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Adapting Extension and Outreach Content to Audiences' Educational Interests

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Abstract

For various, largely unknown reasons, decision makers do not have equal interest in all Extension and outreach topics pertinent to a particular concept. This situation hampers Extension's ability to effectively deliver information and efficiently allocate limited resources. Using survey data, we identified heterogeneous preference for various topics related to the concept of woody bioenergy, our case study subject, and built profiles of forestland owners who expressed interest in topics that received above-average and below-average preference rates. Given our results, we argue for using this approach in objectively ranking audiences' educational interests in various forest and nonforest products and services and subsequently allocating time, space, and other Extension resources to the topics of interest.

Keywords: [audience analyses](#), [woody bioenergy](#), [ranking preferences](#), [adaptive Extension](#)

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Introduction

Despite the availability of various opportunities to make economic, social, and environmental impacts, decision makers often lack the information to fully take advantage of them (Jacobson, McDuff, & Monroe, 2015; Kittredge, 2004). In addition to lacking information, decision makers can have inaccurate perceptions that adversely affect

the choices they make. Such lack of information and misperception among decision makers can result in challenges related to the social acceptability of their decisions, their participation in relevant markets, and their enthusiasm for proactively applying relevant best management practices (Joshi & Arano, 2009; Munsell & Fox, 2010; Shivan & Mehmood, 2010). Thus, lack of information and/or inaccurate perceptions can lead to missed opportunities and exacerbate the potential for suboptimal social, economic, and environmental outcomes (Jacobson et al., 2015; Monroe, Andrews, & Biedenweg, 2008).

Compared to each decision maker's having to research different products and services on his or her own, Extension professionals have economy of scale in producing and distributing relevant information, given their background, the nature of their work, and the resources available to them. However, Extension professionals do not always fully understand which, if any, topics related to given products and services actually interest decision makers. The training manuals available for Extension professionals to use with audiences can be too broadly focused for a given training program and not necessarily adapted to varied decision-maker contexts (Hubbard, Biles, Mayfield, & Ashton, 2007). Furthermore, not every outreach topic for a given product or service may be relevant to every decision maker. Similarly, not all decision makers may be interested in the same topics.

Understanding decision makers' educational interests can help Extension professionals more effectively respond to the educational interests of their audiences and increase the return on Extension and outreach investment (Butler et al., 2007; Kittredge, 2004; Majumdar, Teeter, & Butler, 2008). A better understanding of decision makers' educational interests may also help Extension professionals

- objectively rank topics and allocate resources accordingly,
- identify a subset of topics to focus on,
- determine which aspects of a given product or service are important to decision makers,
- identify the types of information that spur positive and negative reactions from decision makers,
- determine how a given product or service should be presented in promotional programs, and
- address previously unexplored and unaddressed interests.

A concomitant benefit of addressing decision makers' educational interests might be improving their involvement in relevant events, such as stakeholder and community meetings or other educational events.

Extension professionals often customize content and adapt educational events to specific audiences by assessing previous participants' knowledge gain and overall satisfaction with the educational material and event. Potential pitfalls of this strategy may include the following scenarios:

- The first set of audiences, whose inputs will be used to inform future events, will not have benefited from such inputs themselves.
- The representativeness of the first set of audiences relative to other audiences, and hence the relevance of their input to future educational events, is not certain.
- The feedback generated is not always detailed enough in terms of demographics and preferred topics to allow

systematic analyses of audience profiles that may be used to match topics of interest to those profiles.

Toward addressing these pitfalls, we surveyed members of a particular Extension target audience to determine whether entries on a list of topics interested them and which topics on the list interested them more or less than others. We performed the research as a case study using an audience of randomly selected forestland owners and the content area woody bioenergy.

Background

Monroe & Oxarart (2011) found that 54% of respondents to a survey regarding woody biomass were "not at all knowledgeable" (p. 1468) about the production of electricity from woody biomass. A comparable proportion of respondents also did not know how woody bioenergy compares to fossil fuel in terms of mitigating air pollution and greenhouse gas emission (Monroe & Oxarart, 2011). These findings indicated a significant educational need that would require a systematic approach to be addressed. Given the proportion of forest cover under the control of private forestland owners and the broad economic and environmental implications that follow from their decisions, the aggregate loss of individual and social benefits, both economic and environmental, from private forestland owners' lack of relevant forestry education could be substantial (Bliss, Nepal, Brooks, & Larsen, 1994; Downing & Finley, 2005; Rasamoelina, Johnson, & Hull, 2010; Virginia Department of Forestry, 2015). Consequently, this group represented an appropriate example audience with which to explore a method for helping Extension professionals better understand the educational interests of decision makers.

