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Woody biomass outreach in the southern United States: A case study

Martha C. Monroe*, Annie Oxarart¹

School of Forest Resources and Conservation, University of Florida, PO Box 110410, Gainesville, FL 32611-0410, USA

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ABSTRACT

Woody biomass is one potential renewable energy source that is technically feasible where environmental and economic factors are promising. It becomes a realistic option when it is also socially acceptable. Public acceptance and support of wood to energy proposals require community education and outreach. The Wood to Energy Outreach Program provides science-based information, tools, and resources for fostering informed community discussions about using wood for energy in the southern United States. The development of this program involved three research activities. (1) A small survey of the general public suggests that a lack of information and misconceptions will challenge biomass outreach programs. (2) Focus group discussions about text written to be memorable and interesting reveal that participants' mistrust and misconceptions might contribute to perceptions of bias in text, even when the text contains factual information. (3) Surveys of participants in community forums suggest that interacting with the public can increase knowledge, address misconceptions, and may be necessary to establish trust. This case study summarizes these research findings and evaluation findings for the Wood to Energy Outreach Program and suggests ways to increase the effectiveness of bioenergy outreach efforts.

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1. Introduction

The transition from nonrenewable to renewable sources of energy is moving to the forefront of the global energy agenda. In the United States (U.S.), researchers are exploring the environmental sustainability and economic viability of renewable sources of energy [1], while communities are considering which sources are locally feasible for meeting future energy demands [2]. In the southern U.S., where total timber production steadily increased in the 1900s to provide more than 58% of the nation's fiber production in 1997 [3], biomass is considered to be the most promising local option to expand renewable energy sources in the near future [4]. Several factors account for this promising outlook:

- the landscape has been heavily modified and converted to agriculture, second-growth forests, and intensive pine plantations [3];
- many of the forest lands are in private family (69%) or industrial (20%) ownership [3];
- the sub-tropical climate creates a long growing season; and
- the human population is increasing faster than other regions of the nation [5], creating a need for energy.

While the conversion of forest land to development removes forest cover, it also brings new urban areas closer to working forests, reducing transportation costs for using wood for energy in these communities. In addition to typical sources of biomass from forest slash and harvested timber, thinning

* Corresponding author. Tel.: +1 352 846 0878; fax: +1 352 846 1277.

E-mail addresses: mcmonroe@ufl.edu (M.C. Monroe), oxarart@ufl.edu (A. Oxarart).

¹ Tel.: +1 352 846 0144.

for improved tree growth and wildfire risk reduction could provide small diameter fuel, and periodic hurricanes could provide woody waste.

Technical competence and an adequate and economically available supply of wood are essential, but public acceptance and support is acknowledged as another key factor in implementing woody biomass proposals. In the United Kingdom, significant public opposition has delayed and halted plans to implement biomass energy projects [6,7]. Opposition has been attributed to a poor public relations strategy [8] and insufficient public acceptance [9]. In Austria, the development of biomass district heating systems faced significant mistrust in some rural communities. Locations experiencing strong resistance had 30% higher investment costs than facilities with no resistance, due to site changes and additional requirements. Only when significant attention was paid to the social systems through responsive communication and education were the facilities deemed successful [10].

The challenges to public outreach may be more severe in the U.S. where only 12% of the public could pass a basic quiz on energy in 2001 [11] and support for biomass was far below other renewable sources and even below natural gas in 1999 [12]. A recent recommendation from the Southern Bioenergy Roadmap to promote bioenergy in the South states we must “educate Southern leaders and the public on the economic and environmental opportunities of biopower and biofuels.... A critical step is to provide government and community leaders, farmers, foresters, rural communities, and the general public with the most up-to-date information regarding biopower and biofuels” [13].

