Chapter 3

Methods and Procedures

The general systems approach used by Loving (1991) provided the format for extending the database of cost and production information of independent logging contractors. The cost and productivity of the harvesting system from the standing tree to delivery at the mill or woodyard was the purview of this study. The objective of this study is the documentation and analysis of production, cost and efficiency relationships for logging contractors. This is part of an ongoing study to monitor changes in harvesting and transportation efficiency over time.

3.1 Contractor Selection

The group of independent contractors sampled in this research were a combination of contractors cooperating in past research projects with Virginia Tech as well as some new contractors. All the contractors received a nomination from a supporting member of the Industrial Forestry Operations Research Cooperative (IFORC). The criteria for contractor nomination was that the contractor was in the upper 25% of the logging force in terms of productivity, professionalism, public relations and environmental performance. Contractors participated voluntarily and shared proprietary information in a good faith effort to find improvements in contractor efficiency and in mill-contractor relations.

As in Loving's research, the businesses sampled varied in production capacity, age, organization, and management strategy. Figure 3.1 shows that the sample spanned six southern states, covering the mountain, piedmont and coastal plain physiographic regions. Only treelength or longwood operations with mechanized felling and grapple skidding were surveyed. The jobs were primarily "cut and haul contractors" working on stumpage owned by the consuming mill, purchased by company procurement staff or by wood brokers.

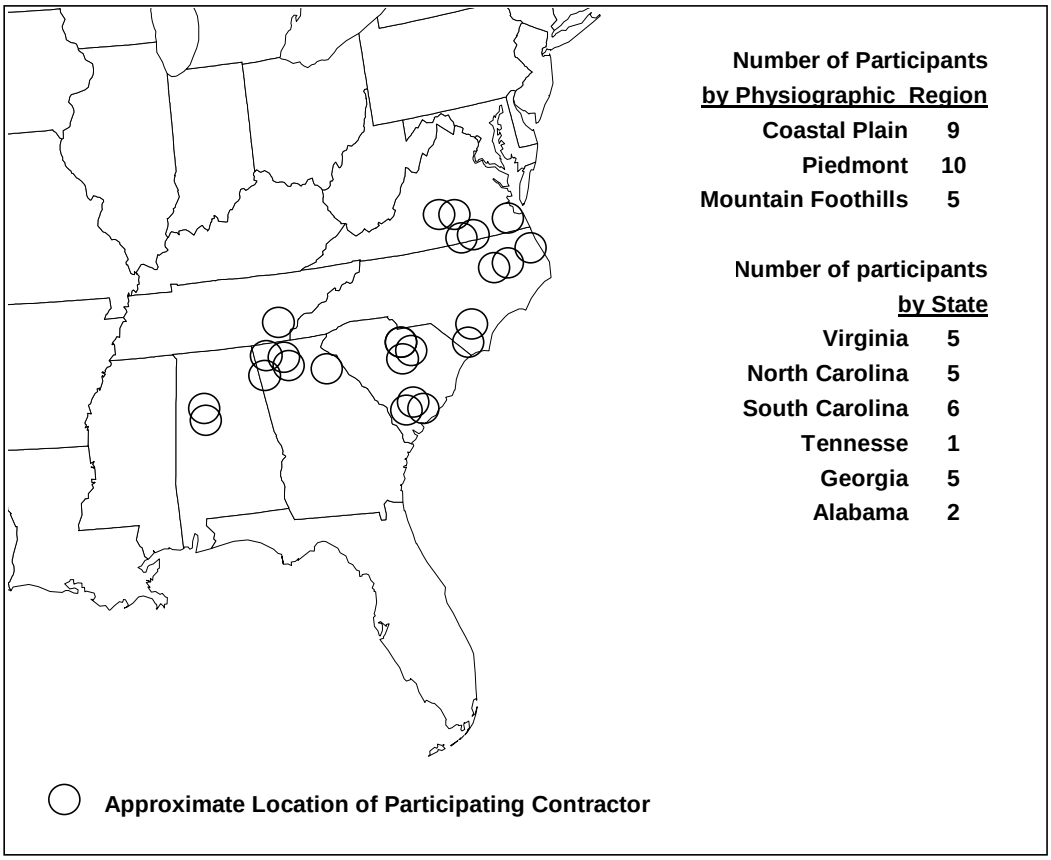

Figure 3.1 Map of contractors' locations.

