Unused Logging Production Capacity in Northern New England, USA

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ABSTRACT

Among the costs associated with timber harvesting in northern New England, those related to unused production capacity are among the most poorly understood. Yet research in other regions of the US suggests that idle logging capacity can impose significant costs on wood supply systems, including logging businesses and procurement organizations.

Mail surveys of logging business owners and representatives of wood consuming mills were used to understand unused logging capacity in the northern New England states: Maine, New Hampshire and Vermont. Over two-thirds of logging business owners said that they experienced unused production capacity in an "average" year. Weather, poor road conditions, equipment breakdowns, and mill-imposed quotas, were cited most often as causes of unused logging capacity. Results of this study have implications for logging businesses, procurement organizations, and wood supply system efficiency in northern New England.

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Keywords: *Unused logging production capacity, mail survey, northern New England.*

INTRODUCTION

Despite the importance of the forest products industry to the economy of the northern New England states of Maine, New Hampshire, and Vermont, systematic inquiries designed to understand logging businesses in the region are few. In addition, idle logging capacity and its associated costs have been major concerns of logging businesses and procurement organizations in the US. The Wood Supply Research Institute (WSRI), a partnership of logger associations and wood consuming concerns that supports applied research related to the wood supply system in the US, cited a better understanding of the causes and costs of unused logging capacity as one of its primary research objectives [6].

The objective of this research was to develop an improved understanding of unused logging capacity in northern New England from the perspectives of the region's logging business owners and mill representatives. Factors such as logging firms' capital investment and degree of mechanization were used to explore the causes of unused capacity. In addition, information describing loggers and logging businesses in the region is included to provide some background for this discussion.

The broad survey approach used in this study provides information from a large population of logging business owners, complements previous work that focuses on smaller, selected populations of logging businesses [7, 9], and provides an opportunity to develop baseline information and subsequent follow-up with logging businesses in the study region. For the purposes of this study, unused logging production capacity was defined as *the difference between what a logger could produce and what he/she does produce during an "average" year*, a description consistent with previous studies of the phenomenon [e.g., 6, 7].

BACKGROUND

While investigators have focused recently on labor-related dimensions of the logging community in northern New England, such as bonded Canadian labor [10], the formation of logger associations [3], and logging labor supply [4, 5, 11], there is little research that has focused directly on the region's logging businesses and their unused production capacity. Responding to concerns about a shortage of logging labor and a reduction of production capacity in Maine, Taggart and Egan [11]

assessed occupational choice and prestige among Maine's loggers. The study was later repeated for the broader northern New England logging community [4]. Most loggers in the region chose, rather than were resigned to, logging, but would not recommend the profession to their children. In addition, loggers in the region felt that there was low social status associated with their work, suggesting difficulties in recruiting new workers. Logging labor issues also prompted the PAC/Irland study [10] of Canadian labor in northern Maine. The study concluded that bonded labor did not have a serious negative impact on the state's logging workforce, but that localized problems associated with bonded labor – for example, unfair competition for logging jobs with US citizens – may exist.

Despite the concern about unused logging capacity by representatives of the forest products industry, little has been published on its causes and costs in the US, and most of the published work on the subject describes the phenomenon in the southern US. Loving [9], for example, compared loggers' highest sustainable weekly production recorded in past years with their production at the time of his study. He found a logging capacity utilization of 51-59 percent, and suggested that the short-term cost of excess capacity was borne by logging contractors. Lebel [7] found that a sample of 22 loggers was working at a median capacity of 70 percent, and that the most frequent causes of lost production were adverse weather, mill-imposed quota, and moving equipment. However, Lebel suggested that mill-imposed quotas would claim extra logging capacity when weather conditions were more favorable for logging, since this is a mechanism available to consuming mills for reducing either logging productivity or mill yard inventory. Later, Greene et al. [6] found that wood supply systems in Maine and the southern US did not use 35 percent of their logging production capacity due to system inefficiencies, including the imposition of quotas and poor planning. In addition, they estimated that the overall cost of idle logging capacity in the region studied was $1.73 per ton, costing the wood supply system $448 million annually, a quarter to two-thirds of which could be removed by improving wood supply system efficiencies. Market factors (e.g., mill-imposed quotas) caused the most lost production, followed by unfavorable weather, and poor planning.

