry became parastatal early 1990’s
  - creation of SAFCOL
- Throughout 1990’s SAFCOL aggressively increased log prices to international levels (see graph)
  - also developed a log export program
- Log prices increased much faster than lumber prices
- Sawmillers became concerned over value for money from pruned logs

Sawlog vs. lumber price escalation

![Graph showing the price index of lumber, consumer price index, and sawlog price index from 1990 to 2004.](image)
1.3 Resource legacy (cont…)

- Proposals around pruned log grading & quality/price differentials were investigated but never implemented:
  - controversial issue
  - based on a destructive pre-harvest assessment of the knotty core
  - how to implement in practice?
  - eventually price differentials were based purely on diameter

2. PRESENT

2.1 Industry overview
2.2 Markets & technologies
2.3 Forestry strategies & practices
2.4 Pruned log volumes & clear yields
2.5 Economics of pruned logs & clears
2.1 Industry Overview

- SAFCOL privatization almost complete
- Pulp & paper companies have virtually withdrawn from sawmill industry (focus)
- Strong growth in small, low cost “informal sawmills”
- Strengthening of Rand makes lumber exports challenging
- Current log and lumber shortage.
- Strong drive by mills to become low cost producers

Plantation area 1900 - 2002

<table>
<thead>
<tr>
<th>Years</th>
<th>Hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>0</td>
</tr>
<tr>
<td>1910</td>
<td>200,000</td>
</tr>
<tr>
<td>1920</td>
<td>400,000</td>
</tr>
<tr>
<td>1930</td>
<td>600,000</td>
</tr>
<tr>
<td>1940</td>
<td>800,000</td>
</tr>
<tr>
<td>1950</td>
<td>1,000,000</td>
</tr>
<tr>
<td>1960</td>
<td>1,200,000</td>
</tr>
<tr>
<td>1970</td>
<td>1,400,000</td>
</tr>
<tr>
<td>1980</td>
<td>1,600,000</td>
</tr>
<tr>
<td>1990</td>
<td>1,800,000</td>
</tr>
<tr>
<td>2000</td>
<td>2,000,000</td>
</tr>
</tbody>
</table>
Total roundwood production 1980 - 2002

- Production increase over period = 39.9%
- Afforestation increase over period = 16.4%

Land use in South Africa

- Total area – 122 million ha
- Grazing: 13.7%
- Arable: 68.6%
- Nature Conservation: 9.6%
- Other: 7.0%
- Forestry: 1.1%
Plantation distribution

Plantation area by objective

- Pulpwood: 56.0%
- Mining Timber: 3.8%
- Other: 3.1%
- Sawlogs: 37.0%

Total – 1,351,402 ha
FSC status

- 62.2% FSC Only
- 18.3% FSC & ISO 14001
- 19.5% Not Certified

Certified area 1,088,071 ha – 80.5% of total

Roundwood into plants 2002

- 73.0% Pulp, Paper & Board Mills
- 21.8% Sawmills
- 3.4% Mng. Timber Mills
- 1.8% Other

Total – 16.8 million m³
2.2 Markets & Technologies

- Large shift from structural to industrial lumber demand
- Large export-oriented local remanufacturing industry (furniture and doors):
  - strong demand for clear and tight-knot lumber
  - dependent on exchange rate
- Strong international demand for long clears:
  - 2.1 m into EU (door manufacturers)
  - 4.88 m into USA (mouldings manufacturers)
  - currently less profitable than local clear sales due to Rand
  - SA co.’s very small players in a large clear market
- In general non-clear is more difficult to export
  - low prices & high transport cost

2.2 Markets & Tech. (cont.)

- Majority of SA mills employ framesaw technology:
  - low throughput & recovery
  - low capital
  - known technology (most new installations still framesaws)
  - not ideal for maximizing clear yield!

- Some bandsaw installations aimed at clearwood maximization
  - most recently: Mondi Timber eucalyptus mill in Swaziland
2.2 Markets & Tech. (cont.)

- High-tech optimizing board edgers (Catech BoardMaster) recently installed
- Due to variable pruned log quality, ripping and cross-cutting plays a critical part in clear recovery:
  - not all clears are long length!

