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Research In Brief

Landowner and Natural Resources Professional Perceptions of Silvopasture in Central and North-Central Minnesota

Abstract

Silvopasture is an agroforestry practice that combines trees, forage, and livestock in an intensively managed system. We surveyed landowners and natural resources professionals in Minnesota to determine their perceptions of silvopasture. Although most respondents had heard of silvopasture, few knew a lot about it. We concluded that there is a need for more educational programming that expands the knowledge of and provides technical assistance to landowners and natural resources professionals who want to add silvopasture to their management toolboxes.

Keywords: silvopasture, landowners, natural resources professionals, survey, adoption

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Introduction

Livestock production is a predominant agricultural sector in Minnesota, comprising 47% of the value of the agricultural economy; hence, it is important to optimize grazing operations in the state (Minnesota Department of Agriculture, 2015) or at least increase the acreage for forage production. One opportunity may exist on forested land in the state. Minnesota has 7 million ha of forested land (Oswalt, Smith, Miles, & Pugh, 2014), 12% of which is located on farms, where approximately 177,000 ha are grazed unmanaged (U.S. Department of Agriculture National Agricultural Statistics Service, 2012). This passive woodland grazing, letting cows graze in the woods, allows the animals to take advantage of available forage after a canopy opening disturbance, such as selective tree removal or tree mortality. However, farm woodlands often are not

managed to their fullest potential (Garrett et al., 2004; Sharrow, 1998). Passive woodland grazing can cause economic decline (e.g., loss of timber quality, loss of livestock weight gain) and environmental decline (e.g., soil compaction leading to erosion and impaired water quality, loss of biodiversity) (Ford et al., 2019; Garrett et al., 2004).

The passive grazing approach used by landowners in Minnesota presents an opportunity for silvopasture application as a means for improving existing woodland grazing systems and allowing more acreage for forage production. Silvopasture is an agroforestry practice that involves intentionally integrating trees, forage, and livestock as one intensively managed system to increase the economic value of the land through income diversification while enhancing the environmental benefits provided by the land, such as improved water quality and enhanced biodiversity (Garrett et al., 2004).

Silvopasture is a common practice in the southeastern (Stutzman, Barlow, Morse, Monks, & Teeter, 2019) and southwestern (Sharrow, 1998) regions of the United States. However, it is a new or foreign concept among farmers and natural resources professionals (NRPs) in Minnesota and across the upper Midwest, where there is limited information and research available on silvopasture. Previous studies have shown that there are various potential barriers and constraints to silvopasture adoption in the region and that the benefits of silvopasture may or may not be known to landowners (Ford et al., 2019; Mayerfeld, Rickenbach, & Rissman, 2016). Specifically, landowner perceptions of a practice, in addition to market and environmental factors, play a key role in adoption of alternative agricultural practices (Frey et al., 2012; Jacobson & Kar, 2013). Adoption is also influenced by an individual's own experiences and the experiences of others, such as friends and neighbors (Frey et al., 2012). Understanding the social and environmental aspects of silvopasture adoption is important because these factors are often not included in financial analyses of silvopasture systems (Shrestha, Alavalapati, & Kalmbacher, 2004). Furthermore, understanding NRPs' perceptions is equally important as they often provide technical assistance to landowners for land management issues.

Because silvopasture provides a new opportunity for Minnesota farmers, it is important for Extension professionals to understand local landowners' and NRPs' perceptions of the practice and the barriers to adoption before attempting to encourage silvopasture across the landscape.

Purpose and Objectives

Our purpose was to gain an understanding of landowners' and NRPs' perceptions of silvopasture and woodland grazing in central and north-central Minnesota. Our specific objectives were to

- identify the extent to which landowners practice passive woodland grazing and silvopasture;
- identify the extent to which NRPs promote silvopasture to landowners who are producing livestock;
- determine existing knowledge of silvopasture by landowners and NRPs;
- determine landowners' and NRPs' perceptions of silvopasture benefits;
- identify perceived key barriers to silvopasture adoption and promotion; and
- determine which establishment methods are most feasible for silvopasture adoption among landowners,

along with their willingness to adopt.

Methods

We developed two distinct, separate surveys—one for landowners and one for NRPs. The Institutional Review Board of the University of Minnesota approved both surveys prior to their distribution. We developed the survey questions following methods outlined by Dillman, Smyth, and Christian (2009) and tailored them for (a) landowners who had livestock and likely owned woodlands in central and north-central Minnesota, where woodland grazing dominates, and (b) NRPs who provided technical assistance to landowners throughout Minnesota. We developed the surveys with input from the University of Minnesota Extension's evaluation specialist and nongovernmental organizations, such as the Minnesota Cattleman's Association, the Minnesota Milk Producers Association, and the Crow Wing River Basin Forage Council.

