Examining the Performance of Independent Harvesting Firms in the Eastern United States[1]

Brian D. Jackson[2], William B. Stuart, Laura A. Grace, and Andrew J. Londo

Abstract: Thirty-eight harvesting firms provided business information, production and expense data for a comprehensive analysis of trends affecting the logging businesses. Contractors are leaving the industry; the study began with 50 participants but 12 withdrew from the industry between 1998 and 2001. The younger entrepreneurs left and in 2002 the median age was 51½. Equipment was also aging. In-woods, production equipment had median ages of at least five years, haul trucks tended to be older (median age of seven years). Corporations were the most common business forms; 78% in 2002, versus 59% in 1995. The analyses provided evidence that equipment investment has dropped; equipment costs declined from 22.3% of total cost in 1999 to 18.9% in 2001. The cost of labor increased 5%. The unadjusted average cost per ton for the population increased from 2000 ($13.40) to 2001 ($14.74).

Key Words: Logging, Cost Analysis, Production Analysis

Funding provided by
Mississippi State University, Department of Forestry and the USDA Wood Utilization Research Grant

INTRODUCTION

Independent harvesting firms are a critical link in the wood supply system of the eastern United States. The wood supply system is a network consisting of three major stakeholders in the production of forestry: landowners, logging firms, and the forest products manufacturing firms (Stuart and Grace 1998). Without loggers, the system would not exist. They convert the landowner's potential wealth of timber crops into actual wealth – a salable market commodity. Loggers harvest one of the most economically viable natural resources available, and make the forest products industry one of the largest manufacturing industries in the nation (Anon. 1995). Logging constitutes a considerable portion of the cost of converting standing timber into useable forms (Brown 1949). The status and structure of logging businesses and their general financial well-being are important to the overall status, health, and viability of the forest industry, warranting a comprehensive study to determine business' performance.

This study examined the productivity and expense patterns of independent logging businesses and related them to business performance. Many factors will affect the success or failure of a logging business: weather conditions, business cycles, compliance with environmental regulations, downtime due to equipment breakdowns, market fluctuation, and mill quotas, to name a few. These factors can limit production capacity while increasing total cost.

STUDY OBJECTIVES

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[1] Approved for publication as Journal Article No. F0238 at the Forest and Wildlife Research Center, Mississippi State University.

[2] Authors are respectively, graduate research assistant, professor, associate professor, assistant professor, Mississippi State University, Department of Forestry, Box 9681, Mississippi State, MS 39762 USA 662-325-8110, bstuart@cfr.msstate.edu -

Cost and productivity studies are useful in determining the overall status of the wood producing and consuming industry. Traditional studies have been restricted to short term analyses incorporating assumptions concerning machine life, operating costs,
and market and weather stability. Few have monitored actual expenditures and production over periods of weeks, months, or years. Fewer have focused on a group of firms dispersed across a wide geographical region.
The overall project objective was to assess the long term business performance of independent logging firms in the eastern United States. Specific objectives for this study included:

1) Maintain and expand the database of contractor cost and production information.
2) To document business characteristics and shifts of participating firms throughout this study period as well as relating these to previous cost and productivity studies.
3) To monitor the productivity, expense, and production cost (cost per ton) shifts that occurred during the study period and how these factors affected business performance.

RESULTS

Methods and Procedures

Selection and Participation

This study builds on a body of research first documented by Loving (1991). Potential participants were nominated by various organizations, such as the Forest Resource Association (FRA), state loggers' associations, Certified Public Accountants (CPA), and wood-consuming firms. Those nominated were expected to be respected business professionals in their geographic area and were also expected to be in compliance with relevant laws and regulations, including workers' compensation insurance. Detailed financial records were required in order to capture the necessary information.

Participation in the study was strictly voluntary. Firms have been added and have left over the course of the study, depending on their continuation in the industry, willingness to participate, or their ability to provide cost and production information.
Typically, when a contractor is nominated or asks to be included in the study, an initial meeting is scheduled to discuss the nature of the project and the purpose of the research. The objectives of the study are explained. They are informed of the voluntary nature of participation and the efforts made to ensure confidentiality in the collection and treatment of their data. The potential participants are told about the type of data that is requested, procedures used to ensure the confidentiality of the data, and how the data will be used. Potential participants are also provided examples of recent research outputs. Nominees are asked to consider participating in the project at the end of this initial meeting. Potential participants are contacted later and, if they choose to participate, a second meeting is scheduled to initiate data collection.

