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KEY INDICATORS OF SUCCESSFUL LOGGING JOBS IN THE NORTHEAST

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ABSTRACT

Uncertainty and inadequate information for prediction hinder attempts to judge the chances for success on logging jobs. In this study, variation in the success of commercial logging jobs in the Northeast was examined to relate the kinds of conditions present to the chances of logging being most successful under those conditions. Respondents rated half of the sample logging jobs most successful; they agreed that these jobs were excellent business ventures compared to other recent logging jobs. Splitting the sample on key variables substantially improved our ability to explain success on these logging jobs. Among 22 characteristics, total timber harvest, hauling distance, crew size, and distance from the preceding job were key determinants of the most successful jobs.

THE ABILITY to sort out the most favorable opportunities for investment is a major asset in any business. If, for example, the manpower and capital investments committed to a logging business are to be used wisely, somebody must estimate the chances for a successful business venture based on the conditions under which logging is to be done. Likewise, knowledge of the underlying conditions for successful logging should guide the activities of landowners toward developing operable tracts of timber.

Recent research on commercial logging has provided industry-wide data about logging operations in the Northeast *(Herrick 1975a, 1975b)*. This information supports much of the state-of-the-art knowledge about the industry through documentation of facts. In addition, an analysis was made to identify the key determinants of successful logging jobs. This paper is a report on the organizational effectiveness, or success, of logging jobs in the Northeast.

APPROACH

Uncertainty is a fact of life, and in dealing with it one need not judge the outcome of future activities at the polar extremes of successful or unsuccessful. In the face of uncertainty there are acceptable degrees of success. This probe into the range of success experienced on commercial logging jobs across the Northeast revealed the kinds of conditions present and the chances of logging being most successful under those conditions.

The data were derived from a study describing the combination of men, equipment, and actions that logging firms in the Northeast employed on recent (1974) logging jobs *(Herrick 1975a, 1975b)*. Logging was defined to include the activities involved in cutting and moving timber products from the stump to the mill or purchase point.

Variables

Dependent variable.—The dependent variable was based on each firms' comparative judgment about the success of their most recent logging job compared to other recent logging jobs done by the firm. If respondents said that they (1) strongly agreed or (2) tended to agree that their job was an excellent business venture, it was classified as *most successful.* Jobs for which the response was (3) hard to decide, (4) tended to disagree, or (5) strongly disagreed were labeled *least successful.*

Independent variables. — Characteristics that describe the logging job and the operating unit that did the job were used as 22 independent (predictor) variables for analyzing job success (table 1).

Table 1.—Statistical relationships between logging and job success rating

Characteristics of logging unit and job	Chi-square significance level
	Pct.
1. Status of firms' logging business; major or partial activity	—[1]
2. Number of logging crews in firm	7.8
3. Regional subarea of logging job	—
4. Number of timber products produced on this job	—
5. Major timber product produced on job	—
6. Major type of timber cut	6.3
7. Capital-labor ratio of crew	—
8. Equipment investment on job	9.1
9. Number of workers in crew	7.1
10. Distance moved from preceding job	—
11. Acres in job	—
12. Ownership of tract logged	—
13. Ownership of timber logged	—
14. Volume of timber products cut per acre	9.8
15. Total volume of timber products cut	3.8
16. Value of timber cut	—
17. Most common skidding distance (stump to loading point)	—
18. Longest skidding distance	—
19. Most common temporary road distance (loading point to permanent road)	—
20. Longest temporary road distance	—
21. Most common hauling distance (to mill or purchase point)	—
22. Longest hauling distance	3.5

[1] Indicates not significant at the 10 percent level.

Contingency Analysis

The relationship between logging-job success and each characteristic of the job was tested by contingency analysis (table 1). Results showed a significant dependence (at the 5.0-percent level) between job success and two characteristics: hauling distance for timber products, and total volume of timber products cut. The predominant type of timber, number of workers in the logging crew, number of logging crews in the firm, average investment in equipment on the job, and volume of timber products cut per acre were also related to job success, but at lower levels of significance.

The contingency analysis identified several variables for explaining logging success. However, it did not indicate what combination of characteristics best explains successful logging jobs. To do this we have to use this information in another analysis.

Multiple Variable Analysis

What combination of logging job characteristics spells the most success? One way to approach this question is by subdividing the logging jobs into a series of subgroups that will maximize our ability to explain characteristics of the most successful jobs. The analytical technique called AID—Automatic Interaction Detector—is useful for this purpose *(Sonquist and Morgan 1964, Sonquist and others 1971)*.