To address these needs for education and outreach, the U.S. Forest Service, Centers for Urban and Interface Forestry, contracted with the School of Forest Resources and Conservation, University of Florida to develop the Wood to Energy Outreach Program [14]. These partners successfully implemented natural resource education programs together since 2000, and early discussions about woody biomass outreach resulted in a successful proposal to the U.S. Department of Energy for outreach and training funds. The Wood to Energy Outreach Program is designed to foster informed community discussions about the possibility of using wood for energy in the wildland–urban interface of the southern U.S. Our aim was to provide educational materials for the interested public and

community leaders to help them better understand the environmental, economic, and technical components of using wood for heat, power, and electricity. The program includes:

- 18 fact sheets, which cover topics such as sustainable forest management, conversion technologies, and regional economic impacts;
- 16 case studies, which provide examples of industries, utilities, and schools that currently use wood for energy in the southern U.S.;
- 13 community economic profiles, which suggest the amount and cost of local woody biomass resources and regional economic impacts for selected counties in each southern state;
- an outreach guide, which provides suggestions and materials for educators who are targeting and conducting educational outreach work in potential communities;
- additional tools and resources such as slide presentations, a survey template, frequently asked questions, and a glossary; and
- a Web site containing all program materials (<http://www.interfacesouth.org/woodybiomass>).

2. Research site

Although the Wood to Energy Outreach Program was designed to serve a 13-state region from Texas to Virginia, an audience analysis could not feasibly cover that geographic range. For that reason, we relied upon the literature and a regional advisory board to make our materials relevant and used one location—Alachua County, Florida—to test our assumptions and outreach tools (Fig. 1). Residents of Alachua County, and more specifically those interested and concerned citizens who might be active in community decisions about woody biomass, provided insight and perspectives about woody biomass use that helped us develop the outreach materials.

While Florida is known for its beaches and amusement parks, about half of the state (65 560 km²) is still covered in forest [15]. A thriving forest industry produces saw timber and pulp from privately-owned pine plantations and woodlands.

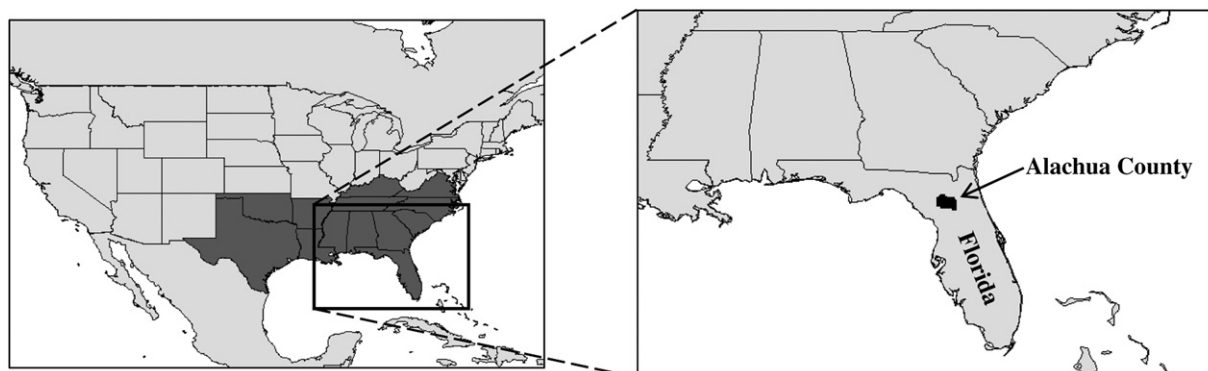


Fig. 1 – Alachua County, Florida is located in the southern United States.

Alachua County is located in north-central Florida, about 97 km from the Atlantic and the Gulf of Mexico coasts (29°39'28.64" N, 82°18'06.38" W). The economic hub of the county (the University of Florida) is in Gainesville. From 2000 to 2006, the population of the county grew at 4.2% to 227 000 people [16]. During this time, the local utility company, which is owned by the City of Gainesville, anticipated the need for a new power plant based on projected growth rates. Citizen opposition to a coal-fired facility based on air quality and climate change concerns pushed the city commission to consider various fuel options, including wood. Wood is currently used to generate power in nearby Jacksonville, and plans for wood pellet plants are underway across the region.