Method

Ensuring a survey's validity and reliability is important in gathering and interpreting data. To improve our survey's understandability, consistency with market realities, and comprehensiveness, we used focus group discussions, pilot surveys, and peer review. From an Extension database, we randomly chose 1,800 potential respondents in Virginia and Texas who had at least 20 ac of forestland, the minimum area required for economically viable biomass production (Joshi & Arano, 2009; Shivan & Mehmood, 2010). Further implementing best practices, we used the tailored Dillman approach, with three rounds of mailings—first survey, postcard reminder, and final reminder (Dillman, Smyth, & Melani, 2011). Finally, we compared our data against the national forestland owners' database for the two states to test and confirm its representativeness and relevance. The survey had a 21.6% response rate, and we used the 229 surveys with each question answered for analysis.

Respondents were asked to indicate interest in learning about topics within the content area of woody bioenergy by replying with either "yes" or "no." The topics, which were populated after the previously mentioned focus group discussions, pilot survey testing, and input from peers, included

- where to get technical assistance (e.g., foresters);
- type of wood that can be used for energy production;
- market conditions;
- tax implications of selling biomass for bioenergy;
- whom to contact for buying/selling of wood (e.g., contractors);

- impact of harvest on soil/water/recreation/fishing;
- relevant rules, regulations, and government programs; and
- forestry-related educational programs offered by university Extension services.

For the topics that had statistically higher or lower rates of preference, we assessed the factors that predicted interest in the topic or the lack thereof. We then used that information to generate profiles of forestland owners interested in said topics. The table below provides a list of the variables used to profile the forestland owners along with the variables' groupings and descriptions.

Table 1.
Variables Constituting Three Final Regression Models for Predicting Forestland Owners' Educational Interests

Variable grouping	Variable	Description
Reasons for owning land	To protect nature and biodiversity	Ordinal
	To produce timber	Ordinal
	To receive payment for carbon sequestration in the future	Ordinal
	To enjoy natural beauty and scenery	Ordinal
Motivations for supplying biomass	Contribution to mitigating climate change problems	Ordinal
	Price offered	Ordinal
Forest management activities (forestland owner either completed activity in preceding 5 years or planned to complete activity in upcoming 5 years)	Build or maintain road in the forestland	No, yes
	Participate in state/federal technical/financial assistance program	No, yes
	Partially cut stand	No, yes
	Develop a written forest management plan	No, yes
Forestland/forestland owner attributes	Acreage	Bought,
	Form of land	inherited,

