
Forestry-Related Educational Needs of Innovative Ohio Sawmill Operators

Stephen M. Bratkovich, *USDA Forest Service, Northeastern Area, State and Private Forestry, 1992 Folwell Ave., St. Paul, MN 55108*; **Donald W. Floyd**, *State University of New York, 306 Bray Hall, 1 Forestry Drive, Syracuse, NY 13210*; and **Larry E. Miller**, *The Ohio State University, Department of Agricultural Education, 2120 Fyffe Rd., Columbus, OH 43210*.

ABSTRACT. *Thirty-two innovative Ohio sawmill operators were surveyed to assess perceived "job importance" and their "current knowledge" of 67 job-related skills divided into 6 subject areas. The discrepancy or gap between importance and knowledge scores was used to compute perceived educational need scores for the skills, 21 of which are highlighted in this paper. Although the subject area of "sawmill production" was ranked first by sawmill operators in both importance and knowledge, the areas of "environmental awareness" and "forest product marketing" had the highest perceived educational need. Seventy-five percent of the forestry-related skills received "high" importance scores; however, with the exception of "maintaining an adequate log supply," forestry-related skills ranked in or near the bottom-half of all skills in perceived educational need. Sawmillers rated their knowledge of forestry-related skills such as "understanding the benefits of TSI" higher than their knowledge level of skills such as "exporting lumber" and "developing new wood products." Recommendations are given for field foresters to assist them in initiating a meaningful dialogue with sawmill operators to help bridge the often-encountered communication gap between sawmill, forester, and NIPF landowner. North. J. Appl. For. 13(3):135-139.*

Foresters continue to have a unique and important role in natural resources management. On nonindustrial private forest (NIPF) lands, which dominate the northeastern United States, a complex relationship exists among the service or consulting forester, the forest landowner, and primary manufacturing industries such as logging and sawmilling. These entities, operating separately or in conjunction with each other, form the core of rural forest-based economic activity.

Much has been written about: the motivations of NIPF landowners (Bliss and Martin 1988, 1989, Bliss 1989); the use of adoption/diffusion theory in reaching landowners (Haymond 1988a, 1988b, Haymond and Baldwin 1988, West et al. 1988); continuing education needs of foresters (Straka and Richards 1984, Blank 1994) and loggers (Reisinger et al. 1994, Smidt and Blinn 1994); and forester-logger/landowner-logger relationships (Reed 1987, Steele 1992). There is, however, little published information about the educational and training needs of sawmill operators and their relationship with NIPF landowners and field foresters.

In many respects the scarcity of research on sawmill operators is surprising because sawmillers in the Northeastern US can (and do) have a substantial impact on NIPF land. For example, many sawmills employ loggers and/or timber buyers who interact directly with NIPF landowners, often bypassing the service or consulting forester. The sawmill-employed logger/timber buyers typically receive their "marching orders" directly from the mill owner/operator. Second, sawmill operators influence independent loggers, and, in turn, their interaction with NIPF land and landowners, by the prices paid, species preferred, and the volume of timber demanded. Because most mills are located in rural areas, many sawmillers are in direct and frequent communication with NIPF landowners in their log procurement area.

Log and lumber price increases have occurred at the same time that the public is increasingly concerned about environmental protection. To secure an adequate supply of timber and meet environmental protection regulations, sawmillers could benefit from a better understanding of the needs of

forest landowners. In turn, it would be advantageous for field foresters to better understand sawmillers' educational needs relating to forest resources management. These circumstances combine to provide the service and consulting for-ester with the often elusive "teachable moment."

This study was designed to determine the perceived educational needs of innovative Ohio sawmill operators. Selected results of the study should prove useful to field foresters in bridging the often-encountered "gap" between foresters, sawmillers, and NIPF landowners.

Methods

This study was designed as a descriptive study that used survey research methods. The population consisted of Ohio sawmill operators. A nonrandom sampling plan was used to identify innovative Ohio sawmill operators.

A panel of six experts, self-judged to be knowledgeable about Ohio sawmill operators, identified the most innovative sawmillers in the state ($n = 32$) which comprised the subjects for the study. The selection criterion used by the expert panel was based upon Rogers' (1983) innovator and early adopter definitions (first or nearly the first individuals to adopt new ideas or practices). The use of a nonrandom sample was appropriate for this study because the subjects (innovative sawmill operators) tend to: (1) introduce new ideas and practices into a group (sawmill operators in general); (2) communicate the new ideas and practices to other members of the group; and (3) serve as the target audience for individuals who act as change agents (field foresters for example). [Note: Studies involving a "diffusion of innovations" perspective usually focus on "early adopters" since they communicate (diffuse) new ideas and practices to others. Eighty-four percent of the subjects in this study (27 out of 32) fit the definition of early adopter. Since the total number of subjects was small, and because innovators and early adopters are closely related based on their degree of "innovativeness," the two adopter categories were combined for this study.]