An economic analysis of the available wood resources within a 1 h haul time of the county's largest power plant suggests that approximately 200 kt of dry woody biomass—mostly consisting of urban waste wood and logging residue—could be available on a sustainable basis at a price competitive with coal (Fig. 2) [17]. The operation of a 40 MW facility could positively impact the community with over 400 jobs and \$17 million, annually [18].

3. Audience research

The development of outreach materials begins with an audience analysis to understand what they know and care about, uncover misconceptions that might thwart outreach activities, and learn how they perceive messages [19]. While a literature review can often suggest general directions for survey research, interviews with or surveys of the intended audience can test assumptions and provide a rationale for decisions that will be made throughout the development process. Materials testing (also called formative evaluation) allows alternate versions to be assessed by the audience and gives the developer keen insight into the requisite level of detail or program delivery methods [20].

The need for research about outreach may strike some content experts as unnecessary. If people do not understand the potential for woody biomass, they may reason, the information should simply be provided. This would be true if the audience knew nothing at all, but of course it is not the case. People have existing beliefs and knowledge, which may be

relevant or untrue [21]. They also have preconceived notions about how the world works that may conflict with the information experts are trying to convey. Existing values and perceptions of threats to nearby forests, for example, affect how people view using woody biomass. Furthermore, audiences have preferences about how they want to receive information and who they trust to provide it [22]. If communication tools provide the information experts wish to distribute but not the information that answers the audience's questions in a manner that the audience understands and believes, they have failed.

3.1. Public perceptions survey

Prior to developing the survey, we interviewed several city commissioners and citizens to understand their concerns and ideas about burning wood for energy. The survey was pilot tested and revised, then mailed to a randomly selected sample of 1517 single-family and mobile-home owners in Alachua County. The survey consisted of 22 questions, which covered awareness and knowledge, general impressions, trust, and community participation.

Of the 1517 surveys sent, 298 useable surveys were returned after sending one reminder postcard, yielding a poor response rate of 19.6%. We performed a time-series analysis on the returned surveys to detect potential non-response bias [23]. The comparison of survey responses returned early ($n = 160$) to those returned after the reminder ($n = 34$) yielded no significant difference (at $\alpha = 0.05$) for most questions. In the most notable exception early responders expressed significantly more confidence in their knowledge of using wood for electricity. This suggests that perceived lack of knowledge on the part of non-participants might have accounted for their failure to respond. Our comparison of respondents to census data revealed that African Americans, lower-income households, and individuals between 18 and 34 were underrepresented, which is not inconsistent with other surveys of political participation [24]. Deadlines imposed by the funding contract prevented us from working to increase the response rate.

Although the possibility of a wood-fueled power plant in Gainesville had been a part of public discussion since 2003, only 18% of the respondents were aware of the issue. When

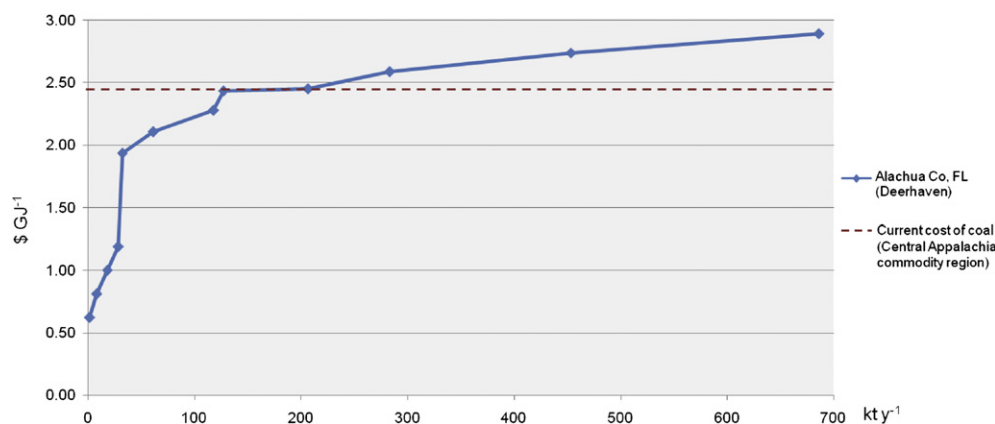


Fig. 2 – Supply curve suggesting woody biomass resources could compete with coal in Alachua County, Florida.