The AID technique divides the data set, through a series of two-way splits, into a series of subgroups. Every job is a member of one of these subgroups. They are chosen so that, at each step of the procedure, the two new groups will reduce the variance of the dependent variable more than any other pair of subgroups. Thus the procedure starts with the most stable and dependable finding and works down to less and less dependable findings on smaller and

smaller subgroups. The splitting process is constrained by a lower limit for predictive error reduction and sample size in order to keep the final information relevant and valid.

In this study the following specifications were used for splitting:

1. The split of any group had to reduce total predictive error at least 1.0 percent.
2. Each subgroup had to contain at least 25 observations.
3. Where a predictor had a natural order, that ordered series of categories was preserved in any resulting two new groups.

RESULTS

The analysis resulted in 10 mutually exclusive groups of logging jobs showing the corresponding proportion of jobs that were rated "most successful" in each group. These results were arrived at by the following procedure, as represented by a tree-diagram of the splits (fig. 1).

When the total sample (group 1) was examined, the maximum reduction in the predictive error was attained by splitting the sample into two new groups: "timber harvest 25,000 cubic feet or less" (group 2), and "timber harvest greater than 25,000 cubic feet" (group 3).

Group 3, the over-25,000-cubic-foot jobs, was then split into "longest hauling distance is 15 miles or less" and "longest hauling distance exceeds 15 miles." Similarly the "exceeds 15 miles, greater than 25,000 cubic feet" group was further divided into "larger than 4-man crew" and "crew of 4-men or less," etc.

A group that could no longer be split became one of the 10 final groups. When all final groups had been formed, some of the original variables (table 1) still had not been used. At each step there was another variable that proved more useful in explaining the variance remaining in that particular group.

Only final groups—those at the ends of the tree branches—are of major concern. Group descriptions define the job characteristics

Figure 1.—Variables used to explain success on logging jobs. In each cell, the percentage figure shows the proportion of jobs in each group that were rated most successful. N=size of final groups.

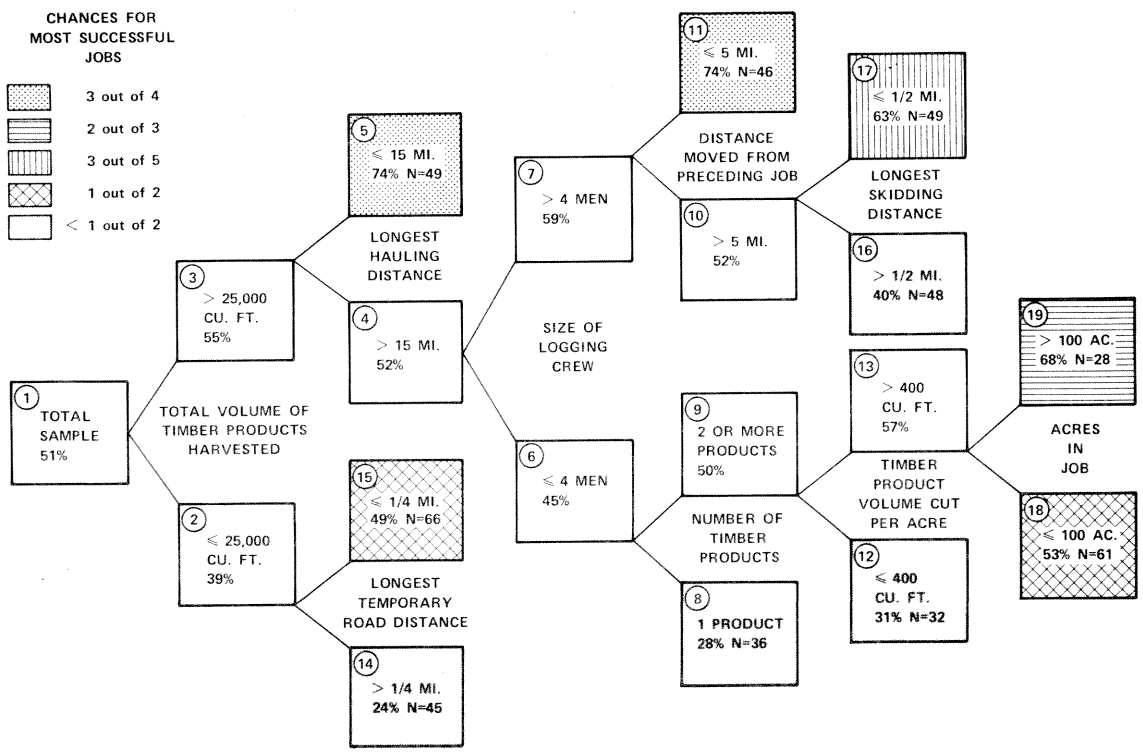

Table 2.—Final groups of Northeastern logging jobs, in rank by their proportions of most successful jobs