acquisition

inherited +
bought

Gender

Male, female

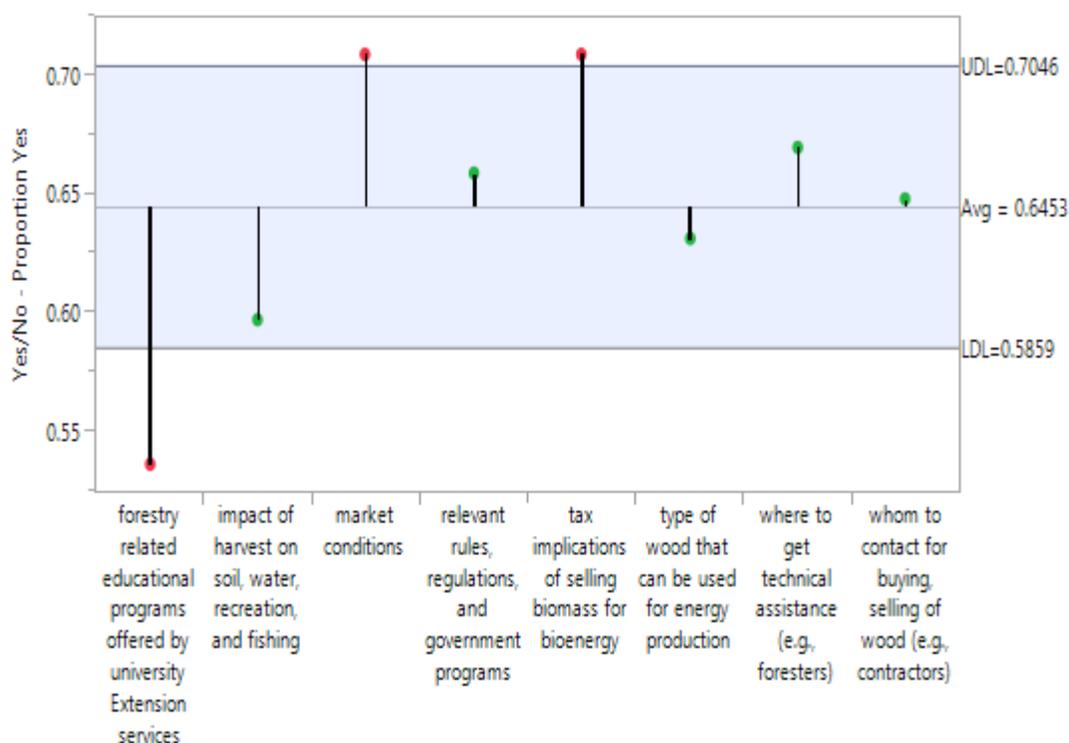
Results and Discussion

Homogeneity of Preference Rate by Topic

The results of the likelihood ratio test indicated that the proportions of respondents replying "yes" to the different topics were not homogenous, the chi square test statistic being 18.15 and having a p value of .011. The analyses of mean for proportions showed that three topics—namely, "market conditions," "tax implications of selling biomass for bioenergy," and "forestry-related educational programs offered by university Extension services"—had significantly different rates of "yes" responses compared to the average "yes" response rate given all the topics listed in the survey. Although statistically insignificant given the overall "yes" responses, the topics "where to get technical assistance" and "relevant rules, regulations, and government programs" received more "yes" responses than the topics "type of wood that can be used for energy production" and "impact of harvest on soil/water/recreation/fishing." Figure 1 shows which topics were within the upper and lower decision limits and which topics exceeded the upper and lower decision limits, with the relative interest levels the topics elicited serving as an objective basis for selecting a subset of topics to focus on in deciding how to allocate time, space, and other Extension resources to the various topics.

Figure 1.

Summary Result of the Analysis of Mean for Proportions of Forestland Owners Expressing Interest in a Topic



Note: The results show the proportions of respondents responding "yes." Red dots show responses that exceed either the upper decision limit (UDL) or the lower

decision limit (LDL). Green dots show responses that are within the decision limit, showing statistical insignificance relative to the overall "yes" responses.

Regression Analyses

In the regression analyses, we used the three topics having statistical significance as dependent variables to determine the factors that predicted interest in each of those topics and to determine the profile of forestland owners interested in each topic. The partitioned socioeconomic data were used as independent variables. We used a recursive partitioning approach to determine thresholds in the respondent attributes and created dummy versions of the continuous and multivariate variables on the basis of the respective variable's threshold, presented in the reference cluster (Ref.) and alternative cluster (Alt.) columns of the tables that follow (SAS Institute Inc., 2013). Taking the exponential of the respective logistic regression coefficients produced the odds ratio, which indicates how much more/less likely forestland owners with a given attribute are to express interest in a given topic as compared to forestland owners without that attribute.

The results' general theme is that different factors predicted interest in the three topics. Some variables that significantly predicted interest in one topic did not necessarily predict interest in the other topics. Similarly, the threshold values for variables that were significant for more than one topic were not the same; neither were the directions of relationships. These results lend support to the notion that different types of forestland owners are interested in specific suites of varied topics.

Market Conditions

The topic "market conditions" was of interest to us because the proportion of "yes" responses for this topic exceeded the upper decision limit. Table 2 lists the factors that significantly predicted interest in this topic.

Table 2.

Summary Result of Significant Variables Predicting Interest in Learning About Market Conditions of Woody Bioenergy

Variable	Description	Ref.	Alt.	Estimate	Odds ratio
To protect nature and biodiversity	Ordinal	1, 2, 3, 4	5	-1.08***	0.34
To produce timber	Ordinal	1, 2	3, 4, 5	1.28***	3.60
Contribution to mitigating climate change problems	Ordinal	1, 2, 3	4, 5	-0.78**	0.46
Built or maintained road in the forestland in the past 5 years	No, yes	0	1	0.68*	1.98
Participated in state/federal	No, yes	0	1	1.13*	3.12

technical/financial assistance program in the past 5 years					
Plan to partially cut stand in the next 5 years	No, yes	0	1	0.81*	2.24
Plan to develop a written forest management plan in the next 5 years	No, yes	0	1	0.75*	2.12
Acreage	Continuous	<60	60	1***	2.70
Gender	Male, female	0	1	-0.75*	0.47

Note. All ordinal choices ranged from 1 for *not at all important* to 5 for *very important*. No = 0; yes = 1. Male = 0; female = 1.
 * $p < .1$. ** $p < .05$. *** $p < .01$.