The data collection instrument for this study was a mail questionnaire. A measurement scale, similar to those used in educational research to measure attitudes, was used to assess the perceived educational needs of innovative Ohio sawmill operators on 67 job skills (competencies). The 67 skills were divided into six subject matter areas: forest products marketing, sawmill production, equipment maintenance and management, communications, environmental awareness, and business management. The measurement scale employed a five-point rating system (1 = low and 5 = high) to assess the skills that sawmill operators thought were most important and those they knew the least about. Using a procedure common in educational research (Borich 1980), the sawmill operators' self-reported importance and knowledge scores were converted into a weighted "perceived educational need score."

Strategies recommended by Dillman (1978) in implementing mail surveys were used to increase response rate. Two mailings of the questionnaire, advance and reminder postcards, and telephone followup were used in late winter/

early spring 1991 to achieve a response rate of 100%. Additional details on the methodology used in this study (research design, survey instrument, and data collection) can be found in Bratkovich and Miller (1993).

Results and Conclusions

Characteristics of Innovative Ohio Sawmill Operators

The typical innovative Ohio sawmill operator can best be described as a 45- to 54-yr-old male with a tenure of 20 to 29 yr in the sawmilling business. The typical operator had "some college" education, annually produced 5 to 6.9 mmbf of lumber, generated an annual gross income of \$3 million to \$4.9 million, and had "strong aspirations" to seek new information.

Perceived Importance, Knowledge, and Educational Needs

Table 1 shows the 21 skills (out of a total of 67) with the highest educational need mean scores, along with importance and knowledge scores for the same skills. For interpretation of importance and knowledge scores, the scale was categorized into scores of low (1.0 to 2.3), medium (2.4 to 3.6), and high (3.7 to 5.0). For perceived educational need, a positive mean score represented a situation where the mean importance score was greater than the mean knowledge score, i.e., a perceived educational need existed (positive gap or discrepancy between the two scores). The greater the computed need mean score (mean importance score minus mean knowledge score multiplied by mean importance score), the greater was the perceived educational need. For example, from Table 1, the "predicting future lumber prices" educational need score of 6.3 was computed by multiplying the mean importance and knowledge score gap (4.5 - 3.1) times mean importance score (4.5).

Table 2 ranks the job skills by subject matter area. Innovative Ohio sawmill operators rated the sawmill production subject matter area as first in both importance and knowledge. However, the areas of environmental awareness and forest product marketing had the highest perceived educational needs as computed by the example shown above.

Forestry-Related Skills

This study defined forestry-related skills of sawmill operators as those pertaining directly to forestland, forestland owners, foresters, and loggers. Eight of the 67 skills were categorized as forestry-related: understanding the benefits of timber stand improvement, understanding the advantages and disadvantages of clearcutting as a timber harvesting method, understanding the impact of timber harvesting on the quality of wildlife habitat, building logging roads to prevent excess soil erosion, negotiating a timber purchase with a landowner, buying standing timber, buying logs, and maintaining an adequate log supply. Table 3 presents the perceived importance, knowledge, and educational need mean score rankings of the forestry-related skills. "Maintaining an adequate log supply" is the only skill in Table 3 that had an educational need score high enough to be included in Table 1. Excluding the "log supply" skill, all forestry-

Table 1 Rank order of 21 skills out of 67 tested with highest educational need mean scores

	Importance		Knowledge		Educational need	
	Rank	Mean	Rank	Mean	Rank	Mean ^a
Sawmill operator skill						
Predicting future lumber prices	3	4.5	45	3.1	1	6.3 ^b
Understanding environmental laws enforced by regulatory agencies	22	4.0	54	2.7	2	5.4
Exporting lumber	39	3.7	59	2.6	3	4.0
Motivating employees	8	4.4	25	3.5	4	3.9
Disposing of sawmill wastes in an environmentally safe manner	8	4.4	23	3.6	5	3.8
Evaluating new mfg. technologies	22	4.0	45	3.1	6	3.7
Evaluating log yield/lumber output	3	4.5	12	3.7	7	3.5
Keeping up-to-date on worker compensation issues	11	4.3	32	3.4	8	3.4
Preventing sapstain on lumber	1	4.7	2	4.0	9	3.3
Conserving energy at the sawmill	22	4.0	39	3.2	9	3.3
Developing new wood products	42	3.6	54	2.7	9	3.3
Resolving problems with employees	3	4.5	8	3.8	12	3.2
Recognizing differences between marketing and selling	28	3.9	45	3.1	13	3.0
Marketing domestic lumber	11	4.3	12	3.7	14	2.8
Projecting a good image to customers	2	4.6	2	4.0	15	2.7
Controlling noise in the sawmill	28	3.9	39	3.2	15	2.7
Maintaining an adequate log supply	3	4.5	5	3.9	17	2.6
Correcting mill safety problems	8	4.4	8	3.8	17	2.6
Controlling wood dust in the sawmill	42	3.6	52	2.9	19	2.5
Projecting a good image to the general public	11	4.3	12	3.7	19	2.5
Developing an efficient pattern of material flow through the sawmill	3	4.5	5	3.9	19	2.5