Figure 3.2 shows forty-three individual logging contractors who have participated in one or more of three related recent studies conducted by the IFORC at Virginia Tech. Of the twenty-four contractors participating in Loving's original study (1991) eleven agreed to continue to provide information. Five contractors that participated in LeBel's capacity utilization study (1993), that were not involved in Loving's study, also agreed to participate in this project. Some contractors declined to continue participation in the project because of the extra paperwork involved. Another contractor was moving into sawmilling and getting away from logging. Other contractors were retiring and some were unsure of their chances of business survival in changing procurement environments. Attrition of these contractors decreased the subsample of loggers from the mountain region. Another sponsor joined the project in 1994 and nominated many new potential study participants in the piedmont and coastal plain regions. Eight of these nominees joined the study.

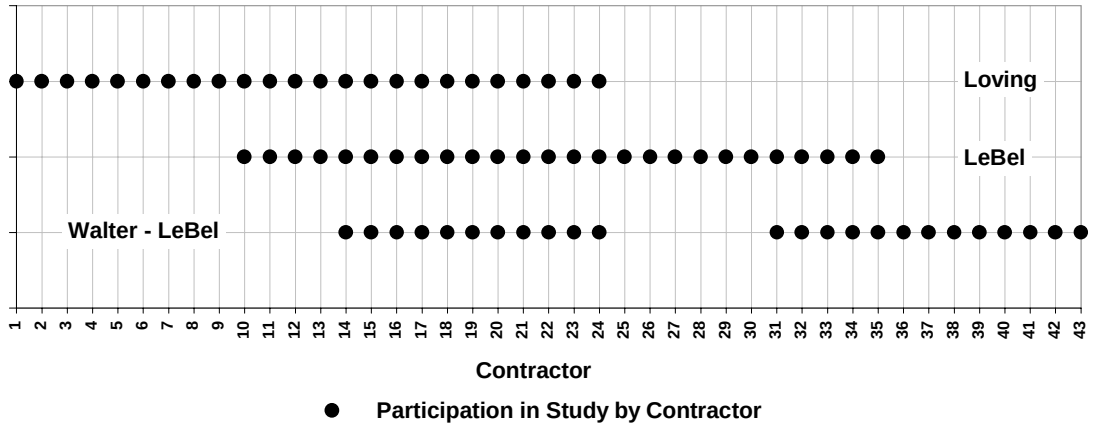

Figure 3.2 Contractor participation in three Virginia Tech studies.

3.2 Cost Information

Quarterly and annual business expenses for operations, overhead, insurance and contracted services were examined on a cash flow basis. This method mirrors the contractor business environment, tax position and provides a picture of business management strategies.

Contractors provided their cost records for 1990, 1991, 1992, and 1993. In some cases 1994 data and in one case 1995 data were collected. For the eleven contractors who had participated in Loving's study, ten provided 1988 data and eleven provided 1989 records. Quarterly reports were requested, however many contractors were able to provide costs on an annual basis only. On the other hand, several contractors were able to provide monthly profit and loss statements. Three contractors were unwilling or unable to provide cost data.

Only those costs directly related to the harvesting and/or hauling of timber are collected and used in the analysis. No information is collected concerning contract rates, revenues, profitability, income taxes, or other business activity such as purchasing stumpage or marketing products. Costs are pooled or otherwise protected to avoid disclosure of any contractor's business or financial position.