Other investigators have focused on the roundwood consuming dimension of regional logging capacity and the imperfect markets associated with many logger-mill relationships, especially for pulpwood. For example, in his study of factors influencing mill delivered softwood roundwood prices, Libbey [8] found that having a large number of suppliers decreased the mill-delivered price of wood for most mills participating in the study, primarily due to the excess logging capacity associated with maintaining a larger core of suppliers. According to 81 timber buyers participating in the study, major factors that increased the price of delivered wood were competition for delivered wood, adverse weather for logging, and decreasing timber availability. Todd and Rice [12] found that, of the important factors affecting procurement decisions in the pulpwood industry in the northeastern US, weather was the only one that influenced annual inventory patterns.

METHODS

A mail survey was developed and tested with groups of loggers in each of the three northern New England states. Using multiple mailings [2], including an initial survey/cover letter mailing, followed by a reminder postcard, and then a final survey/cover letter, all loggers in the region whose names appeared on logger training lists in the three states were mailed the survey during the winter, 2001. Surveys were also mailed to all loggers who had filed a logging notification form in Maine during 2000. The survey was formatted so that questions related to the management of logging businesses (e.g., causes of unused production capacity) were answered only by logging business owners.

In preparation for understanding the estimated costs of unused production capacity and to condition respondents to think about the production capacities of their businesses, we asked logging business owners to respond to the following questions:

- *On average, what is the annual productive capacity of your logging business (i.e., given your equipment and labor mix, how much could you produce annually given "average" logging and market conditions)?*
- *On average, how much do you produce annually?*
- *How much wood do you need to produce annually to break even financially (i.e., no profit or loss*)?
- *How much wood do you need to produce annually to show a reasonable profit (i.e., what you would pay yourself)?*

For those respondents indicating that they did experience unused capacity, the survey asked: *For an "average" year, what do you consider to be the main causes of your unused logging capacity (i.e., what are the causes for the difference between what you feel that you could produce and what you do produce during an "average" year)? Please indicate below the approximate percent,*

if any, for each possible cause of unused capacity that you experience.

A list of 15 possible causes for unused capacity, derived from results of previous studies [5, 6], was offered, and included weather, regulations, road conditions, mill quotas, and poor planning, as well as an "other" option, allowing the respondent to specify a cause that did not appear in the list. The survey then posed the question: *On average, what would you estimate is the total cost to your business of your unused logging capacity, if any, per year?*

In addition, to gain insight into idle logging capacity from another perspective, representatives of all wood consuming mills in the region were surveyed in the summer 2002 using the same multiple mailings sequence used for loggers. The perspective of mill inventory and procurement managers was considered important because previous studies of unused logging capacity had found that mill-imposed quotas were a common cause of idle logging capacity [6, 7], and because many loggers in the region work on logging services contracts with wood consuming mills. Contingency table analysis, analysis of variance, and logistic regression analysis were used to analyze data. All tests were conducted at alpha = 0.10.

RESULTS AND DISCUSSION

There were 1,115 responses to the Northern New England Loggers Survey: 692 from Maine, 191 from loggers from Quebec who work in Maine, 119 from New Hampshire, and 91 from Vermont, and 22 respondents who did not identify their state/province of residence. However, not all survey respondents answered all survey questions. The response rate for the survey of Maine loggers and Quebec resident loggers who worked in Maine was 32 percent. Response rates for New Hampshire and Vermont surveys could not be determined because those surveys were administered by logger associations in those states and the mailing lists were not shared with the research team.

Non-response bias was estimated by using chi-square analysis to test whether survey respondents' responses were dependent on whether a respondent was an early or late survey respondent [1]. We found no significant differences between responses of early and late survey participants, suggesting that survey respondents and nonrespondents were from the same population. Direct tests of nonresponse bias were conducted for respondents vs. nonrespondents for Maine loggers. Results of chi-square analyses suggested that survey respondents and nonrespondents were from the same population.