2.3 Forestry Strategies & Practices

- Due to pruned log premium SAFCOL developed a pruning optimization strategy:
  - implemented since 1994
  - diameter-based pruning (see table)
  - tailored to site quality (no more blanket treatment)
  - high pruning (9.5 m)
  - large diameter (target 42 cm DBH)
- Growing large diameter well-pruned trees has become a major focus!
- GFP adopted this strategy for own conditions and started implementation during 2002
Diameter-based pruning schedule

<table>
<thead>
<tr>
<th>STAND AGE (years)</th>
<th>TREE HEIGHT (m)</th>
<th>DBH (cm)</th>
<th>PRUNING HEIGHT (m)</th>
<th>DIAMETER GAUGE (cm)</th>
<th>REMAINING CROWN (%)</th>
<th>KNOTTY CORE (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8</td>
<td>5.1</td>
<td>7.5</td>
<td>2</td>
<td>n.a.</td>
<td>60.6</td>
<td>14.5</td>
</tr>
<tr>
<td>4.5</td>
<td>7.8</td>
<td>11.3</td>
<td>4.1</td>
<td>8</td>
<td>47.1</td>
<td>16.4</td>
</tr>
<tr>
<td>6</td>
<td>9.9</td>
<td>13.8</td>
<td>5.5</td>
<td>9</td>
<td>44.5</td>
<td>16.8</td>
</tr>
<tr>
<td>7</td>
<td>11.3</td>
<td>15.1</td>
<td>7</td>
<td>9</td>
<td>37.9</td>
<td>16.8</td>
</tr>
<tr>
<td>8</td>
<td>12.5</td>
<td>16.3</td>
<td>8.2</td>
<td>9</td>
<td>34.6</td>
<td>16.5</td>
</tr>
</tbody>
</table>

Note: no trees smaller than diameter gauge are pruned, to avoid over pruning.

2.3 Forestry Strategies & Practices (cont…)

• Some growers and processors have developed a different sawlog strategy:
  - small to medium logs
  - prefer small tight knots to clears
  - shorter rotations
  - less pruning and thinning
  - small log processing technology
  - depends on growing conditions & target market
2.4 Pruned log volumes & clear yields

- Typical sawlog stand yield at clearfell:
  - 25-30 year rotation
  - 39 cm DBH
  - 350 stems/hectare
  - 300 m³/ha
  - 85% sawlogs (17 cm +)
  - 30-40% of sawlogs pruned (27 cm+)

2.4 Pruned log volumes & clear yields (cont…)

- Typical medium to large sawmill intake:
  - 600 – 1,200 m³/day intake
  - 20-50% pruned logs (depends on allocation strategy)
  - 25-29 cm average diameter
  - 5.4 m average length
  - 10-25% yield of clear-based product

- Clear-based products include:
  - long clear & semi-clear (2.1 m+)
  - "upgradeable" (contains at least one 2.1 m clear)
  - medium length furniture components (0.6 – 1.8 m)
  - finger-joint blocks (0.15 – 0.55 m)
2.4 Pruned log volumes & clear yields (cont…)

GRADE YIELD USING FRAMESAW TECHNOLOGY: PRUNED vs UNPRUNED
(% of lumber output)

<table>
<thead>
<tr>
<th>GRADE</th>
<th>DETAILS OF CLEAR MIX</th>
<th>PRUNED</th>
<th>UNPRUNED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear-based</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long clear</td>
<td>14.0%</td>
<td>35%</td>
<td>0%</td>
</tr>
<tr>
<td>Semi-clear</td>
<td>9.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upgradable</td>
<td>11.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long clear</td>
<td>6.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium clear</td>
<td>1.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FJ block</td>
<td>1.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td>1.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural</td>
<td>50%</td>
<td></td>
<td>85%</td>
</tr>
<tr>
<td>Utility</td>
<td>15%</td>
<td></td>
<td>15%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

2.4 Pruned log volumes & clear yields (cont…)

- Plywood plant log intake:
  - 350 m³/day log intake
  - 60-70% pruned logs
  - 33 cm average diameter
  - 2.65 m length
  - 20% A/B face veneer
2.5 Economics of pruned logs & clears