assessing their own level of knowledge about converting wood to electricity, less than 5% considered themselves “very knowledgeable,” while over half (54.5%) considered themselves to be “not at all knowledgeable” about the topic. This lack of knowledge was also apparent where respondents were asked to compare wood to fossil fuel energy sources in the context of several different characteristics (e.g., air pollution, cost). In every specific query at least a third, and in some cases over half, of the respondents answered that they did not know whether wood would be better or worse than either coal or natural gas. In addition, less than 20% of the respondents indicated that wood was a more preferred fuel given the challenge of climate change than natural gas or coal (12% and 19%, respectively).

Despite their lack of knowledge, respondents expressed interest in being a part of the planning process, with just over 50% of respondents suggesting that community members would be influential in making planning decisions and that they were willing to participate in such a process. Regarding the most contentious issue, how they would feel about the construction of a local woody biomass power plant, 32% of the respondents reported negative or highly negative feelings, while 27% characterized their feelings as positive or highly positive. The remaining 42% responded “neutral.” A large majority of respondents (71%) were supportive of using wood collected from forest thinning and from harvesting slash for energy. These results, however, suggest a sizable minority might oppose any proposal.

We asked respondents to identify the concerns and benefits associated with using wood for energy that they thought were most important and whom they trusted. Of six possible concerns, respondents rated increased air pollution and loss of local forests as the most important (Table 1). Of eight possible benefits, respondents perceived that using waste wood and maintaining local forests were the most important (Table 2). Of the eight entities who might be conveying information about a woody biomass project, survey respondents trusted local foresters and environmental groups to provide truthful information and trusted industry and local businesses the least (Table 3).

While recognizing that the low response rate does not allow us to speak for the population, these data provided some clues for selecting vocabulary and content for the outreach materials. The low knowledge level about woody biomass, fossil fuels, electricity production, and carbon neutrality suggested the outreach materials must be simple

Table 1 – Survey respondents’ ratings of potential concerns regarding using wood for electricity.

Potential Concerns	Average Score ^a	n
Loss of local forests	4.09	284
Increased air pollution	3.94	281
Higher cost of electricity	3.80	279
Increased traffic for wood delivery	3.59	282
Increased competition for wood	3.35	277
Increased noise from plant operations	3.23	273

a 1 = Not at all important; 5 = Extremely important.

Table 2 – Survey respondents’ ratings of potential benefits regarding using wood for electricity.

Potential Benefits	Average Score ^a	n
Use wood that would otherwise go to waste	4.22	279
Maintain local forests	4.21	279
Renewable energy source	4.11	275
Not contributed to global climate change	3.99	273
Reduce dependence on foreign energy	3.96	281
Keep dollars in the community	3.47	283
Addition of entry level jobs to the area	3.06	283
Provide better markets for wood	3.00	276

a 1 = Not at all important; 5 = Extremely important.

yet accurate. Because there are public misconceptions about comparisons between fuel sources, our fact sheets were written to acknowledge the elements of truth in these general perceptions and to carefully explain the facts about advantages and disadvantages of woody biomass [25,26]. The concerns and fears expressed in this small survey are similar to those reported in the literature mentioned previously, and suggest that utilities and biomass entrepreneurs may wish to work with local communities to define appropriate and sustainable forest management techniques, to dedicate resources to air emissions testing, and to build trust and faith. The latter may be a necessary step toward improved communication with those who are opposed to a woody biomass facility.