We mailed the landowner survey to 1,343 landowners in March 2015 and sent reminder postcards to nonrespondents in April. We obtained addresses of landowners in 20 central and north-central Minnesota counties using the databases of the Crow Wing River Basin Forage Council and the University of Minnesota Extension Beef Team. We received 202 completed landowner surveys, for a response rate of 18.1%.

Prior to distribution of the landowner survey, in December 2014 we sent the NRPs' survey to 431 individuals throughout Minnesota via email using the Qualtrics online survey manager platform (Qualtrics, Provo, UT). We also sent an email reminder to NRPs 3 weeks after the initial mailing. NRPs included individuals from the state's Natural Resources Conservation Service (NRCS), soil and water conservation districts (SWCDs), and Farm Service Agency as well as approved forest stewardship plan preparers. We received 41 completed surveys from NRPs, for a response rate of 12.3%. A comparison of the responses for several key questions to results of assessments following NRP silvopasture educational events indicated that our results were not dissimilar to feedback we have obtained through those informal evaluations.

Results and Discussion

Respondent Profiles

Gender, age, and ethnicity data for all respondents are shown in Table 1. The majority of landowner survey respondents (95%) were male, and the largest proportion of landowner respondents (41%) were in the 55–69 age group. Almost all the landowner respondents (99%) identified themselves as White. Of those who responded to the NRP survey, 61% were male. The largest age group, with 41% of respondents, was 35–54. The majority of NRP respondents (94%) identified their ethnicity as White.

Table 1.
Gender, Age, and Ethnicity Demographics of Landowners and Natural Resources Professionals (NRPs)

	Landowners		NRPs	
Factor	***f***	**%**	***f***	**%**
Gender				

Male	190	95	25	61
Female	9	5	16	39
Total	199	100	41	100
Age				
18-34	6	4	11	27
35-54	41	20	17	41
55-69	83	41	13	32
70 & over	71	35	0	0
Total	201	100	41	100
Ethnicity				
White	201	99	38	94
American Indian	1	1	0	0
Asian/Pacific Islander	0	0	1	3
European	0	0	1	3
Total	202	100	40	100

Additional landowner and NRP demographic data are shown in Tables 2 and 3. Most landowners reported having farming or livestock production as their main occupation (30% and 29%, respectively), and 34% of landowners indicated that their household annual income was $25,000–$49,999 (Table 2). Most NRP respondents worked for SWCDs (54%) or the NRCS (32%), and nearly 40% of NRP respondents had been working as an NRP for 6–15 years (Table 3).

Table 2.

Landowners' Primary Occupations and Household Incomes

Factor	***f***	**%**
Primary occupation		
Farmer only	59	30
Livestock producer only	58	29
Farmer and livestock producer	28	14
Business owner	8	4
Other	47	23
Total	200	100
Household income		

<$25,000	16	9
$25,000-$49,999	63	34
$50,000-$74,999	47	25
$75,000-$99,999	27	14
$100,000-$149,999	20	11
$150,000+	14	7
Total	187	100

Table 3.

Natural Resources Professionals' Employers and Years of Experience

Factor	***f***	**%**
Employer		
SWCD	22	54
NRCS	13	32
Private consultant	3	7
FSA	3	7
Total	41	100
Years of experience		
1-5	3	7
6-10	8	20
11-15	8	20
16-20	4	9
20-25	7	17
26-30	5	12
Over 30	6	15
Total	41	100

Note. SWCD = soil and water conservation district. NRCS = Natural Resources Conservation Service. FSA = Farm Service Agency.

Levels of Knowledge of Silvopasture

Thirty percent of landowner respondents indicated that they practiced silvopasture, and 62% reported practicing passive woodland grazing (Table 4). With regard to practicing management-intensive grazing, the landowner sample was split almost evenly between those who did (47%) and those who did not (53%) (Table 4). In terms of knowledge of silvopasture, 54% of landowner respondents indicated having no knowledge at

all about the practice, and only 3% indicated having a lot of knowledge about the practice (Table 4). Of the landowner respondents who indicated that they practiced silvopasture and indicated their level of knowledge of silvopasture, 44% indicated having little or no knowledge and 56% indicated having some or a lot of knowledge. In contrast, of the landowner respondents who indicated that they did not practice silvopasture and indicated their level of knowledge of silvopasture, 90% indicated having little or no knowledge and 10% indicated having some or a lot of knowledge.