2.5.1 Pine log prices (road side)

2.5.2 Indicative lumber prices

2.5.3 Pruning costs per hectare

2.5.4 Relative cost of pruning

2.5.5 Sawmill profit: pruned vs. unpruned

2.5.6 Plywood profit: pruned vs. unpruned

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### 2.5.1 Pine log prices (roadside)

<table>
<thead>
<tr>
<th>MARKET</th>
<th>QUALITY</th>
<th>DIAMETER</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RANGE</td>
<td>R/m³</td>
</tr>
<tr>
<td>Pulp</td>
<td>Unpruned</td>
<td>n.a.</td>
<td>R 100</td>
</tr>
<tr>
<td>Sawlog</td>
<td>Unpruned</td>
<td>15-17 cm</td>
<td>R 100</td>
</tr>
<tr>
<td>Sawlog</td>
<td>Unpruned</td>
<td>19-25 cm</td>
<td>R 126</td>
</tr>
<tr>
<td>Sawlog</td>
<td>Unpruned</td>
<td>27-33 cm</td>
<td>R 183</td>
</tr>
<tr>
<td>Sawlog</td>
<td>Unpruned</td>
<td>35 cm +</td>
<td>R 232</td>
</tr>
<tr>
<td>Sawlog</td>
<td>Pruned</td>
<td>31 cm +</td>
<td>R 303</td>
</tr>
<tr>
<td>Veneer</td>
<td>Unpruned</td>
<td>31-33 cm</td>
<td>R 241</td>
</tr>
<tr>
<td>Veneer</td>
<td>Unpruned</td>
<td>35 cm+</td>
<td>R 263</td>
</tr>
<tr>
<td>Veneer</td>
<td>Pruned</td>
<td>31-33 cm</td>
<td>R 315</td>
</tr>
<tr>
<td>Veneer</td>
<td>Pruned</td>
<td>35 cm+</td>
<td>R 370</td>
</tr>
</tbody>
</table>
2.5.2 Indicative lumber prices

<table>
<thead>
<tr>
<th>GRADE</th>
<th>PRICE (R/m³)</th>
<th>INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long clears</td>
<td>R 2,400</td>
<td>200</td>
</tr>
<tr>
<td>Medium clears</td>
<td>R 1,800</td>
<td>150</td>
</tr>
<tr>
<td>Semi-clear</td>
<td>R 1,700</td>
<td>142</td>
</tr>
<tr>
<td>FJ blocks</td>
<td>R 1,200</td>
<td>100</td>
</tr>
<tr>
<td>Structural</td>
<td>R 1,200</td>
<td>100</td>
</tr>
<tr>
<td>Crating</td>
<td>R 900</td>
<td>75</td>
</tr>
</tbody>
</table>

→ Long clears fetch 100% premium over structural

2.5.3 Pruning costs per hectare

<table>
<thead>
<tr>
<th>Lift No</th>
<th>Height (m)</th>
<th>Age (years)</th>
<th>Stems per ha</th>
<th>R/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.5</td>
<td>3</td>
<td>1,111</td>
<td>R 308</td>
</tr>
<tr>
<td>2</td>
<td>2.5</td>
<td>5</td>
<td>1,111</td>
<td>R 230</td>
</tr>
<tr>
<td>3</td>
<td>5.0</td>
<td>7</td>
<td>500</td>
<td>R 304</td>
</tr>
<tr>
<td>4</td>
<td>7.0</td>
<td>10</td>
<td>500</td>
<td>R 291</td>
</tr>
</tbody>
</table>
2.5.4 Relative cost of pruning

- Average log cost:
  
<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing</td>
<td>R83/m³</td>
</tr>
<tr>
<td>Harvesting</td>
<td>R32/m³</td>
</tr>
<tr>
<td>Transport</td>
<td>R49/m³</td>
</tr>
</tbody>
</table>
  | **Total**     | **R164/m³**

- Pruning represents only 2% of delivered log cost
- Log cost is about 45% of total lumber cost
- Therefore, on average pruning represents less than 1% of delivered lumber cost (stump-to-market)