3.2. Communicating with interesting and memorable text

Fact sheets, brochures, and newsletters are common components of education and outreach programs. These familiar communication tools can efficiently reach large audiences, and the public can access written materials at their convenience [19]. Typically, traditional fact sheets contain generalized science-based information and read much like a textbook. Because using wood for energy is an unfamiliar and potentially controversial topic, we explored how to

Table 3 – Survey respondents’ ratings of information sources trusted to provide accurate information.

Information Sources	Average Score ^a	n
Local forester	2.26	284
Environmental group	2.18	284
Local extension agent	2.10	275
Local utility company	1.94	287
Local newspaper	1.82	283
City mayor/commissioner	1.66	283
County commissioner	1.66	280
Private industry	1.61	285
Chamber of commerce	1.58	281

a 1 = Not at all; 3 = Very much.

present factual information that is also memorable, interesting, and motivating. To learn how involved, concerned citizens understand and perceive such information, qualitative data were collected during three focus groups in Gainesville, Florida [27].

Written text that explained the option of using wood for energy and aimed to motivate citizen involvement was developed for use in the focus groups. The text contained simple, understandable information; addressed common questions, concerns, and differing perspectives; provided information about how to become involved in energy issues; included quotes from experts on both sides of the issue; and provided specific and concrete examples of facilities using wood for energy. These characteristics were chosen based on survey results (see Section 3.1) and research that suggests qualities of text that readers find interesting [28,29] and the value of vivid, interesting information [30]. To ensure the text contained these characteristics, communication and education professors, graduate students, and professionals rated the text. In addition, a pilot focus group provided feedback on the text and the interview guide. Focus group participants read the text and discussed their perceptions of the text, interesting text characteristics, and motivation to become further involved. The discussions were audio-recorded, transcribed, and analyzed through a process of coding and theme development [31,32].

The focus group participants ($n = 16$; each group contained 5–6 participants) were recruited from citizen organizations and a retirement community. While these participants only represent a fraction of the public, they do represent our intended audience of interested, concerned, and involved citizens. Most participants were white and non-Hispanic, over 50 years old, female, had at least a bachelor's degree and were concerned about community issues.

The reading material provided participants with new information about wood to energy possibilities. The vivid, specific examples and quotes helped participants relate to and understand the unfamiliar, technical information. One participant stated, "If we don't relate to [the text] somehow, whether the name, people, or place, then we're going to lose interest... You need to make sure it reaches out to a bunch of different individuals and different personalities." In addition, readers report being interested in learning more about woody biomass and becoming further involved in the issue by participating in informal actions (e.g., discussing the issue with neighbors, touring a local power plant). However, the challenges of using this type of interesting and specific text to communicate with this audience were apparent. Three themes were developed through systematic analysis of the qualitative data: 1) mistrust, 2) unanswered concerns and questions, and 3) bias.

1) As participants discussed the text, they expressed mistrust and skepticism about supply and cost projections provided by the energy and forest industries. One participant mentioned the cypress mulch industry as a specific example of how business ventures have broken promises in the past: "I mean that started out, yeah we'll just use scrap [wood]. Well, it's not scrap now. They are cutting down [trees]." In addition, participants were wary of information cited from government agencies. Even though many

participants perceived the university as a credible source of "fact-based" information, some participants thought it may not be "objective" information due to the source of funding.

2) While the text contained information that covered the issues that were relevant to experts, participants made comments such as, "I got a lot of facts. But as I continue reading, my head kept telling me it's not answering the questions that I have in my mind. And I got to the end and my questions were still not answered." Participants questioned information that did not match their prior knowledge, especially if their ideas included misconceptions. For example, although the text explained the difference between burning wood at an energy facility with emission controls and burning wood in a fireplace or a forest fire, one participant expressed doubt about the air quality at a biomass facility since she knew the health hazards of wild-fire smoke.

3) Participants in all three groups provided unsolicited comments that text seemed "for using wood for energy." Participants felt the benefits of using wood for energy were more explicitly explained than the concerns or disadvantages. While the article contained differing perspectives, some participants explained this as "token opposition" which was easily dismissed. Participants wanted to know about other views, as this participant stated: "Well, I don't care if it's biased, as long as I get both biases, for and against, I could form my own conclusions."