Data Acquisition

Initial data concerning business characteristics and structure were collected during the second meeting. These meetings were usually performed at the contractors' job site, home, or office. Production and cost data collection were also discussed to determine the most convenient method for the firm submitting the data. Often, this entailed scheduling subsequent visits with the contractor, contractor's bookkeeper, or CPA. Some contractors requested that the

researchers contact their CPA or wood purchasers directly. Regardless of the method of data transfer, each participating contractor was visited at least annually, and periodic reports were sent to the contractor to provide project updates. Follow-up contact was maintained by mailing reports and regular phone conversations.

Contractor and Business Characteristics

Forty-two firms provided data concerning their business characteristics. The criteria for inclusion favored good, dependable, well managed businesses. The firms selected were considered to be in the upper tier of their profession and were well respected in their area. They differed in equipment spread, business characteristics, entrepreneur's age and education, along with many other characteristics.

The 42 firms were located in thirteen eastern states, encompassing four major physiographic regions: the coastal plain (20), Piedmont (13), Lake States (4), and the Appalachians (5). The majority (48%) of the firms were located in the coastal plain region, while the Piedmont region added another 31 percent.

The firms in the study were primarily owned or managed by white males between the ages of 35 and 70, with a median age of 51.5. Many wives and mothers were also active business participants, involved in the decision making process for the business, and active in the record keeping and business office of the firm. Others were silent partners in the ownership.

Owning and operating a capital intensive business such as logging requires the manager to be both educated and a savvy businessman in order to be successful. The highest level of education achieved by the participants, along with other formal training is shown in Figure 1.

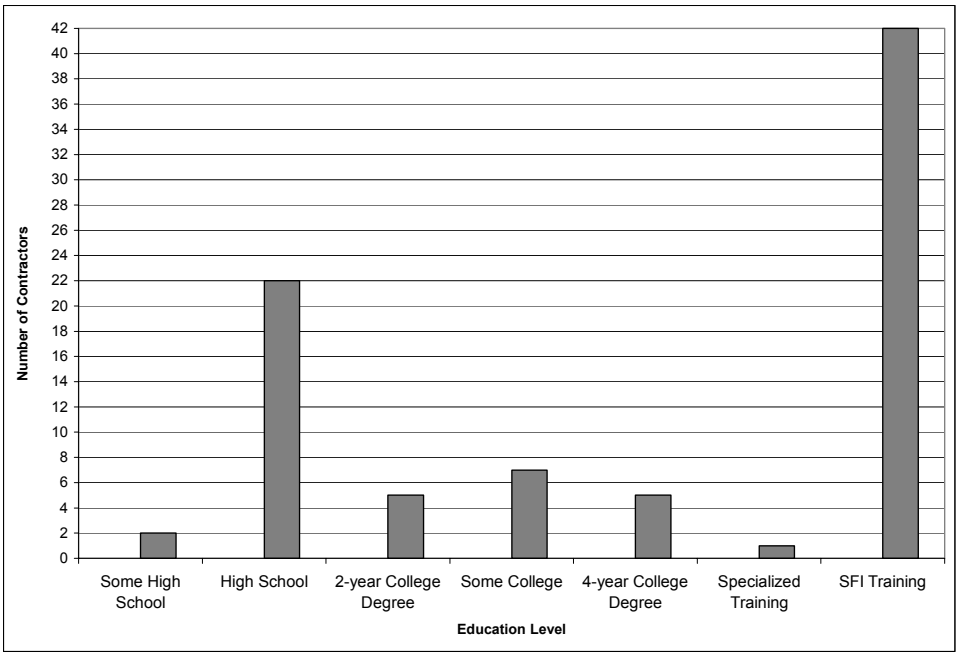

Figure 1 Highest level of education attained by study participants.

Only two contractors had not completed high school, over 95% had high school diplomas, and fifty-two percent had high school completion as their terminal, formal education. Forty-three percent had attended at least some college. One contractor had specialized training in lumber grading. All had completed formal SFI training.

Four common organizational structures were observed; C corporations, S corporations, sole proprietorships, and Limited Liability Companies (LLCs). These business structures were plotted with each firms' estimate of their annual production to compare potential relationships of business size to organizational structure (Figure 2).