Contractors were encouraged to provide the most detailed level of cost categorization they maintained as part of their normal business record keeping. As expected, the diversity of accounting systems resulted in costs being broken down in a variety of ways. Quicken accounting software was used to reaggregate costs into six major categories.

1. **CAPITAL**: Investments in Equipment and related costs.
   - Depreciation value
   - Interest
   - Lease Payments
   - Highway Use Tax
   - Ad Valorem (Property) Tax
   - Vehicle Taxes

2. LABOR: Includes all items related to employee compensation.

Net Payroll (Wages and Salaries) and Owners Draw
Payroll Taxes (FUTA, SUTA, FICA, Medicare)
Workers Compensation Insurance
Employee Benefits (Health Insurance Plan, Uniforms)

3. CONSUMABLES:

Fuel, Oil and Lubricants
Tires
Parts, Repairs and Maintenance
Gravel, Mats
Chainsaws and other small non-depreciable tools
Truck and Equipment Washing, Wrecker Service

4. ADMINISTRATIVE OVERHEAD

Legal and Professional Fees
Bookkeeping or Accounting Fees
Telephone, Utilities, Office expenses and Miscellaneous
Dues, Contributions and Fines

5. INSURANCE

General Liability
Equipment Insurance: Fire / Theft / Vandalism
Umbrella Policy

6. CONTRACT HAULING: for those operations which subcontracted trucking.

A "contractor-year" of data includes the six categories of cost data for one contractor for one year. Each contractor-year fell into one of three distinct groups based on hauling strategy and distributions of costs in the contract hauling category. The first group is the "cut-and-haul contractors" that have not contracted out any hauling. They own trucks and trailers and employ drivers. They have no contract hauling expenses; hauling expenses are included under capital, labor, and consumables. The second group did not perform any of their own trucking. The "logging-only" contractors contracted hauling out to a separate trucking business. In this case the contract hauling expense represented all hauling costs. Conversely, the capital, labor, and consumables categories represent the costs for logging only. The third group was a combination of the first two, in that some hauling was done in house and rest was contracted out. For these "split

contractors", the contract hauling category represents a part of the total trucking expense for the business.

LeBel (1996) divided equally any contract hauling costs to capital, labor and consumables for each contractor-year compiled. Doing so, put all contractors on the same basis for comparing efficiencies by these three categories. This methodology used in this report reallocates the contract hauling expenses of the split contractors only. The contract hauling cost was divided by three and the quotient added to the original capital, labor and consumables category. This transformed the cost structure of the split contractors to a five category cost structure like that of the cut-and-haul contractors. Total cost and the proportion of costs in the capital, labor, consumable categories remained unchanged for all contractors. This transformation allowed observation and comparison of two groups: cut-and-haul contractors and logging-only contractors.

One aspect of compiling labor costs was problematic. The owner's role in a logging business spans from worker to supervisor to manager to entrepreneur. Financial rewards for successful entrepreneurship come from profits. The owner's labor as an equipment operator, supervisor and manager should be charged to the business as an expense. In smaller sole proprietorships, the owner's production role as a working member of the crew is an important component of labor cost. However, the sole proprietors said they drew their incomes from the business profits. Profits were not disclosed in this study. Not all contractors organized as corporations were willing to provide information regarding their "officers salary". So, rather than enter an owners draw for those contractors who did disclose their draw and none for those who chose not to, it was decided to enter an arbitrary owners draw for all operations. The draw was calculated at twenty thousand dollars annually plus thirty cents per annual ton produced annually and included. Higher production operations require more management skill and effort and involve greater risk. Hence the justification for the increase in arbitrary owners draw by production.

3.3 Production Information

Green tons delivered was the chosen unit of measuring production. The ton was the most common unit found in production records. Loads, cords, board feet or other measures were converted to tons using the local conversion factor. Deliveries were used because they are a direct measure of job production and are easily measured. The transactional nature of deliveries results in settlement records from which weekly production can be derived. Since contractors are paid on a delivered basis, this method closely follows the contractors cash flows.