These results reveal several challenges of using interesting text to communicate about complex environmental issues. While the information presented was factual and written to address common questions and concerns, the readers thought the text was biased and inadequate. We present two main factors that potentially contributed to these perceptions. First, participants' basic lack of trust in information sources and industry, along with strongly held beliefs and misconceptions, affected how they perceived the text and in some cases caused them to disbelieve it. Secondly, because the scientific data and facts were situated in a story-like context, the information may have appeared less factual and trustworthy; however, it is important to note that the inclusion of vivid examples and quotes did help make the information memorable, interesting, and understandable.

Thus, where people are initially skeptical, where mistrust abounds, and where misconceptions affect perceptions, interesting text may not be as helpful as traditional fact sheets. In addition, combining written information with interactive outreach efforts may be more effective than using text alone. Building trust, addressing individualized questions and concerns, and overcoming misconceptions may help the effectiveness of communication efforts. These processes often require time and personal interaction [33–35]. Finally, it is important to recognize the risk of appearing to be an advocate of one side of an issue. Carefully pilot-testing the outreach materials or strategies with the target audience may help identify and reduce potential areas of perceived bias.

3.3. Community forums

Engaging the public in local decisions is not helpful if they lack basic information and understanding about the issue [36].

Organizing an opportunity to educate citizens and capture their informed opinions could enhance decision making and increase community ownership of potential solutions. Controversial and misunderstood issues like woody biomass may require a community education strategy that blends information with participation—that enables the public to learn and share informed opinions with community leadership.

Strategies that blend education and participation are often used with small groups of stakeholders or citizen advisors who meet regularly to build trust, define common ground, understand their perspectives, and negotiate a solution [35,37–39]. There are relatively few community education programs that reach larger groups of citizens, require less personal time commitment, and provide opportunities to share opinions with legislators. The Kettering Foundation's National Issues Forum program (<http://www.nifi.org>) is one example where facilitated discussions about a particular issue allow citizens to explore information and values. Their subsequent opinions are summarized in a report for the U.S. Congress. The challenges to these types of programs include attracting an audience, providing information that answers their questions and enables them to understand the problems well enough to have knowledgeable opinions, and enabling citizens to express opinions to decision makers [40].

We pilot tested a community forum model to provide education and report attendees' opinions to decision makers and conducted 6 forums in Gainesville in late 2006. Our model consisted of a panel of experts (i.e., foresters, economists, energy consultants, education specialists) who each spoke for about 5 min, providing a basic foundation in woody biomass: the local sources of wood, the local forest ownership and management, the amount of wood currently available in Alachua County, and the local economic impact of using wood. They were counseled to address the misconceptions gleaned from the public perception survey, to avoid complicated explanations, and to adopt a humble attitude of sharing one perspective, not advocating for a solution. A facilitator asked the audience for questions and directed them to one or more panelists. This enabled additional explanation and discussion on the issues that people found most interesting or confusing. It also enabled the experts to realize how people were understanding information and where a different explanation might be useful. In some cases, audience members helped answer questions, too. When questions stumped the panel, we recorded it, researched answers, and emailed all the questions and answers to the entire list of participants who provided email addresses.

We offered evening forums in public libraries with announcements in the local newspaper and radio, but these were poorly attended (from 4 to 10 participants in 3 locations). We had much better attendance when we held the forum at existing community group meetings (e.g., Kiwanis Club, Sierra Club), both for lunch and evening gatherings (from 15 to 60 participants). Six forums reached a total of 172 individuals, and while they were clearly not a random sample, they represent our target audience of interested or civically active adults.

Participants were asked to complete a short survey immediately before the forum and again at its conclusion.

Participants returned their anonymous survey, as they passed fact sheets of additional information. Forum surveys were returned by 108 participants.