^a Educational need mean score = (Importance mean - Knowledge mean) × (Importance mean).

^b Due to rounding error, hand-calculated mean scores may differ from the mean scores shown in this table.

related skills ranked approximately in the bottom half of all skills in perceived educational need.

Perceived importance and knowledge scores for the forestry-related skills are presented in Table 4. Three-fourths (6 of 8) of the skills rated by the sawmill operators can be defined as receiving a high importance score ≥ 3.7 . In addition, knowledge scores of forestry-related skills (Table 4) were comparable to knowledge scores of the skills with the highest educational need (Table 1).

Recommendations and Discussion

This study conducted an educational needs assessment within the context of innovation diffusion theory whereby sawmill operators defined as innovative were targeted for assessment, rather than the entire population of Ohio sawmill operators. This study followed the recommendation of Muth and Hendee (1980), who wrote that the well-established concepts and principles of the classical diffu-

sion-adoption model, which helped make U.S. agriculture the best in the world, should be applied in forestry. Although the findings of this study are not directly generalizable beyond the sawmill operators that were studied, the results do provide field foresters in the northeastern United States with additional insights into accomplishing forest-land management objectives.

Communicating with Sawmill Operators

Field foresters should recognize that an opportunity exists for communicating complex issues to innovative sawmill operators. This recommendation is justified based on the results of this study which found that the typical innovative sawmiller was experienced (20–29 yr in the business), educated (minimum education of “some college”), and had “strong aspirations” to seek new information. These characteristics imply that a meaningful dialogue between innovative sawmillers and field foresters can occur. Communicating with sawmillers on a one-on-one basis, as opportunities

Table 2. Rank order of subject matter areas by educational need mean scores.

Subject matter area	Importance		Knowledge		Educational need	
	Rank	Mean	Rank	Mean	Rank	Mean ^a
Environmental awareness	3	3.8	3	3.2	1	2.3 ^b
Forest products marketing	3	3.8	3	3.2	1	2.3
Sawmill production	1	4.1	1	3.6	3	2.0
Communications	2	3.9	2	3.5	4	1.7
Business management	5	3.6	3	3.2	5	1.5
Equipment maintenance and management	6	3.2	6	3.0	6	0.6

^a Educational need mean score = (Importance mean - Knowledge mean) × (Importance mean).

^b Due to rounding error, hand-calculated mean scores may differ from the mean scores presented in this table.

Table 3 Perceived importance, knowledge, and educational need mean score rankings for eight forestry-related skills

Forestry-related skill	Rank order ^{a,b}		
	Importance	Knowledge	Educational need
Maintaining an adequate log supply	3	5	17
Buying standing timber	33	32	32
Understanding the benefits of timber stand improvement	18	12	34
Negotiating a timber purchase with a landowner	33	32	36
Buying logs	22	12	41
Understanding the advantages and disadvantages of clearcutting as a timber harvesting method	33	25	42
Understanding the impact of timber harvesting on the quality of wildlife habitat	46	39	46
Building logging roads to prevent excess soil erosion	52	51	48

^a Rank order out of 67 job-related skills from one (highest) to 67 (lowest).

^b Score rankings above 3 (1 and 2) and below 52 (53 to 67) are not shown since the corresponding skill was not considered "forestry-related."

occur, is one method that field foresters can use to initiate a meaningful dialogue. In addition, field foresters should consider implementing the following strategies: (1) invite innovative sawmillers to participate in professional forestry meetings and workshops such as those sponsored by the Society of American Foresters; (2) include innovative sawmillers in existing forester-logger cross-training sessions; and (3) develop joint training/educational programs and newsletters/publications for both foresters and sawmillers. Foresters (and sawmillers) must recognize the importance of collaborative training and education as a forerunner to collaborative resource management.