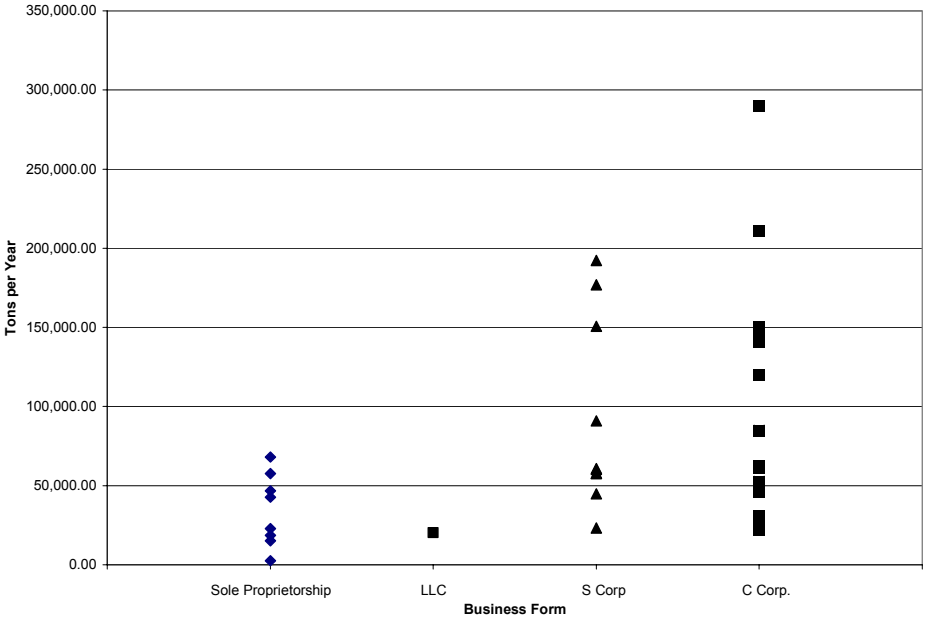

Figure 2 Business structure versus production size of participating logging firms in 2002.

The majority of the firms were corporations. Nineteen (45%), were C corporations, fourteen (33%) were S corporations, eight (19%) were sole proprietors, and only one firm (3%) was a limited liability company (LLC). Sole proprietorships were usually smaller firms. However, not all small firms (in terms of estimated production) were sole proprietorships. Several of the smaller firms had incorporated. No firm with an estimated annual production in excess of 100,000 tons was a sole proprietorship. Incorporation, either as an S or C corporation, was common across all business sizes. Accountants and financial advisors often suggest to their clients that it would be in their best interest to incorporate, to protect personal assets and for tax purposes.

Aging trends for each equipment type became more apparent in this study when compared with similar data from 1998 (Table 1).

Table 1 Median equipment ages (years) for the 1998 and 2002 studies.

Equipment Type	1998	2002
Feller-bunchers	2	5
Skidders	3	6
Loaders	3	5
Trucks	4	7
Service Vehicles	3	6
Bulldozers	11	9

Comparing the current (2002) equipment age with the equipment ages in 1998 finds median equipment ages have increased for every category except for bulldozers. The median age of feller-bunchers, skidders, trucks, and service vehicles increased three years over the four-year period, implying limited renewal of production equipment.

A Kolmogorov-Smirnov Two – Sample Statistic Test was also used to test the assumption that equipment age distributions have changed since 1998. This is a general, two sample test that is useful for comparing two independent and random samples of similar size (Daniel 1990), in this case the similarity between equipment age distributions from 1998 and 2002.

The null and alternative hypotheses were:

$\mathbf{H_0}$: $\mathbf{Age_{1998} = Age_{2002}}$

$\mathbf{H_A}$: $\mathbf{Age_{1998} \neq Age_{2002}}$

Table 2. Probabilities (significance values) for each equipment type (1998, 2002), showing the differences in age distributions, calculated using the Kolmogorov – Smirnov Two Sample Test.

Equipment Type	Probability
Feller-bunchers	0.01 > p > 0.005
Skidders	0.1 > p > 0.05
Loaders	0.1 > p > 0.05
Trucks	0.1 > p > 0.05
Service Vehicles	0.1 > p > 0.05
Bulldozers	0.2 > p > 0.1

The probabilities for tests of each of the equipment types in Table 2 demonstrate that the distributions have changed in shape or location. The tests indicated that the age distributions of each equipment type, except bulldozers, have changed in the past several years. The highest significance values were for the feller-bunchers (>0.01), followed by skidders, loaders, trucks, and service vehicles (0.1). The difference in bulldozer distributions was not statistically significant using scientific thresholds of significance, but there appears to be a practical difference; in actuality, several decades-old machines were replaced.

Equipment purchases have declined over the last several years. Several explanations exist for this trend: first, operating mergers left little room for reinvestment, financing was difficult to arrange, and insurance companies were not willing to risk insuring expensive machinery. The market for used equipment declined in the late 1990s and many could replace older equipment with newer, but used machines. During the early and mid 1990s, contractors rotated machines every three to four years. Very few firms in this study have been able to do so in recent years. Many were encouraged by dealers or company foresters to run older equipment under the assumption that it would reduce costs and lead to profitability. In fact, the use of older equipment decreases equity of the firm, results in higher taxes, and increases repair and maintenance costs. Production capability is also affected by unpredictable downtime. New equipment purchases, for the most part, were only made when absolutely necessary.