The pre-forum portion of the survey revealed that participants did not believe they knew very much about woody biomass (mean of 2.0 on a scale from 1 to 4, with 1 being not at all knowledgeable and 4 being very knowledgeable). Respondents scored their knowledge as 2.5 on the post-forum surveys, a significant increase at $p < 0.01$ ($n = 83$). While 43% of the respondents favored a woody biomass power plant before the forum, the post-forum results suggest 81% would be in favor of a facility that took into account their concerns and interests about transportation limits and forest management, for example.

We compiled our survey results, the list of questions people asked, and the concerns they have about a woody biomass facility and sent a report to the local city commissioners and utility staff [41]. We added our estimates of the quantity of local urban wood, logging residue, and pulpwood that could be available for a facility.

Respondents were pleased to contribute to the report to community leaders, even though they did not consider themselves to have expertise and would not be likely to speak at a commission meeting. They wanted to be involved, but they wanted limited involvement—a level that matched their limited knowledge. We found that working with community groups provided an existing audience for several of the community forums. To increase attendance at forums open to the public, we suggest raising awareness about the local relevance of the issue for several weeks before the forum (e.g., series of news releases, informational brochures, emails to relevant listserves). Finally, examples of communities who considered but chose not to use wood for energy would have been a useful addition to the program agenda to reduce the potential appearance of bias.

4. Program dissemination and implementation

The Wood to Energy Outreach Program was released in a training program in September 2007. Seventy-eight Extension agents, natural resource professionals, renewable energy advocates, and community development professionals from across the southern U.S. participated. In order to build partnerships and develop state plans for woody biomass outreach efforts, participants worked together in state teams.

The training was evaluated with a retrospective-post survey by 49 participants (63% response rate). Survey respondents reported an increased understanding of woody biomass topics and increased confidence to develop related outreach programs. Training participants were “mostly satisfied” with the program (score of 4.1, where 1 = not at all satisfied and 5 = completely satisfied) and found the program to be “quite relevant” to their organization, agency, or company (score of 3.9, where 1 = not at all relevant and 5 = completely relevant). Several participants noted that networking with others interested in bioenergy from their region or state was the most beneficial part of the training. Participants expected to use the materials in the future to give

presentations, promote discussion about woody biomass, and share information with other trainers (respective scores of 4.4, 4.3, and 4.2, where 1 = definitely will not use materials and 5 = definitely will use the materials).

Approximately one year after the training, we attempted to reach all participants for a follow-up phone interview to assess how participants used the materials. Of the 69 participants who were contacted, 45 participated in the phone interview (65% response rate). The interviewees were dispersed across the South, and most were either university employees (professors, researchers, Extension agents) or public forestry agency employees (federal, state, or local level). Of the 70% of interviewees who had used the program materials, the majority reported using the outreach guide, fact sheets, and community economic profiles one to three times since the training. Interviewees tended to distribute the materials in workshops, trainings, meetings, presentations, conferences and symposia. For example:

- In Northwest Florida, a Bioenergy Conference was organized with approximately 120 attendees.
- In Virginia, three train-the-trainer workshops were held for Extension agents and forestry department staff.
- In North Carolina, eight regional landowner meetings reached 1100 participants.
- In Missouri, six townhall meetings were held in three communities to explore wood to energy possibilities.
- Fact sheets were converted to magazine articles in Kentucky and brochures in Texas.

In many states, training existing staff or reaching traditional audiences (e.g., landowners, forestry industry) was the first step the training participants undertook to develop an outreach program in bioenergy. In a few areas where woody biomass was already being considered by communities or industries, participants were able to use the program materials in community outreach. This process was often driven by external program directives and funding. In places where biomass was not yet being considered by communities, little public outreach occurred. Training participants mentioned several strengths of the outreach materials, including the large amount of science-based information and the ease of using and adapting the materials to meet their specific outreach needs. Participants also recognized program challenges, such as the need to update the information as new research becomes available.

