Logging Capacity Utilization in Wisconsin

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Outline

• Rationale for study

• Results from other regions

• Methodology

• Findings
Challenges Facing Wisconsin Loggers

• 1/3\textsuperscript{rd} of WI loggers have left the industry since early 2000s

• Concerns about logging capacity

• Barriers to year-round logging

• Delivered wood costs
Concerns About Logging Capacity

• “...an aging logging workforce with very few young adults coming in and not enough logging capacity to support the markets...”¹

• “Recovery is here, and the conversation now includes logging capacity, with the question being can loggers produce enough wood to supply the demand?”²

• “Procurement managers [in the Northeast] have struggled to build fiber inventories due to challenging weather conditions and a lack of logging capacity...”³

¹Mark Huempfner, GLTPA Magazine, May 2014
²Mike Crouse, Loggers World, June 2014
³Peter Coutu, Forestry Source, April 2014
Logging Capacity

- Logging capacity = the amount of timber that loggers are capable of harvesting during a given period

- Logging capacity utilization = the percentage of logging capacity that is being used during a given period
Logging Capacity Utilization

• Survey results:
  – Michigan: 82% utilization in 2008
  – Minnesota: 60% utilization in 2011
  – Lake States:
    • 76% utilization in 2004
    • 74% utilization in 2005

• Capacity studies in U.S. South
  – 51-59% utilization in 1988-1989
  – 70% utilization in early 1990s
  – 65% utilization in 2000-2001

Study Objectives

1. Estimate logging capacity utilization
2. Identify reasons for lost production
3. Estimate logging efficiency
Methods

• In-person recruitment at GLTPA 2014 Logging & Heavy Equipment Expo

• Recruitment letters to GLTPA members and Master Loggers in September 2014

• Participants provided weekly production reports
  – Loads of timber delivered
  – Lost production and reason
  – Hours worked
  – Type of harvest (i.e. clearcut or thinning)
  – Haul distance
  – Trucking strategy
Logging Capacity Utilization

• Logging capacity utilization = \( \frac{\text{Actual Production}}{\text{Potential Production}} \)
  - Potential loads = loads delivered + loads lost

• Compared actual production to:
  - Reported break-even production level
  - Target production level
  - Maximum production capacity
Logging Efficiency Estimation

• Stochastic frontier analysis (SFA)
  – Predicts production based on inputs
  – Efficiency measured as a percentage of predicted production

• SFA output = loads of timber delivered

• SFA inputs = labor and capital

• Environmental variables
Inputs into Stochastic Frontier Analysis Model

• Labor = number of man-hours worked

• Capital = Used machine rate method to calculate average weekly cost of owning and operating each machine in harvesting system

• Environmental variables included in model:
  – Harvest type, felling technique, trucking strategy, etc.
  – Variables removed using backward elimination until all variables statistically significant (α = 0.05)
Participation 9/28/14 – 8/29/15

- 894 crew-weeks of data
  - 9,169 loads delivered

- 20 crews from single crew organizations
  - 10 crews from multi-crew organizations

- Harvesting systems
  - Cut-to-length: 20 crews
  - Chainsaw: 7 crews
  - Feller-buncher: 3 crews

- Geographic Distribution
  - 17 crews from Northern region
  - 6 crews from Northeastern region
  - 5 crews from West Central region
  - 2 crews from South Central region
## Results 9/28/14 – 8/29/15

<table>
<thead>
<tr>
<th>Harvesting System</th>
<th>Crew-Weeks Reported</th>
<th>Average production (loads wk(^{-1}))</th>
<th>Average lost production (loads wk(^{-1}))</th>
<th>Average Capacity utilization (%)</th>
<th>Total loads delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut-to-length</td>
<td>588</td>
<td>11.9(^a)</td>
<td>5.3(^a)</td>
<td>68.8(^a)</td>
<td>6,983</td>
</tr>
<tr>
<td>Chainsaw</td>
<td>172</td>
<td>3.2(^b)</td>
<td>1.1(^b)</td>
<td>74.6(^{ab})</td>
<td>558</td>
</tr>
<tr>
<td>Feller-buncher</td>
<td>76</td>
<td>21.4(^c)</td>
<td>5.7(^a)</td>
<td>81.1(^b)</td>
<td>1,628</td>
</tr>
<tr>
<td>Overall</td>
<td>836</td>
<td>11.0</td>
<td>4.5</td>
<td>71.0</td>
<td>9,169</td>
</tr>
</tbody>
</table>