Cost and Production Analysis

Thirty-five firms provided cost and production data for 1997 thru 2001. The expenditures were segregated into six categories: equipment, consumables, labor, insurance, contract services and administrative overheads. The median percentage contribution of each of these to total cost is shown in Table 3.

Table 3 Median percentages of expense components for 35 logging firms from 1997 to 2001.

	Equipment	Consumables	Total Labor	Insurance	Contract Services	Overheads
1997	20.89%	19.82%	30.56%	3.24%	15.75%	2.26%
1998	19.59%	18.15%	32.98%	3.16%	12.97%	3.17%
1999	22.32%	19.35%	33.64%	3.09%	14.16%	3.23%
2000	19.19%	20.68%	32.98%	3.36%	13.56%	2.71%
2001	18.86%	19.60%	35.55%	3.62%	18.32%	2.82%

Labor expenditures were the largest contributor to total cost for the sample population and the percentage has increased from 1997 (30.56%) to 2001 (35.55%). Equipment expenditures rose in 1999, fell back and ended at a period low (18.86%). The pattern for contracted services was particularly interesting; falling, rising, and ending the period approaching equipment expenditures. Increased contract services costs indicate that the firms have opted to outsource a greater portion of their services to others. Insurance costs have increased from 3.09% in 1999 to 3.62% in 2001. Overhead costs spiked in 1999 but dropped to one of its lowest levels in 2001, another possible sign of cost-cutting in areas unrelated to the business' direct operation. Administrative costs seemed to be the only manageable or controllable expenditures over the period.

Consumable supplies fell in 1998, then rose with increased fuel prices in 2000 to the point they displaced equipment as the second largest cost category. Higher repair and maintenance expenses from operating older equipment also contributed to the rise. Increased fuel prices were a major reason for the spike in consumable supplies expenditures for 2000.

Cost per ton is a function of the relationship between production and expenditures, but that relationship is not necessarily mechanical or predictable. In essence, a high or low cost per ton value does not necessarily equate with a firm's operational efficiency. It may reflect investment strategy, market access, weather, quota, or other factors. Figure 3 shows the

correlation between total annual cost and annual production for the years 1999 to 2001. Linear trend lines were fitted for each year's data. The R^2-values were relatively high for these comparisons. These regression analyses are not intended as prediction equations but rather as descriptions of how costs changed from year to year. They also indicate that the often supposed economies of scale do not really exist in logging.

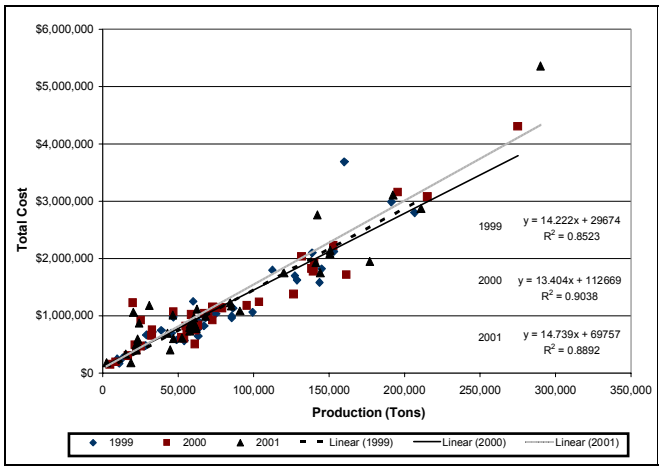

Figure 3 Unadjusted total cost versus annual production for 38 logging firms from 1999 to 2001.

The cost of adding one more ton of production is indicated by the slope of the line. The y-intercepts describe the amount of fixed costs or investments. Fixed costs, in this case, are those unaffected by production or relatively unchangeable from year to year, for a particular firm (Stuart and Grace 1998). The cost of producing one more ton increased from $14.22 in 1999 to $14.74 in 2001, an approximate five percent increase; it was, however at a period low in 2000 at $13.40. The intercept was the highest in 2000, which indicated an increase in "fixed" costs for the firms. Industry/market instability during that year may have contributed. Total production amount explained 85 to 90% of the variation in total cost for the three years.

CONCLUSION

Independent harvesting contractors have struggled financially in recent years. Many have assumed that the answer to the problem is increasing production. This is not always the best remedy. Each firm reacts differently to the changing market conditions and will find ways of adapting. Strategies that work well for some contractors may not work well for others. The wood supply system is a complex, social, and economic construct that does not react to external stimuli in the same manner as a biological system. The system is not easily corrected when disturbed and the effects of attempts to "correct" it are not predictable.

The industry was in a state of unrest during 1999 and 2000, mainly due to corporate mergers, which changed markets. However, a settling down period seemed to occur in 2001, when the system began to react and adapt to the changes. Further insight will continue to be gained with the collection of actual expense and production data from logging firms and additional analyses of their business investment.

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