Above all, field foresters (acting as change agents) must be aware of two important factors upon which their success depends. First, field foresters must view the resource management "situation" with empathy from the sawmillers' perspective, not his or her own. This point of view helps establish the forester's credibility and trustworthiness in the eyes of the sawmiller. Second, the field forester must be "client centered," focusing on the sawmiller's needs and de-emphasizing their own needs. These two factors or roles, which have been paraphrased from Rogers (1983), must be embraced by field foresters if the forester-sawmiller dialogue is to be successful.

Environmental Awareness

The fact that the subject matter area of "environmental awareness" tied "forest products marketing" for the highest

perceived educational need is indicative of important changes taking place in the sawmill industry. Specifically, the environmental awareness skills of "understanding environmental laws enforced by regulatory agencies, disposing of sawmill wastes in an environmentally safe manner, and conserving energy at the sawmill" ranked in the top ten skills in this study as measured by perceived need. Field foresters who can provide up-to-date technical assistance in these specific skills will likely establish good working relationships with sawmill operators. Field foresters lacking the training or expertise in specific skills should consider using an intermediary to deliver the direct assistance to the sawmillers. For example, field foresters can play an important role by serving as the "eyes and ears" for state and federal forest products specialists. Referrals can be directed to these specialists who work on a regular basis with sawmills and related industries. A team approach to technical assistance can still enable field foresters to enhance their credibility and trustworthiness in the eyes of the sawmiller.

Forestry-Related Skills

The forestry-related skill of "maintaining an adequate log supply" ranked (out of the total 67 competencies) 3rd in perceived importance, 5th in perceived knowledge, and 17th in perceived educational need. Field foresters should capitalize on this finding by providing technical assistance to sawmillers that incorporates the "log supply" issue. For example, field foresters have an opportunity to educate

Table 4. Perceived importance and knowledge mean scores of eight forestry-related skills.

Forestry-related skill	Mean score ^a	
	Importance	Knowledge
Maintaining an adequate log supply	4.5	3.9
Buying standing timber	3.8	3.4
Understanding the benefits of timber stand improvement	4.1	3.7
Negotiating a timber purchase with a landowner	3.8	3.4
Buying logs	4.0	3.7
Understanding the advantages and disadvantages of clearcutting as a timber harvesting method	3.8	3.5
Understanding the impact of timber harvesting on the quality of wildlife habitat	3.5	3.2
Building logging roads to prevent excess soil erosion	3.2	3.0

^a Mean scores can be interpreted as low (1.0 to 2.3), medium (2.4 to 3.6), and high (3.7 to 5.0).

sawmillers that a NIPF landowner may be more likely to sell timber (i.e., increase the available log supply) if the landowner's wildlife, recreation, and aesthetic management objectives also can be achieved as a part of the harvest. Similarly, sawmill operators will see another benefit to implementing practices such as BMPs (Best Management Practices) if the forester can clearly establish the link between landowner satisfaction and an increased raw material supply.

Sawmill operators in this study tended to perceive forestry-related skills as high in importance to their job, perhaps recognizing the long-term relationship between a successful sawmill business and responsible resource management. Information and technical assistance directed at topics such as timber stand improvement and timber harvesting methods may be well received by sawmillers and could provide a basis for establishing or re-establishing the service and consulting forester as a primary source of forestry expertise.

Surprisingly, the mean knowledge score of the forestry-related skills (3.5 as computed from Table 4) is greater than the mean knowledge scores of specific skills that many would judge to be central to innovative sawmill businesses, i.e., exporting lumber (2.6), developing new wood products (2.7), and evaluating new manufacturing technologies (3.1). Therefore, sawmillers in this study perceive they know more about selected forestry-related skills than they do about several aspects of sawmilling. These perceptions may or may not be warranted. Assertive field foresters may regard this kind of discrepancy as an opportunity for further education. Also, since sawmillers in this study were found to have "strong aspirations" to seek new information, foresters may choose to expand their educational efforts and include "new" topics such as stewardship, sustainable forestry, and ecosystem management.

Although this paper focused primarily on forestry-related educational needs, foresters who are knowledgeable about highly ranked educational needs not specifically related to field forestry have an additional opportunity. Predicting future lumber prices, understanding environmental laws enforced by regulatory agencies, and exporting lumber (as examples) are highly ranked educational needs (Table 1) that could be addressed by foresters possessing knowledge of these skills.

Lastly, field foresters should continually strive to integrate their knowledge of landowner motivations and objectives with the perceptions of innovative sawmill operators. This integration of perspectives will aid the forester in bridging the communication gap between landowner and sawmiller as well as between sawmiller and forester.

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