Of responding NRPs, 44% reported that they recommended silvopasture as a management tool (Table 5). However, 59% indicated having little or no knowledge about silvopasture, and only 2% indicated having a lot of knowledge about (expertise in) the practice.

Table 4.
Landowners' Practices and Levels of Silvopasture Knowledge

Factor	*f*	%
Practice silvopasture		
Yes	61	30
No	141	70
Total	202	100
Practice woodland grazing		
Yes	125	62
No	77	38
Total	202	100
Practice management-intensive grazing		
Yes	91	47
No	103	53
Total	194	100
Knowledge of silvopasture		
None	93	54
A little	45	26
Some	28	17
A lot	6	3
Total	172	100

Table 5.
Natural Resources Professionals'

Recommendations Regarding and Levels of Knowledge of Silvopasture

Factor	*f*	%
Recommend silvopasture		
Yes	17	44
No	22	56
Total	39	100
Knowledge of silvopasture		
Nothing	6	15
A little	18	44
Some	16	39
A lot	1	2
Total	41	100

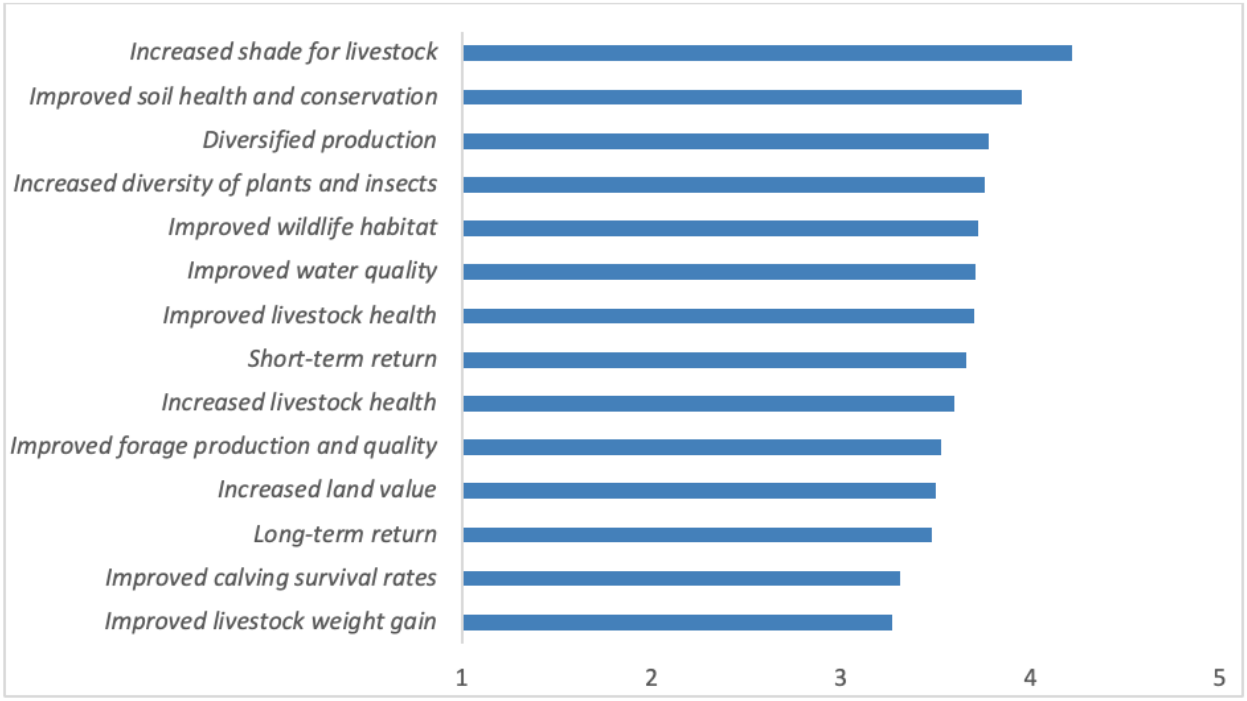
Perceived Benefits of Silvopasture Adoption

Our survey instrument included a list of known benefits of silvopasture (Garrett et al., 2004; Sharrow, 1998). Respondents were to indicate their perception as to whether each item was a benefit of silvopasture using a 5-point scale (1 = *strongly disagree*, 2 = *slightly disagree*, 3 = *neutral*, 4 = *slightly agree*, 5 = *strongly agree*). Landowner respondents expressed the highest levels of agreement that increased shade for livestock (*M* = 4.22) and improved soil health and conservation (*M* = 3.95) are benefits of silvopasture (Figure 1).