Background information on the region's loggers. Approximately two-thirds of respondents identified themselves as logging business owners, while the rest identified themselves as logging employees. Overall, survey respondents had an average age of 45.5 years, an average educational level of 11.8 years, and had been logging for an average of 23.3 years (Table 1). Analysis of variance found statistically significant differences among the states and the province studied in average age, education, and years logging. Quebecois loggers who worked in Maine were the oldest, least educated, and had the most years of logging experience. Loggers from Quebec reported over four years less education than their counterparts from New Hampshire, the most highly educated group, and over nine years more logging experience than loggers from New Hampshire and Vermont, the least experienced groups. Logging business owners had mean education levels of 12.4 years, while logging employees had mean education levels of 10.6 years ($F = 139.00$; $p < 0.01$).

According to logging business owners surveyed, over two-thirds of the logging systems in the region were classified as conventional (manual felling-cable skidder), while 24 percent were mechanized (feller-buncher–grapple skidder or processor-forwarder), and 5 percent were small-scale systems (tractor and/or horse) (Table 1). The type of logging system used varied significantly by state, with Maine and New Hampshire the most mechanized and Vermont and Quebecois working in Maine the least mechanized.

Unused logging capacity. Overall, the median annual production capacity reported by logging businesses in the region was 6,650 tons, while the median annual production was 4,735 tons – 71 percent of reported capacity. Median break-even production was 4,170 tons (approximately 63 percent of capacity), while a production of 5,670 tons (approximately 85 percent of capacity) was needed to show a "reasonable" profit (Table 2). Reported production figures varied by the type of operation: conventional, mechanized, or small-scale. However, despite the close agreement between, for example, the overall percent unused capacity found in our study and that found in other studies (Lebel's study of 22 logging businesses in Virginia found that median production was 70 percent of capacity [7]; Greene et al. [6] reported that the wood supply system in Maine and the southern US was using approximately 65 percent of its logging production capacity), we urge caution when comparing our production results with those found by others, or applying them to a single logging crew either in the study region or in other regions of the US. The primary focus of other published studies has been on larger, more mechanized crews in the southeastern and southern US [6, 7, 9], where the work

Table 1. Attributes of loggers and logging businesses in northern New England (ME = Maine; NH = New Hampshire; VT = Vermont; PQ = loggers from the Province of Quebec who work in Maine). Standard errors are in parentheses. (n = 1115)

Attribute	ME	NH	VT	PQ	Overall
Average age (years) (F = 12.8; p < 0.001; n = 1115)	44.3 (.41)	45.6 (.96)	44.7 (.96)	49.4 (.70)	45.5 (.32)
Mean education (years) (F = 173.2; p < 0.001; n = 1100)	12.3 (.08)	13.0 (.21)	12.8 (.26)	8.7 (.17)	11.8 (.08)
Average logging experience (years) (F = 32.1; p < 0.001; n = 1098)	22.3 (.41)	20.3 (.99)	19.9 (1.10)	30.0 (.86)	23.3 (.34)
Logging business owners (percent of all respondents) (chi-square = 174.0; p < 0.001; n = 1011)	69	88	91	24	66
Type of logging system (percent)					
Conventional	70	68	84	86	72
Mechanized	25	28	10	14	24
Small-scale (chi-square = 11.7; p = 0.07, n = 607)	5	3	6	0	5
Experience unused capacity in an "average" year (percent YES)	71	71	75	49	70

environment, equipment mix, harvested log weights, and other factors are often quite different from those found in northern New England. Less than one in five of the logging business participating in our study was mechanized. Even logging businesses operating in the forests of northern New England operate under diverse forest conditions – from the boreal forests of northern portions of the region to white pine, hemlock, and hardwood forests found elsewhere – as well as diverse physiographic, weather, and market conditions.

Over two-thirds of logging business owners in the study region said that they experienced unused logging capacity; responses were dependent on loggers' state/province of residence (Table 1). For example, while 75 percent of Vermont loggers experienced unused capacity, 49 percent of Quebecois loggers who worked in Maine reported having experienced unused capacity. Logistic regression analysis found that the existence of unused logging capacity was not significantly associated with a battery of logging business related variables: hours worked per week, average commuting distance, number of woodlots logged per year, the percent of contracted trucking, and the amount of capital invested in their logging business. However, although not significantly different (F = 2.02; p = 0.16), logging businesses that did experience unused capacity reported a mean capital investment of approximately $320,000; those that did not reported a mean capital investment of approximately $208,000. Moreover, the presence of unused capacity in a business was independent of whether the logging system owned by the business was classified as conventional, mechanized, or small-scale.