\(^{a,b,c}\) Numbers in columns connected by the same letter are not significantly different (\(\alpha = 0.05\)).
Capacity Utilization

• Overall, 71% capacity utilization rate
  – Excludes spring break-up downtime

• Approximately ¾ of loggers ceased production during spring break-up

• After including this downtime, logging capacity utilization falls to 64%
Reasons for Lost Production

• Weather (woods and forest roads)
  – 11.8% reduction
  – 1.8 loads week\(^{-1}\) crew\(^{-1}\)

• Equipment repairs/maintenance
  – 5.1% reduction
  – 0.8 loads week\(^{-1}\) crew\(^{-1}\)

• Other
  – 3.1% reduction
  – 0.5 loads week\(^{-1}\) crew\(^{-1}\)

• Labor
  – 2.3% reduction
  – 0.4 loads week\(^{-1}\) crew\(^{-1}\)

• Mill quotas – only 16 loads lost during study
Actual vs. Planned Production

![Bar chart comparing actual vs. planned production for different categories: Break-Even, Target, Maximum Capability. The chart shows the percentage of Chainsaw and Cut-to-length production.](chart.png)
Logging Efficiency

• 64.8% average efficiency
  – Median = 70.3%
  – Range = 12.6% - 92.2%

• Environmental variables associated with reduced efficiency
  – Chainsaw felling
  – Thinning
  – Spring and summer

• Environmental variables associated with increased efficiency
  – Hardwood harvesting
  – Trucking by logging firm
  – Multi-crew organization
## Logging Efficiency by System

<table>
<thead>
<tr>
<th>System</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>Cut-to-length</td>
<td>13.1%</td>
</tr>
<tr>
<td>Chainsaw</td>
<td>12.6%</td>
</tr>
<tr>
<td>Feller-buncher</td>
<td>17.6%</td>
</tr>
<tr>
<td>Overall</td>
<td>12.6%</td>
</tr>
</tbody>
</table>

\(^{a,b,c}\)Numbers in columns connected by the same letter are not significantly different (\(\alpha = 0.05\)).
## Seasonal Fluctuations (CTL Only)

<table>
<thead>
<tr>
<th>Season</th>
<th>Loads per week</th>
<th>Average capacity utilization</th>
<th>Average efficiency</th>
<th>Percent of Timber Sales Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>11.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>62.9%&lt;sup&gt;a&lt;/sup&gt;</td>
<td>73.3%&lt;sup&gt;a&lt;/sup&gt;</td>
<td>82%</td>
</tr>
<tr>
<td>Winter</td>
<td>15.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>79.9%&lt;sup&gt;b&lt;/sup&gt;</td>
<td>73.2%&lt;sup&gt;a&lt;/sup&gt;</td>
<td>100%</td>
</tr>
<tr>
<td>Spring</td>
<td>7.8&lt;sup&gt;c&lt;/sup&gt;</td>
<td>63.6%&lt;sup&gt;a&lt;/sup&gt;</td>
<td>61.6%&lt;sup&gt;b&lt;/sup&gt;</td>
<td>47%</td>
</tr>
<tr>
<td>Summer</td>
<td>9.5&lt;sup&gt;ac&lt;/sup&gt;</td>
<td>64.6%&lt;sup&gt;a&lt;/sup&gt;</td>
<td>62.3%&lt;sup&gt;b&lt;/sup&gt;</td>
<td>65%</td>
</tr>
</tbody>
</table>

<sup>a,b,c</sup>Numbers in columns connected by the same letter are not significantly different (α = 0.05).
Conclusions

- Unutilized capacity outside of winter months
  - 71% capacity utilization
  - 65% efficiency

- Opportunities to increase production from remaining logging businesses

- Barriers to year-round logging persist