Group no.	Job characteristics	Proportion of jobs rated most successful
		Pct.
5	Job produced more than 25,000 cubic feet of timber product volume, and the longest distance products were hauled did not exceed 15 miles	74
11	Job was within 5 miles of the job that preceded it; more than 4 men were used on the job; the longest hauling distance was greater than 15 miles; and the job produced more than 25,000 cubic feet of timber product volume.	74
19	Job involved more than 100 acres, had more than 400 cubic feet per acre and more than one timber product; at most it involved 4 men; the longest hauling distance was greater than 15 miles; and total volume produced was greater than 25,000 cubic feet.	68
17	Longest skidding distance did not exceed ½ mile; the job was more than 5 miles from the job that preceded it; more than 4 men were used on the job; the longest hauling distance was greater than 15 miles; and total volume was more than 25,000 cubic feet.	63
18	Job involved 100 acres or less (otherwise the same as group No. 19).	53
15	Longest temporary road distance on the job did not exceed ¼ mile, and total timber product volume did not exceed 25,000 cubic feet.	49
16	Longest skidding distance on the job was more than ½ mile (otherwise the same as group No. 17).	40
12	Volume per acre was 400 cubic feet or less; job produced more than one timber product; 4 men or less were used on the job; the longest hauling distance was greater than 15 miles; and total volume was more than 25,000 cubic feet.	31
8	Job produced only one product; 4 men or less were used on the job; the longest hauling distance was greater than 15 miles; and total volume was more than 25,000 cubic feet.	28
14	Longest temporary road distance on the job was more than ¼ mile, and total timber product volume did not exceed 25,000 cubic feet.	24

needed to get the odds of most success associated with each final group (table 2). For example, 74 percent (3 out of 4) of the logging jobs were most successful when the volume cut exceeded 25,000 cubic feet and the hauling distance was 15 miles or less (group 5).

The key groups for explaining logging job success are those that have the highest and lowest proportions of jobs rated most successful in the tree of two-way splits. These groups characterize success extremes. According to our analysis, logging jobs that rated most successful were least prevalent in group 14 and most prevalent in groups 5 and 11.

DISCUSSION

Fifty-one percent of the original sample of logging jobs were rated most successful. Respondents agreed that these jobs were excellent business ventures compared to other recent logging jobs done by the firm. Splitting the sample on key variables substantially improved our ability to explain success on these logging jobs. For example, look at jobs on which total timber product volume did not exceed 25,000 cubic feet and the longest temporary road distance on the job was greater than ¼ mile. Only one in four of these jobs was perceived as being most successful (group 14, fig. 1).

On the other hand, consider those logging jobs yielding more than 25,000 cubic feet of timber products. If the products were hauled no farther than 15 miles to a mill or purchase point, chances were relatively good (three out of four) that the job was rated most successful (group 5).

Moreover, where the hauling distance exceeded 15 miles, chances of rating most successful were also three out of four if the job used a crew of more than four workers and was located within 5 miles of the preceding logging job (group 11). Where distance from the preceding job exceeded 5 miles, three out of five jobs were rated most successful if the distance that timber products were skidded or forwarded did not exceed ½ mile (group 17).

If the logging was done by four workers or less, and the job produced more than one timber product, averaged more than 400 cubic feet per acre, and covered more than 100 acres, chances were two out of three that the job was rated most successful (group 19). If 100 acres or less were involved, chances that the job rated most successful dropped to one out of two (group 18).

The conditions under which loggers operate differ from job to job. This analysis shows the odds that logging jobs have of being most successful under various combinations of conditions. Conversely, it indicates which combinations of conditions represent the most favorable commercial logging opportunities. The results suggest that predicting logging job success on the basis of total timber harvest, hauling distance, crew size, and distance from preceding job would provide a considerable reduction in error.

In application, the emphasis may be on buyers acting to avoid the least favorable situations, or on sellers acting to upgrade these situations. But in terms of the parameters that make for operable tracts of timber, the implications are similar for buyer and seller alike. Knowing the array of chances associated with the various conditions under which timber is being bought, cut, and sold helps to sort things out a little better for those trying to assess the operability of timber resources.

Variables that work are, of course, the most logical candidates to include in a framework for judging the potential for success of a logging job. It should be noted, however, that the above framework is not a decision-making model. It is an additional guide that can be used to reach a more rational decision, which will have to be made anyway. As a guide, the suggested framework is a supplement to the other guides and means used to investigate or evaluate logging jobs in the region.

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