NRP respondents expressed the highest levels of agreement that increased shade for livestock (*M* = 4.06) and diversified production (*M* = 3.94) are benefits of silvopasture (Figure 2). Tied as the third most agreed on benefits were improved wildlife habitat and increased diversity of plants and insects (*M* = 3.88).

Figure 1.

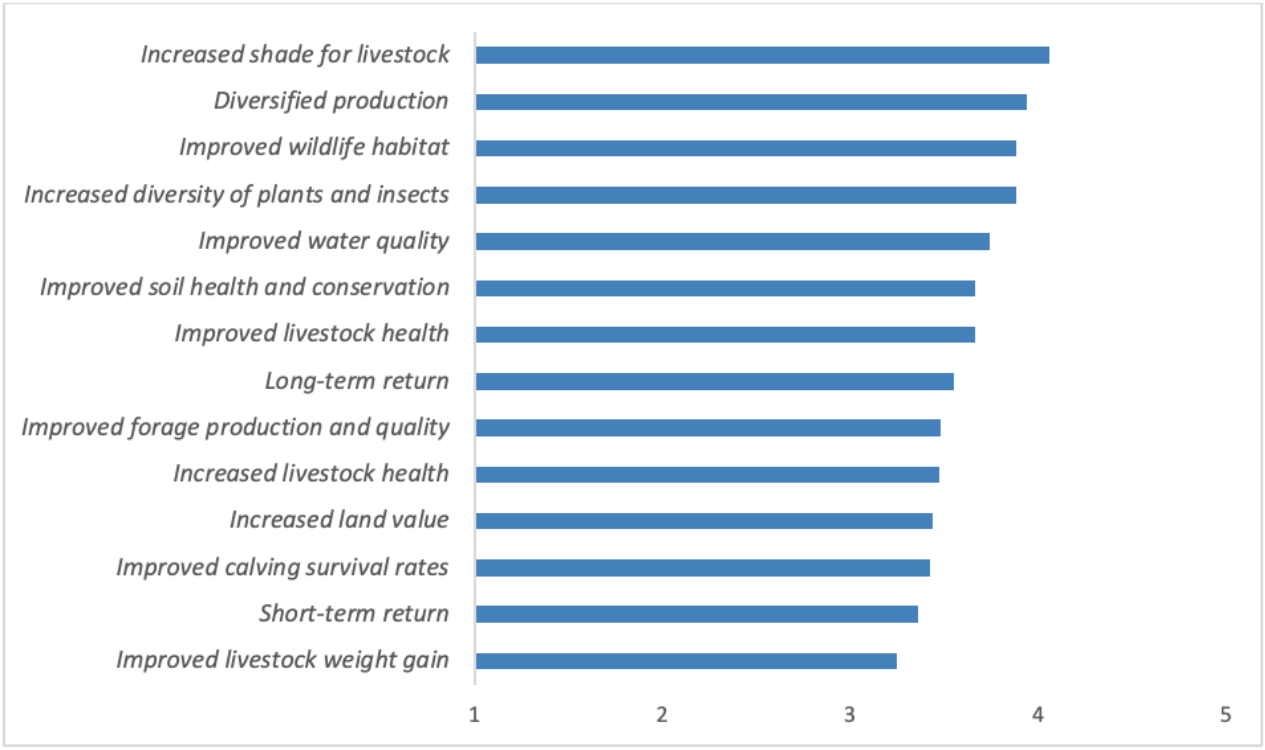
Landowners' Perceptions of the Benefits of Silvopasture



Note: 1 = *strongly disagree*, 2 = *slightly disagree*, 3 = *neutral*, 4 = *slightly agree*, 5 = *strongly agree*.

Figure 2.

Natural Resources Professionals' Perceptions of the Benefits of Silvopasture



Note: 1 = *strongly disagree*, 2 = *slightly disagree*, 3 = *neutral*, 4 = *slightly agree*, 5 = *strongly agree*.