5. Reflections and conclusions

Woody biomass is an important resource for heat, power, and electricity that deserves careful consideration by communities across the southern United States. Because background knowledge levels about energy tend to be low and uninformed opinions do not provide a sound basis for programs or policies, outreach and education are vital, especially when these strategies motivate interested citizens to participate in local discussions and decision making processes.

The Wood to Energy Outreach Program was designed to help coordinators of outreach programs design and conduct

activities that could provide information, empower people to ask locally relevant questions, bring together key stakeholders, and help communities discuss whether to pursue proposals to use wood for energy. Pilot tests, expert reviews, and users of the materials suggest that the materials are appropriate, timely, and well-received. Audiences find the fact-based traditional fact sheets and other program materials informative, helpful, and easy to adapt to their formats.

In Gainesville, Florida, where city commissioners received a report of the economic outlook on using wood and public responses to the community forums, they approved a Forest Stewardship plan to establish incentives and standards to safeguard forests [42] and a contract for a wood-burning biomass power plant [43]. In nearby Tallahassee Florida, public outcry over the site of a proposed woody biomass facility and questions about how the decision was made led to the withdrawal of the plan [44]. Both cases reinforce observations in the literature that citizen involvement and efforts to address their concerns can affect local approvals for woody biomass facilities [10].

Our evaluation findings suggest that in the southern United States, woody biomass involves a combination of two professions that have had little opportunity to work together previously—forestry and energy. As a result, outreach efforts in many states first need to build working relationships and knowledge between these two groups before launching public education programs. This work began in the training workshop for the Wood to Energy Outreach Program and continued in some states. While these states do not have reportable impacts on public understanding, they have created a stronger foundation for future outreach activities. As local communities raise the question of whether woody biomass makes sense for them, Extension agents, foresters, energy representatives, and community development professionals will be able to use materials from the Wood to Energy Outreach Program to provide accurate, science-based information with engaging outreach strategies to the public and community leaders.

We also found from our pilot tests that misconceptions, some types of interesting text, and a reliance on straight facts can reinforce a lack of trust in government and industry projections about woody biomass and prevent helpful communication. We suggest that outreach efforts might be more successful if they rely on face-to-face interactions that enable discussions among a variety of experts and citizens. Including examples of communities that have chosen to reject woody biomass would help citizens believe the program is not biased toward biomass.

The issues associated with using wood for energy can be challenging, confusing, and contentious [45,46]. Citizens can play an important role in helping to identify communities where woody biomass represents a reasonable and viable energy option only if they have sufficient knowledge to provide informed opinions and exchange ideas [36]. This is not new information; we know the power that outreach efforts can have in empowering an informed public. We wish to stress that global communication technology has not eliminated the need for community-based outreach that is locally relevant to each proposal. From our experience with the Wood to Energy Outreach Program, we suggest the following might

enhance local outreach efforts in communities around the world:

1. Prevalent misconceptions about wood as a renewable resource, air pollution, and carbon neutrality can undermine outreach efforts unless simple explanations are provided, questions are answered, and examples are given that the audience can relate to. Merely providing technical facts about woody biomass is a strategy likely to appeal only to those who already favor burning wood.
2. Building trust among educators, community members, industry leaders, and elected officials may be the first step to an effective discussion about energy options. This is unlikely to happen through providing written information (traditional fact sheets or interesting, memorable text), since building trust requires interaction over time. Having a neutral facilitator and maintaining transparency about funding and program objectives can be helpful. Providing information about good reasons not to approve a facility may help increase public acceptance of both the message and the messenger.
3. Creating outreach opportunities that enable the public to learn, ask questions, and share concerns can facilitate their involvement in local energy discussions. These informed opinions can be useful for decision makers and may help them modify biomass proposals.

The use of wood for energy represents one of many emerging interdisciplinary issues that we face as society moves toward an environmentally sustainable and economically viable future. The contentious and complex nature of such issues creates challenges for community education and outreach. Careful attention to how audiences understand the issue, the questions they have, and who they trust can help improve outreach efforts.

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