2.5.5 Sawmill profit: pruned vs unpruned

- Assumptions:
  - 2 scenarios: 100% pruned logs vs 100% unpruned logs
  - 40:60 split C (27-33 cm) vs D (35 cm+) logs in both scenarios
  - clear yields as per table
  - no clears from unpruned
  - all other costs remain the same
  - local market prices
### LOG COST PER UNIT LUMBER

<table>
<thead>
<tr>
<th>LOG CLASS</th>
<th>MIX</th>
<th>PRUNED LOG PRICE (R/m³)</th>
<th>UNPRUNED LOG PRICE (R/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% C</td>
<td>40%</td>
<td>R 303</td>
<td>R 183</td>
</tr>
<tr>
<td>% D</td>
<td>60%</td>
<td>R 303</td>
<td>R 232</td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighted average log price</td>
<td>R 303</td>
<td>R 212</td>
<td></td>
</tr>
<tr>
<td>Transport (R/m³)</td>
<td>R 49</td>
<td>R 49</td>
<td></td>
</tr>
<tr>
<td>Delivered log cost</td>
<td>R 352</td>
<td>R 261</td>
<td></td>
</tr>
<tr>
<td>Net mill recovery</td>
<td>45%</td>
<td>47%</td>
<td></td>
</tr>
<tr>
<td>Delivered log cost per m³ lumber</td>
<td>R 782</td>
<td>R 560</td>
<td></td>
</tr>
</tbody>
</table>

### AVERAGE SELLING PRICE PER m³ LUMBER

<table>
<thead>
<tr>
<th>PRODUCT CLASS</th>
<th>MIX</th>
<th>PRUNED</th>
<th>MIX</th>
<th>UNPRUNED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long clear</td>
<td>21.0%</td>
<td>R 2,400</td>
<td>0%</td>
<td>R 2,400</td>
</tr>
<tr>
<td>Medium clear</td>
<td>2.0%</td>
<td>R 1,800</td>
<td>0%</td>
<td>R 1,800</td>
</tr>
<tr>
<td>Semi-clear</td>
<td>10.0%</td>
<td>R 1,700</td>
<td>0%</td>
<td>R 1,700</td>
</tr>
<tr>
<td>FJ blocks</td>
<td>2.0%</td>
<td>R 1,200</td>
<td>0%</td>
<td>R 1,200</td>
</tr>
<tr>
<td>Structural</td>
<td>50.0%</td>
<td>R 1,200</td>
<td>85%</td>
<td>R 1,200</td>
</tr>
<tr>
<td>Crating</td>
<td>15.0%</td>
<td>R 900</td>
<td>15%</td>
<td>R 900</td>
</tr>
<tr>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
<td>100.0%</td>
</tr>
<tr>
<td>Weighted average selling price</td>
<td>R 1,469</td>
<td>R 1,155</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.5.5 Sawmill profit: pruned vs unpruned (Cont…)

<table>
<thead>
<tr>
<th>PROFIT: 1 m³ LUMBER FROM PRUNED vs UNPRUNED</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRUNED</td>
</tr>
<tr>
<td>Sales</td>
</tr>
<tr>
<td>Log cost</td>
</tr>
<tr>
<td>Other costs</td>
</tr>
<tr>
<td>EBITDA (R/m³)</td>
</tr>
</tbody>
</table>

2.5.6 Plywood profit: pruned vs. unpruned

- Assumptions:
  - 2 scenarios: 100% pruned logs vs 100% unpruned logs
  - 40:60 split C (31-33 cm) vs D (35 cm+) logs in both cases
  - 40:60 split appearance vs industrial plywood from pruned logs
  - no appearance grade plywood from unpruned logs
  - appearance plywood: A/B faces (i.e. clear)
  - industrial plywood: C/C faces (i.e. knotty)
  - all other costs remain the same
  - local market prices
### 2.5.6 Plywood profit: pruned vs. unpruned (cont…)