Production information was obtained from company and contractor settlement records. Weekly production information was available for several contractors. For some contractors daily deliveries were available for the time frame specified. For various reasons, some contractors production information could not be brought to a weekly resolution, in those cases it was necessary to summarize tons delivered on a quarterly or yearly basis.

3.4 Contractor and Business Information

Each contractor was visited at least once to collect information about the business using a standardized interview questionnaire. Contractors were interviewed in a setting convenient for them. This varied from on site at their logging jobs, to their homes or offices. Each contractor's logging job was visited at least once to make observations and ask follow up questions. Contractors were posed questions in conversation allowing them to express thoughts completely and elaborate on topics of importance to them. This interview format allows insights that could not be gained in a mail-in questionnaire or a sterile "yes or no" interview.

Questions and Topics were:

1. Contractor age, education and background.
2. Origin of the business and level of family involvement.
3. Organization structure, duration, and reason(s) for current structure.
4. Crew organization, tenure, and key employees.

5. Method of compensation for employees.
6. Employee supervision, turnover and absenteeism.
7. Safety considerations.
8. Equipment spread.
9. Equipment purchasing strategies and operating philosophies.
10. Repair and maintenance considerations. Vandalism incidents.
11. Trucking strategy: Own vs. Contract Hauling,
12. Trucking considerations: Haul distances, Commercial Driver's License (CDL), weight laws, and inspections.
13. Method(s) of stumpage acquisition.
14. Contractor's relationship with contracting company or dealer.
15. Contractors views on quotas and other factors impacting production and suggestions for improving current systems.
16. Insurance - workers' compensation, equipment, and liability.
17. Reaction to best management practices (BMPs) and social pressures.
18. Future plans for the business.

3.5 Expected Outcomes

The principal objective of this study was to extend the cost-production data base for southern logging operations and use the resulting information to extend the evaluation of changes in efficiency of these operations. These changes are to be measured in the composite, a benchmark of how well the industry sector is doing. The performance of individual firms in the composite is of interest, but not the focal point of the study.

Compilation of the database was the first step in meeting the study's objective. Cost and production information was collected and examined from many sources, and recorded in a format that allowed for spread sheet analysis.

The database is analyzed and presented to provide information and insights about efficiency and productivity relationships. Individual contractor identities were masked by grouping contractors together in analyses were appropriate and using codes to protect

identities of contractors. Various graphical techniques illustrate the data and show trends. Non-parametric statistical procedures were favored because of the relatively small sample and the unknown nature of the underlying population distributions.

Efficiency is a simple term, but a complex issue. The American Heritage Dictionary defines efficiency as producing effectively with a minimum of waste, expense or unnecessary effort. Past studies have measured logging efficiency in terms of the rate at which physical inputs are converted into outputs – cords per man-day, production per machine hour and similar measures. The difficulty with these is that only one input is measured, expenditures of the others necessary to support the single input are ignored.

Economic efficiency, tons out per dollar of input, is the simplest and truest composite measure of performance. The business must purchase all inputs, labor, capital, supplies, and services in a competitive market, and that market establishes the value of each relative to the others. The business is judged on how effectively it converts first the dollar inputs into physical inputs and then the physical inputs into product. The degree of mechanization, the system for paying workers or any of the other differences that may exist between operations is subsumed into this more general measure.

Economic efficiency has one complicating feature – the value of the dollar changes over time due to inflation (or less frequently, deflation). With even a very modest level of inflation a dollar spent this year purchases less than one spent one, two, or five years ago. The inflated dollar buys fewer inputs which result in fewer outputs, unless technological or operating changes increase productivity at a rate that is greater than the loss of purchasing power. A firm converting physical inputs into outputs at the same rate as in the past will show a decline in economic efficiency even though it's performance is stable.

