

Logging Capacity Utilization in Wisconsin

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Outline

- Rationale for study
- Results from other regions
- Methodology
- Findings



Challenges Facing Wisconsin Loggers

- 1/3rd 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 Huempfer, 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



Sources: G.C. and Potter-Witter 2011, Blinn et al. 2015, Taylor 2007, Loving 1991, LeBel 1993, Greene et al. 2004



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 = $\frac{\textit{Actual Production}}{\textit{Potential Production}}$
 - 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



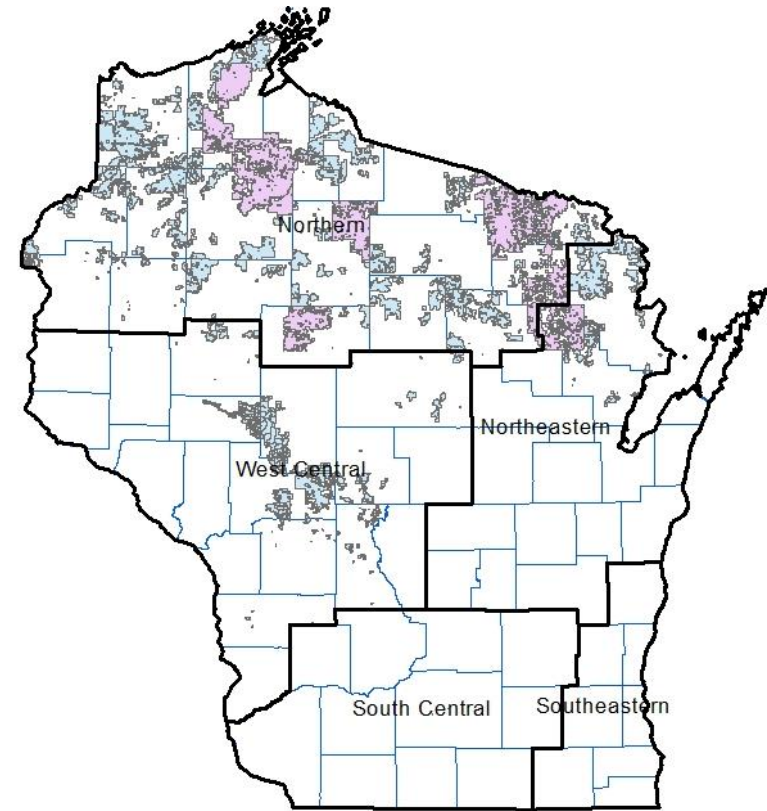
Inputs into Stochastic Frontier Analysis Model

- 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 ($\alpha = 0.05$)



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

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

^{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 $\frac{3}{4}$ of loggers ceased production during spring break-up
- After including this downtime, logging capacity utilization falls to 64%

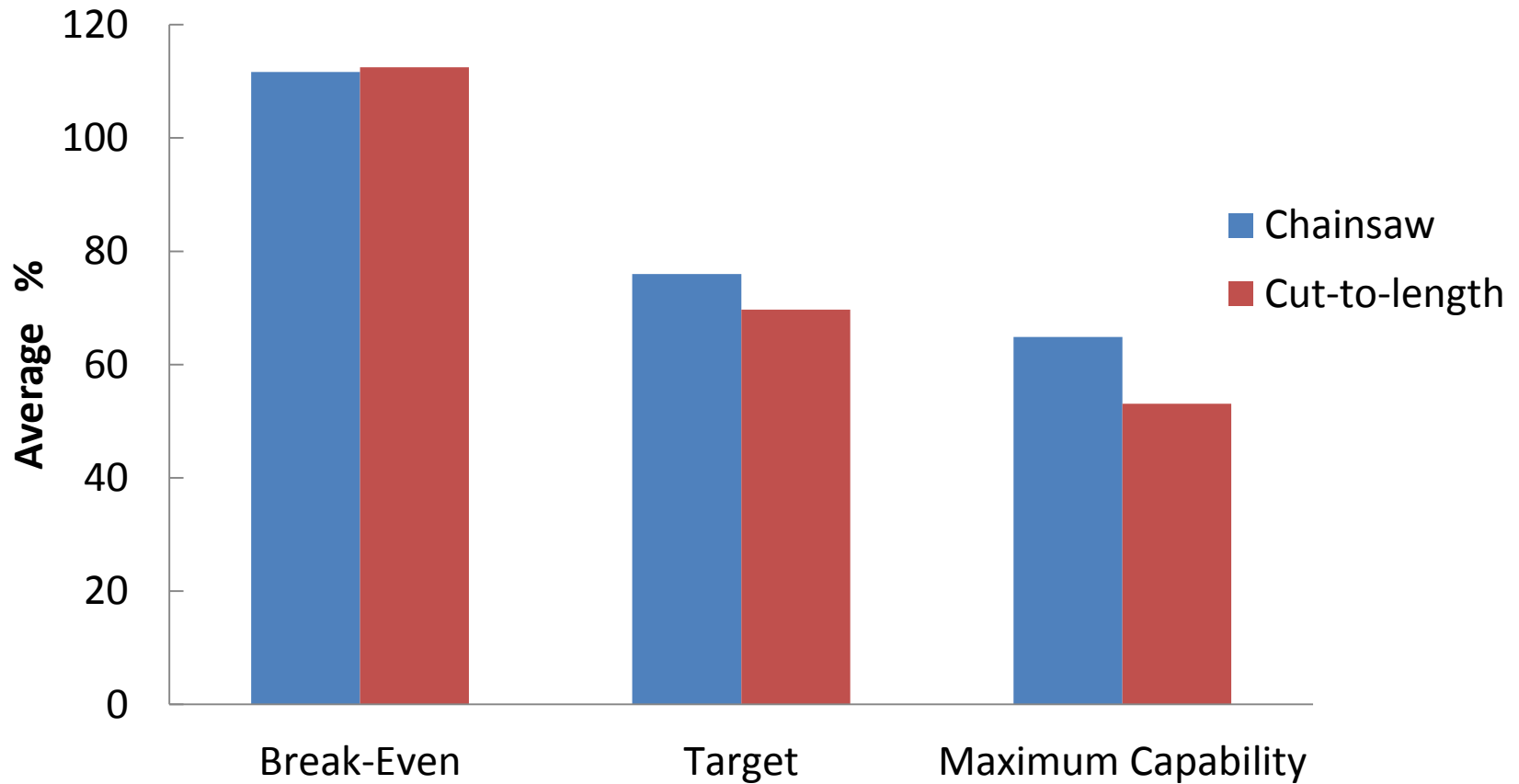


Reasons for Lost Production

- 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



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

System	Efficiency		
	Minimum	Maximum	Mean
Cut-to-length	13.1%	91.6%	69.5% ^a
Chainsaw	12.6%	84.5%	43.3% ^b
Feller-buncher	17.6%	92.2%	69.1% ^a
Overall	12.6%	92.2%	64.8%

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



Seasonal Fluctuations (CTL Only)

Season	Loads per week	Average capacity utilization	Average efficiency	Percent of Timber Sales Available
Fall	11.7 ^a	62.9% ^a	73.3% ^a	82%
Winter	15.6 ^b	79.9% ^b	73.2% ^a	100%
Spring	7.8 ^c	63.6% ^a	61.6% ^b	47%
Summer	9.5 ^{ac}	64.6% ^a	62.3% ^b	65%

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



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