#### LOG COST PER UNIT PLYWOOD

<table>
<thead>
<tr>
<th>LOG CLASS</th>
<th>MIX</th>
<th>PRUNED</th>
<th>UNPRUNED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOG PRICE</td>
<td>LOG PRICE</td>
<td></td>
</tr>
<tr>
<td>% C</td>
<td>40%</td>
<td>R 315</td>
<td>R 241</td>
</tr>
<tr>
<td>% D</td>
<td>60%</td>
<td>R 370</td>
<td>R 263</td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td>R 348</td>
<td>R 254</td>
</tr>
<tr>
<td>Transport (R/m³)</td>
<td></td>
<td>R 58</td>
<td>R 58</td>
</tr>
<tr>
<td>Delivered log cost</td>
<td></td>
<td>R 406</td>
<td>R 312</td>
</tr>
<tr>
<td>Net plywood recovery</td>
<td></td>
<td>42%</td>
<td>42%</td>
</tr>
<tr>
<td>Delivered log cost per m³ plywood</td>
<td></td>
<td>R 967</td>
<td>R 743</td>
</tr>
</tbody>
</table>

#### AVERAGE SELLING PRICE PER UNIT PLYWOOD

<table>
<thead>
<tr>
<th>PRODUCT CLASS</th>
<th>MIX</th>
<th>PRUNED</th>
<th>MIX</th>
<th>UNPRUNED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>40%</td>
<td>R 3,742</td>
<td>0%</td>
<td>R 3,742</td>
</tr>
<tr>
<td>Industrial</td>
<td>60%</td>
<td>R 2,751</td>
<td>100%</td>
<td>R 2,751</td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighted average selling price</td>
<td>R 3,147</td>
<td>R 2,751</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.5.6 Plywood profit: pruned vs. unpruned (cont…)

<table>
<thead>
<tr>
<th>PROFIT: 1 m³ PLYWOOD FROM PRUNED vs UNPRUNED</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRUNED</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Sales</td>
</tr>
<tr>
<td>Log cost</td>
</tr>
<tr>
<td>Other costs</td>
</tr>
<tr>
<td>EBITDA (R/m³)</td>
</tr>
</tbody>
</table>

3. FUTURE

3.1 Markets
3.2 Processing technologies
3.3 Forestry R&D
3.4 Future forestry strategies & practices
3.1 Markets

- Expectations of continued clear demand:
  - strong local re-manufacturing base
  - continued international demand for long clears

- Major driver: retain **flexibility** to serve unknown future markets

3.1 Markets (cont…)

- SA’s competitive advantages:
  - high growth rates (15 - 20 m³/ha/year MAI)
  - low growing costs
  - large existing pruned resource
  - opportunities to improve clear recovery
  - small niche player in world terms
3.1 Markets (cont.)

- SA’s competitive disadvantages:
  - old/outdated technology base
  - high processing costs
  - poorly developed skills levels
  - currency strength
  - high capital cost
  - distance from markets

3.2 Processing technologies

- New capital projects could significantly lower SA mills’ production cost:
  - improved recovery (volume and grade)
  - Economy of scale
- Opportunities exist to improve clear yield from existing pruned resource:
  - grade sawing technology (bandsaws)
3.3 Forestry R&D

- Refine pruning practices.
  - smaller knotty cores in future

- Implement a pre-harvest assessment technique
  - manage variable quality of existing pruned resource

- Work on a new thinning regime.
  - possibly only one commercial thinning?

- Determine financially optimal rotation length
  - high cost of capital has major impact on economics of long rotations

3.4 Future forestry strategies & practices

- Should rotation length be reduced?
  - concern over impact of more juvenile wood on density and strength
  - reduction from 28-30 years down to 23-25 years likely
  - possibly the ideal compromise between cost, clearwood and density?
  - if pruning is optimized, clearwood yield need not suffer significantly (small knotty core)
4. SUMMARY & CONCLUSIONS

- South Africa has a high quality pruned sawlog resource (albeit of variable quality and small in world terms)
- Due to renewed focus on clearwood yield, pruning practices are being optimized:
  - the future resource should be of even better quality!
- Clearwood yields in many mills are not currently optimized and need improvement
- Silviculture regime decisions need to be made carefully with the involvement of marketing and others.

5. RECOMMENDATION FOR SA

- Pruning is a small component of total growing and processing cost:
  - retain the flexibility of having a pruned resource!
  - explore other avenues of improving financial returns such as shorter rotations, less intensive thinning and improved sawmill technology
THE END – THANK YOU