When those who reported that they experienced unused capacity were asked to estimate the costs to their businesses related to the difference between what they could produce and what they do produce during an "average" year, the median reported cost of unused logging capacity in the region was approximately $14,000 per business per year. When asked to rate the importance of several factors as possible barriers to maintaining or expanding their businesses, results appeared to suggest more concern about regional unused capacity than within-business unused capacity. For example, overall, almost two-

Table 2. Median responses of logging business owners to questions related to their logging capacity. Numbers are in tons; number of respondents is in parentheses.

	Type of operation			
	All	Conventional	Mechanized	Small-Scale
What is the annual productive capacity of your logging business (i.e., given your equipment and labor mix, how much could you produce annually given "average" logging and market conditions)?	6,650 (358)	4,720 (233)	25,660 (60)	1,575 (15)
On average, how much do you produce annually?	4,734 (358)	3,805 (233)	16,125 (60)	1,025 (15)
How much wood do you need to produce annually to break even financially (i.e., no profit or loss)?	4,170 (250)	3,170 (160)	13,230 (43)	534 (10)
How much wood do you need to produce annually to show a reasonable profit (i.e., what you would pay yourself)?	5,670 (231)	4,288 (146)	17,750 (43)	926 (10)

thirds of logging business owners surveyed said that *too many loggers in their area* was an important or very important barrier, whereas only one-third said that that having *too much capacity within my business* was a barrier. In both cases, results were dependent on which state or province the respondent resided in. Placing these results in perspective, however, almost three-quarters of responding logging business owners said that *too many logging regulations* was an important or very important barrier to expanding their businesses, while 94 percent rated *mill prices are too low* and *equipment prices are too high* as important or very important barriers (Table 3). These results were also dependent on the state or province in which the respondent resided.

Logging business owners attributed the greatest proportion of their unused logging capacity to weather, followed by mill-imposed quotas, poor road conditions, unscheduled equipment breakdowns, inability to find stumpage, mill closures, inability to compete for stumpage, regulations, lack of labor, unproductive labor, moving equipment, and poor planning. In addition, weather, poor road conditions, equipment breakdowns, and mill-imposed quotas were cited as causing unused logging production capacity most often by respondents (Table 4), results that are generally consistent with previous studies [6, 7].

Mill survey: Unused logging capacity. Procurement or log inventory managers from 145 of the 345 mills in northern New England responded to the mill survey (response rate = 42 percent): 71 from Maine, 42 from Vermont, and 32 from New Hampshire. Respondents were asked to consider the question: *If you work directly with loggers to maintain your wood supply, what do you consider to be the main causes of unused logging capacity experienced by logging firms you deal with?*

Mill representatives most often cited weather as the primary cause of unused logging capacity, while the second most common response was loggers' inability to find enough stumpage, followed by equipment breakdowns, mill-imposed quotas, loggers' inability to compete for stumpage, poor road conditions, poor planning on the part of loggers, and regulations (Table 4). Of these, mean responses among the three states studied for mill-imposed quotas ($F = 5.1$; $p = 0.007$: ME>NH>VT), poor planning on the part of loggers ($F = 3.7$; $p = 0.027$; NH>VT>ME), and regulations ($F = 2.8$; $p = 0.061$; VT>ME>NH) were significantly different.

Table 3. Barriers to maintaining or expanding logging businesses, as rated by logging business owners in northern New England.

	Not Important	Important (percent)	Very Important
There are too many loggers in my area			
Maine	36	37	27
New Hampshire	21	50	28
Vermont	28	35	38
Quebec	44	24	31
ALL	33	38	29
(chi-square = 17.07; p = 0.01; n = 718)			
I already have too much logging capacity			
Maine	68	25	7
New Hampshire	71	22	6
Vermont	70	27	3
Quebec	42	35	22
ALL	67	26	7
(chi-square = 20.73; p < 0.01; n = 682)			
Too many logging regulations			
Maine	24	34	42
New Hampshire	36	40	24
Vermont	32	39	29
Quebec	16	28	56
ALL	23	39	38
(chi-square = 22.54; p < 0.01; n = 733)			
Mill prices are too low			
Maine	4	24	72
New Hampshire	5	49	46
Vermont	6	45	49
Quebec	28	36	36
ALL	6	31	63
(chi-square = 83.12; p < 0.01; n = 732)			
Equipment prices are too high			
Maine	6	33	61
New Hampshire	7	32	61
Vermont	8	31	61
Quebec	2	10	88
ALL	6	31	63
(chi-square = 15.50; p = 0.02; n = 731)			