Reasons for owning land can be used to predict landowners' interest in learning about market conditions of woody bioenergy. Forestland owners who rated the protection of nature and biodiversity as a 5 on a scale of 1 to 5, with 5 being a "very important" reason for owning land, had only a 0.34 odds ratio for expressing interest in the "market conditions" topic. However, forestland owners who rated the production of timber products as at least a 3 on the same scale had a 3.6 odds ratio for expressing interest in learning about market conditions.

Motivations for supplying biomass also can be used to predict landowners' interest in this topic. Forestland owners who were not motivated by the desire to help address climate change, giving this motivation a 3 or less on a scale of 1 to 5, with 5 being a "very important" reason for supplying biomass for bioenergy, had a higher odds ratio for being interested in this topic. Conversely, forestland owners who rated this motivation as at least a 4 on the same scale had only a 0.46 odds ratio for being interested in this topic.

Additionally, past and planned activities can be used to predict landowners' interest in this topic. Forestland owners who had built or maintained roads in their forested areas in the preceding 5 years, participated in state or federal technical or financial assistance programs in the preceding 5 years, planned to partially cut their stands in the subsequent 5 years, or planned to develop written forest management plans in the subsequent 5 years were more interested in this topic, with odds ratios of 1.98, 3.12, 2.24, and 2.12, respectively. These activities suggest that the relevant forestland owners were involved in active exploration of opportunities for their lands, including economic opportunities, explaining their interest in learning about the market conditions of woody bioenergy.

Other predictive factors were acreage and gender. Ownership of 60 ac or more was associated with interest in learning about market conditions of woody bioenergy. This connection may be explained by the fact that forestland owners with larger acreages have relatively better opportunities to engage in economically viable biomass production and benefit from economies of scale and stand to gain potentially more revenue from new market options. Female forestland owners were less interested in learning about market conditions, with an odds ratio of 0.47.

Tax Implications of Selling Biomass for Bioenergy

As with the topic "market conditions," the proportion of "yes" responses for "tax implications of selling biomass for bioenergy" was higher than the upper decision limit. Table 3 summarizes the factors that significantly predicted interest in this topic.

Table 3.

Summary Result of Significant Variables Explaining Interest in Learning About Tax Implications of Selling Woody Biomass for Bioenergy

Variable	Description	Ref.	Alt.	Estimate	Odds ratio
To produce timber	Ordinal	1, 2, 3	4, 5	0.78*	2.18
To receive payment for carbon sequestration in the future	Ordinal	1	2, 3, 4, 5	0.92**	2.51
Price offered	Ordinal	1, 2, 3	4, 5	0.95***	2.58
Plan to build or maintain roads in the forestland in the next 5 years	No, yes	0	1	1.01**	2.76
Plan to partially cut stand in the next 5 years	No, yes	0	1	0.81**	2.26
Plan to develop a written forest management plan in the next 5 years	No, yes	0	1	1.25**	3.49
Acreage	Continuous	<75	75	0.63*	1.88
Form of land acquisition	Bought, inherited, inherited + bought	1	1.5, 2	1.06**	2.89

Note. All ordinal choices ranged from 1 for *not at all important* to 5 for *very important*. No = 0; yes = 1. aBought (1), inherited (2), inherited + bought (1.5). * $p < .1$. ** $p < .05$. *** $p < .01$.

Reasons for owning land can predict landowners' interest in learning about the tax implications of selling biomass for bioenergy. Forestland owners who rated timber production as a 4 on a scale of 1 to 5, with 5 being a "very

important" reason for owning land, had a 2.18 odds ratio for expressing interest in this topic. This finding is another indication of market-oriented forest management, making tax implications an important issue for these forestland owners. Also, forestland owners who rated receipt of future carbon sequestration payment as at least a 2 on the same scale had a 2.51 odds ratio for expressing interest in tax implications of selling biomass for bioenergy.

Motivations for supplying biomass also can be used to predict landowners' interest in this topic. Forestland owners who rated price offered as at least a 4 on a scale of 1 to 5, with 5 being a "very important" reason for supplying biomass for bioenergy, had a 2.58 odds ratio for being interested in this topic.