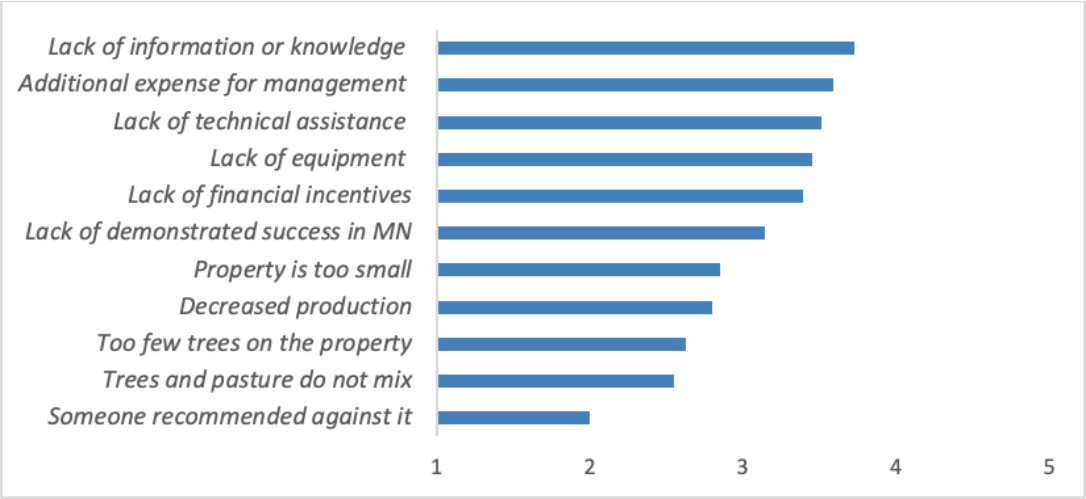
Perceived Barriers to Silvopasture Adoption and Promotion

Using the same 5-point scale, landowner respondents expressed the highest levels of agreement that lack of information or knowledge (*M* = 3.73) and additional expense for management (*M* = 3.59) are barriers to silvopasture adoption (Figure 3). Furthermore, they tended to agree that lack of technical assistance and lack of equipment (*M* = 3.51 and *M* = 3.45, respectively) are other barriers to silvopasture adoption (Figure 3).

NRP respondents expressed the highest level of agreement that lack of information or knowledge is a barrier to their promoting silvopasture to landowners (*M* = 3.92) (Figure 4). NRPs also identified additional expense for management and lack of financial incentives (*M* = 3.64 and *M* = 3.63, respectively) as major factors preventing them from promoting silvopasture to landowners (Figure 4).

Figure 3.

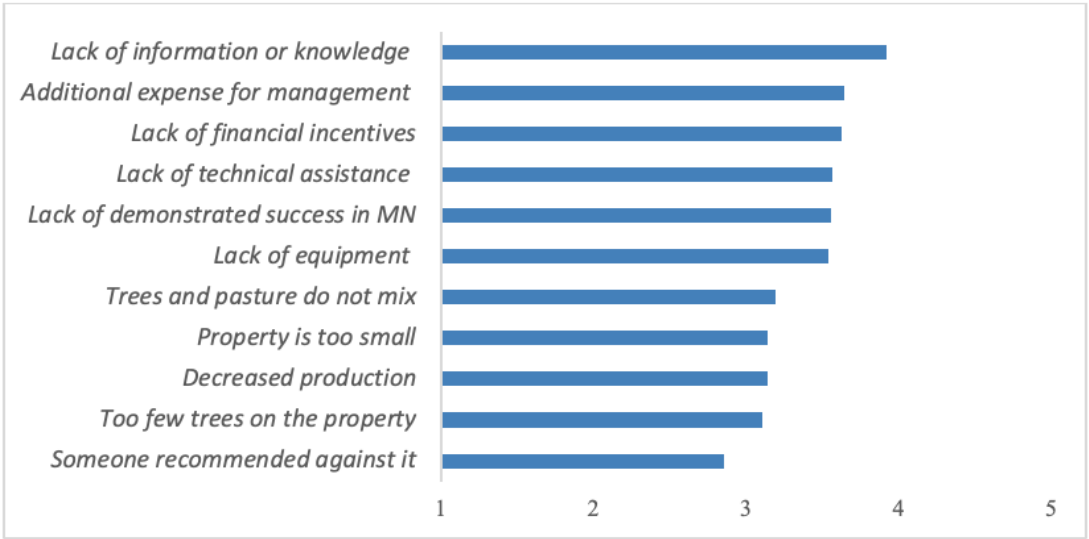
Landowners' Perceptions of Key Barriers to Silvopasture Adoption



Note: 1 = *strongly disagree*, 2 = *slightly disagree*, 3 = *neutral*, 4 = *slightly agree*, 5 = *strongly agree*.