CONCLUSIONS

While eliminating all unused logging production capacity may be unrealistic, previous studies have suggested that idle capacity may reflect system inefficiencies and unaccounted-for costs. Greene at al. [6], for example, showed that idle logging capacity costs the wood supply system in the southern US millions of dollars annually, most of which could be abated by improving efficiencies in the wood supply system. If Loving's [9] perception that logging businesses bear this cost in the short run is correct, a reduction in logging capacity to levels that are detrimental to the wood supply system may result.

Table 4. Causes of unused logging production capacity as reported by logging business owners and wood consuming mills in the region.

Cause	Logging Business Owners (n = 672)	Mill Representatives (n = 375)
	(percent/number of respondents citing each cause)	
poor weather conditions	37/250	21/78
poor road conditions	24/161	12/44
mechanical breakdown	24/159	15/56
mill-imposed quota	22/149	12/47
moving equipment	11/73	9/35
regulations	11/72	10/37
inability to find stumpage	10/68	16/61
mill closure	9/62	6/24
poor planning …		
… by a mill representative	8/52	6/24
… by the logger	5/33	11/41
lack of logging labor	6/40	8/31
unproductive logging labor	5/34	8/29
inefficient unloading of delivered wood	4/29	6/23

However, the causes of unused capacity related to planning and management (e.g., mill-imposed quotas, inability to find stumpage, poor planning practices) may be influenced and are often shared by logging businesses and procurement organizations. In addition, according to Greene et al. [6], it is through improvements in these areas that much of the unused production capacity and its associated costs can be reduced.

Agreeing with Greene et al. [6], inefficiencies in the wood supply system in northern New England will likely demand local, rather than regional, solutions, that are driven, in part, by significant differences in logging methods used, wood products harvested, and local culture and practices. Overbuilt logging workforces, generally resulting in excessive local logging capacity, often supported by some consuming mills as a way of maintaining favorable short-term wood prices and logging services contracts, as well as surge capacity [8], may result in increased long-term wood costs.

Conversely, logging businesses may become more competitive by finding and addressing inefficiencies within their systems. For example, the difficulty of recruiting and maintaining participants in a WSRI-funded project on unused logging capacity in Maine and the southern states [6] suggests that many loggers in the region do not closely track logging costs or inefficiencies. Importantly, effective changes in the wood supply system may arise when all parties involved in the wood supply system recognize that they are interdependent parts of the same system. As suggested by Lebel [7], the adversarial relationship that often develops between loggers and procurement organizations, especially during times of mill-imposed quotas, one of the most often cited causes of unused capacity, is likely counterproductive to an efficient wood supply system in the long term.

By developing baseline information about loggers and logging businesses in northern New England, this study has laid the groundwork for understanding the region's logging businesses over time. Although relying on reported data from survey respondents, our survey provides an opportunity to revisit issues efficiently over time. Surveying procurement managers provided both an important point of view and the opportunity to contrast loggers' and mill representatives' responses. In addition, by finding that other factors, such as regulations, are more important than within-business unused logging capacity as barriers to maintaining or expanding logging businesses, this study has placed the issue of unused logging capacity in better perspective.

Finally, a complex issue such as unused production capacity appears to demand multiple methods that triangulate on research outcomes. Alternative methods for investigating unused logging capacity, such as gathering weekly reports from a small sample of selected logging businesses, still rely on reported, rather than empirically derived, data. Although providing depth that

is difficult to achieve using a survey approach, these studies are often plagued by study design difficulties associated with recruiting participants, periods of non-reporting, high drop out rates among participants [5], and criticisms associated with generalizing results from a small selected sample to the broader population of logging business. Taken together, however, a focused case study approach and a broader survey approach, including gathering perspectives from other relevant populations, such as procurement managers, may help investigators better understand complex issues such as unused logging capacity.

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