As with the topic "market conditions," planned activities can be used to predict interest in this topic as well. Forestland owners who planned to build or maintain roads in their forestlands, partially cut their stands, or develop written forest management plans in the subsequent 5 years had 2.76, 2.26, and 3.49 odds ratios, respectively, for expressing interest in this topic.

Forestland/forestland owner attributes also can be used to predict interest in this topic. Specifically, respondents who owned 75 ac or more of forestland were statistically more interested in learning about the tax implications of selling biomass for bioenergy as compared to those who owned smaller areas of forestland. Because the tax implication of supplying biomass can be both positive and negative—tax relief benefits from public programs that incentivize certain management practices and accruing of additional taxes on earned income—more is at stake for such forestland owners, explaining their greater interest in this topic. Additionally, forestland owners who inherited their land in part or in full, as opposed to purchasing the whole forestland, were more interested in the topic. Previous studies have shown different levels of forest management intensity between inheritors and purchasers of forestland (Majumdar, Laband, Teeter, & Butler, 2009); our finding suggests that forestland owners' interest in different types of information also is affected by form of land acquisition.

Forestry-Related Educational Programs Offered by University Extension Services

Compared to the overall average rate of "yes" responses, a statistically lower number of forestland owners expressed interest in learning about forestry-related educational programs offered by university Extension services. Factors associated with forestland owners not interested in this topic were comparable to factors associated with those who were interested in the two topics discussed above. The full list of significant variables is presented in Table 4.

Table 4.

Summary Result of Significant Variables Explaining Interest in Learning About Forestry-Related Educational Programs Offered by University Extension Services

Variable	Description	Ref.	Alt.	Estimate	Odds ratio
To enjoy natural beauty and scenery	Ordinal	1, 2, 3, 4	5	0.56*	1.75
Plan to build or maintain road in the next 5 years	No, yes	0	1	0.68*	1.97

Partially cut stand in the past 5 years	No, yes	0	1	0.87**	2.40
Plan to develop written forest management plan in the next 5 years	No, yes	0	1	1.28***	3.59
Acreage	Continuous	<33	33	-1.56***	0.21

Note. Ordinal results ranged from 1 for *not at all important* to 5 for *very important*. No = 0; yes = 1.

* $p < .1$. ** $p < .05$. *** $p < .01$.

Reasons for owning land can predict landowners' interest in this topic. Respondents who rated the enjoyment of natural beauty and scenery as a 5 on a scale of 1 to 5, with 5 being a "very important" reason for owning land, had an odds ratio of 1.75 for expressing interest in this topic. Given the generic nature of the topic, it was not clear whether this interest related to bioenergy or was just about learning where to get forestry-related information.

Planned forest management activities also can be used to predict interest in this topic. Forestland owners planning to build or maintain roads in their forested areas, partially cut their stands, and write forest management plans in the subsequent 5 years were less likely to express interest in this topic. Conversely, forestland owners interested in this topic did not plan to do these activities in the subsequent 5 years.

Forestland owner attributes also can be used to predict interest in this topic. Specifically, respondents having less than 33 ac of forestland were more interested in the topic. Forestland owners who owned less than 33 ac had an odds ratio of just 0.21 for expressing interest in this topic.

Implications

The findings we have presented show that preference rates for obtaining information on different topics are not homogenous and that the socioeconomic makeups of decision makers expressing interest in different topics vary. These results suggest that audiences' interests in topics associated with forest-related products and services outside the content area of woody bioenergy, or nonforest-related products and services for that matter, also may be heterogeneous and significantly predicted by a set of socioeconomic attributes, relevant management objectives, and past and planned activities. This situation represents an opportunity not just relative to the content area of woody bioenergy, the case study for our project, but also for Extension services in general. By ranking different topics in terms of the interest they elicit and by paying particular attention to those that elicit statistically higher or lower interest, Extension professionals can select a subset of topics to focus on. Besides selecting specific topics that apply to a given product or service, the same process may be useful in ranking educational interest in various forest and nonforest products and services in general. Doing so may enable the Extension professional to more objectively and efficiently allocate time, space, and other resources across competing educational interests. Our results also show that an opportunity exists for adapting Extension and outreach topics to a particular group of forestland owners, or a particular group within another relevant audience, instead of using the same material for all. Future studies are required to determine why the threshold values for a given variable differ across the various topics and how best to match topics of interest with the relevant audiences. Such a study would be useful in determining an efficient and practical mechanism for implementing

such findings in the field.

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