Figure 4.

Natural Resources Professionals' Perceptions of Key Barriers to Promotion of Silvopasture to Landowners



Note: 1 = *strongly disagree*, 2 = *slightly disagree*, 3 = *neutral*, 4 = *slightly agree*, 5 = *strongly agree*.

Likelihoods of Adopting and Promoting Silvopasture

Forty-four percent of landowners indicated that they would start practicing silvopasture, as compared to 27% who indicated that they were not willing to adopt the practice (Table 6). Fifty-two percent of NRPs indicated their willingness to consider promoting silvopasture to landowners, and only 8% indicated that they would not start promoting silvopasture (Table 6).

Table 6.

Likelihood of Landowners Adopting Silvopasture and Likelihood of Natural Resources Professionals (NRPs) Promoting Silvopasture to Landowners

	Landowners (likelihood of adopting)		**NRPs (likelihood of promoting)**	
Level of likelihood	***f***	**%**	***f***	**%**
Will not	50	27	3	8
Will consider	1	1	21	52
Will start	83	44	3	8
Will continue	53	28	13	32
Total	187	100	40	100

Preferred Establishment Methods

Twenty-six percent of responding landowners indicated that cutting trees in existing grazed woodland to allow sunlight to stimulate forage growth was the most feasible method for establishing silvopasture on their land (Table 7). Only 5% of landowner respondents indicated that integrating livestock into existing tree farming systems was a feasible method of establishing silvopasture (Table 7).

One quarter (25%) of responding NRPs indicated that managing trees on the edge of existing pasture was a feasible method for establishing silvopasture (Table 7). Of the NRP respondents, only 2% felt that silvopasture was not appropriate or feasible on the farmer lands where they provide technical assistance (Table 7).

A relatively common response for both landowners (24%) and NRPs (22%) was that they did not know whether various methods of establishing silvopasture were feasible (Table 7).

Table 7.

Preferences Regarding Methods for Establishing Silvopasture Among Landowners and Natural Resources Professionals (NRPs)

	Landowners		**NRPs**	
Method or other response selected	***f***	**%**	***f***	**%**
Cutting trees in existing grazed woodland to allow light for forage growth	73	26	14	22
Planting trees in existing marginal pasture land	35	13	13	21

Managing trees on the edge of existing pastures	59	21	16	25
Integrating livestock into existing tree farming systems (e.g., red pine plantations)	13	5	5	8
I do not feel silvopasture is appropriate or feasible on my farm/farm(s) I manage	30	11	1	2
I do not know	68	24	14	22
Total	278	100	63	100

Note: Respondents could indicate more than one method.

Conclusions and Recommendations

Unfortunately, survey response rates were relatively low. However, the data we obtained quantitatively confirm anecdotal and post-education-program feedback we have received from landowners and NRPs.

We found that silvopasture is currently practiced by some landowners in central and north-central Minnesota and that almost half of NRPs promote it to landowners. The majority of landowner respondents reported knowing little or nothing or having a lack of awareness about silvopasture. Landowners who had higher levels of knowledge about silvopasture were more likely to practice it, suggesting that increased educational efforts may expand silvopasture application. Also, given that the survey instrument seemed to create awareness of the benefits of silvopasture among landowners, as evidenced by the 44% who indicated that they would start practicing silvopasture, more targeted education could be beneficial.

A similar lack of knowledge or technical know-how about the practice was reported by NRPs. Few NRPs considered themselves experts on silvopasture.

On the basis of our findings, we offer the recommendations below to Extension professionals working with Minnesota landowners and NRPs to expand the use of silvopasture. Our recommendations may be informative for Extension professionals in other locations as well.

1. Create research-based Extension materials about silvopasture establishment that include step-by-step procedures to use to determine whether a specific site fits the requirements for a silvopastoral practice.

2. Deliver silvopasture educational programs targeting landowners and NRPs. Delivery of these educational programs should be site-specific based on local needs.

3. Implement field-based scientific research and demonstration plots featuring silvopasture establishment and management methods. Identify what types of sites are most appropriate for silvopasture, and summarize information about incentives (such as tax deductions or cost-sharing programs) for landowners to establish silvopasture.

4. Offer on-site silvopasture field training to provide peer learning opportunities for landowners and NRPs.

5. Expand opportunities for peer learning of silvopasture concepts through the use of social media and email groups where appropriate.

6. Work with NRCS to develop state-based silvopasture standards outlining establishment and management guidelines for silvopasture systems.

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