Inflation is not accounted for in the data set. Adjusting for inflation with an aggregate price deflator estimate, such as the Producers Price Index, would not be completely accurate because it is not specific to the logging industry. Furthermore, inflation in the

1990s has been very low. Separating the changes in economic efficiency due to changes in the purchasing power of the dollar from those due to changes in operations or market conditions is important only if the analysis is comparing current to past conditions, and if the value of the outputs are changed accordingly. The unadjusted efficiency measure is a better indicator of the current condition and better measure of the business performance in the larger economy.

In addition to the principal outcome of investigating total economic efficiency changes, the nature and trends of the cost components of logging will be explored. Earlier work had shown how businesses achieve nearly equivalent unit costs but with different percentages of total costs in the three major expense categories. Figure 3.3 illustrates these tradeoffs with the vector diagram (Loving 1991).

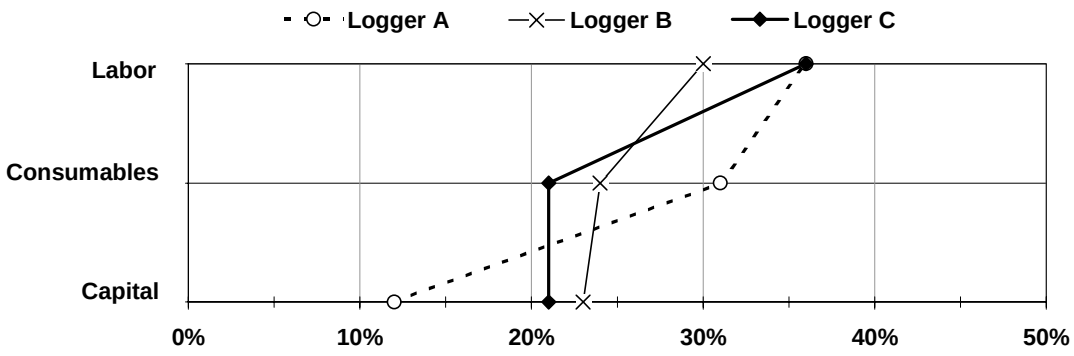

Figure 3.3 Vector diagram of cost structures for three loggers.

The total economic efficiency ratio is defined as the tons of wood delivered per dollar spent in all of the six cost categories (total cost). A partial economic efficiency ratio can also be calculated as the total tons delivered per dollar spent in any one of the six categories. This provides another tool for examining cost trade offs among the three major expense categories.

The three most major cost categories of logging can be thought of as three dimensions. If one dimension is thought of as the height, another as the width and the third as the depth then a box or room is formed. "Defining the room" is an objective of this study as a documentation of a cost / production baseline. Graphical techniques which display the ranges of ratios found will be the main way of illustrating the dimensions of the "room".

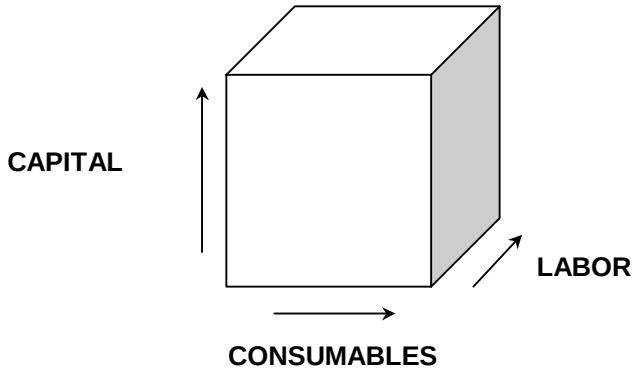

Figure 3.4 Defining the room of partial efficiencies for three major inputs.

Knowledge of the contractors' businesses and production trends can help in identifying the causes of variations in levels of efficiency. The study sought to make observations of contractors' management styles and business survival skills. The personal interviews and discussions with contractors helped gain insight into major forces in the business environment that contribute to variation and inefficiency.