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Abstract

We conducted a survey to evaluate factors influencing consultant recommendations on grazing and producer grazing practices in Nebraska. Producers who did not graze cited soil compaction, inconvenience (lack of watering and fencing), and lack of access to livestock as major reasons for not grazing. Producers who allowed grazing and consultants who recommended grazing were more likely than those who did not favor grazing to perceive that grazing increased subsequent grain yields. Most consultants and producers reported making decisions on the basis of their personal observations. Findings from the survey can be used for enhanced Extension dissemination and research activities regarding grazing of residues.

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Introduction

Grazing corn residue has been practiced for many years and was researched as early as the 1970s. Vetter, Weber, and Gay (1970) studied the effects of grazing cornstalks on beef cow performance, and Ward (1972) analyzed the feeding value of crop residues. Additionally, the effects of grazing corn residue on subsequent crop yields (Clark et al., 2004; Drewnoski, MacDonald, Erickson, Hanford, & Klopfenstein, 2016) and soil properties (Clark et al., 2004; Tracy & Zhang, 2008) have also been researched. Grazing of corn residue can lower winter feed cost for cattle producers by allowing them to extend the grazing season rather than feed harvested and stored forages (Rasby, Drewnoski, & Stalker, 2014).

However, Stalker et al. (2012) stated that only 25% of corn residue acres in Nebraska are currently grazed. Much of the cropland, and thus corn residue, is under the control of producers who specialize in crop production and do not have cattle themselves. Renting corn residue for grazing to cattle producers can be a source of extra income for such crop producers, but whether there is wide awareness of this concept is unclear: The perceptions of crop consultants who provide advice to crop producers and the perceptions of crop producers themselves regarding grazing of corn residue have not been studied. Therefore, we conducted a survey to better understand the perceptions and factors influencing behaviors of crop consultants and crop producers regarding grazing corn residue. The results led us to conclusions about opportunities for targeted Extension programming.

Methods

Survey Methodology and Measures

Industry crop consultants were asked to fill out a 16-question survey, and crop producers were given a 14-question survey. Some questions were similar across surveys to allow comparison of consultant and producer responses. We estimated that it would take 15 to 25 min to complete the survey. We used online survey software, Qualtrics Version 2015, for creating the survey instruments and storing data. An electronic mailing list developed by University of Nebraska Extension educators from educational programming contacts was used for distributing the surveys. A cover letter emailed to the participants explained the purpose of the survey and provided instructions for survey completion. A web address link directed participants to the survey. Three emails (initial announcement, midpoint reminder, and final reminder) were sent. The survey was open from January 15 to February 15, 2015. We did not incentivize the participants for completing surveys. The institutional review board at the University of Nebraska–Lincoln approved the study.

Statistical Analysis

We analyzed the data using SPSS, Version 19 (IBM Corp., Armonk, NY). We computed and compared means, standard deviations, frequencies, and percent responses. According to the Shapiro-Wilk test of normality, the data did not follow a normal distribution; therefore, we were required to use nonparametric tests for the comparisons. Using the Mann-Whitney U test, we detected significant differences as determined by nonparametric, independent samples, at $p < .05$.

Results

Background Information on Respondent Groups

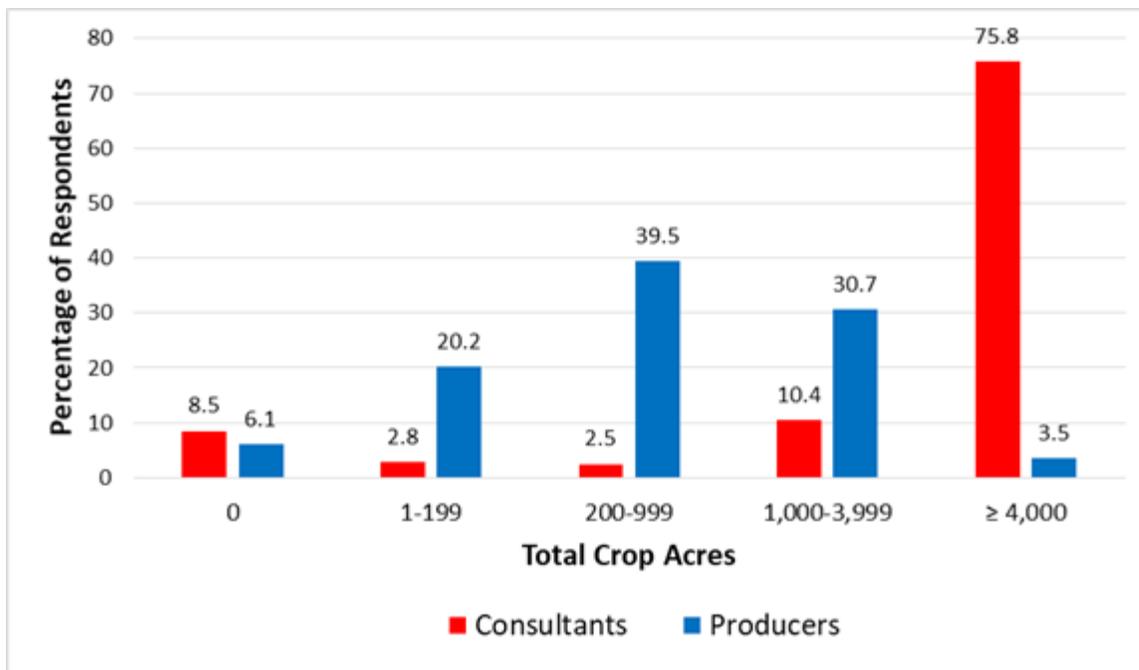
The return rate was 24.9% ($n = 234/940$) for the crop consultant survey. Seventy-six percent of consultants influenced 4,000-plus acres (Figure 1). Consultant responses indicated that the majority of influenced acres were irrigated (3.5 ± 1.3) and that the majority of the consultants' clients used a no-till (3.3 ± 1.3) management system (responses grouped according to the percentage of influenced acres based on a scale ranging from 1 to 5 with increasing 20%-unit increments [1 = 0% to 20% of influenced acres and 5 = 81% to 100% of influenced acres]).

The crop producer survey had a return rate of 23.9% ($n = 130/545$). The majority of producers farmed between 200 and 3,999 ac (Figure 1). The land managed by producers was predominantly managed under no-

till systems (4.4 ± 1.2) and was equally split between irrigated (3.3 ± 1.6) and rain-fed (3.2 ± 1.7) conditions (responses grouped according to farmed acres based on a scale ranging from 1 to 5 with increasing 20%-unit increments [1 = 0% to 20% of farmed acres and 5 = 81% to 100% of farmed acres]).

Figure 1.

Number of Acres Influenced by Crop Consultants and Directly Farmed by Crop Producers

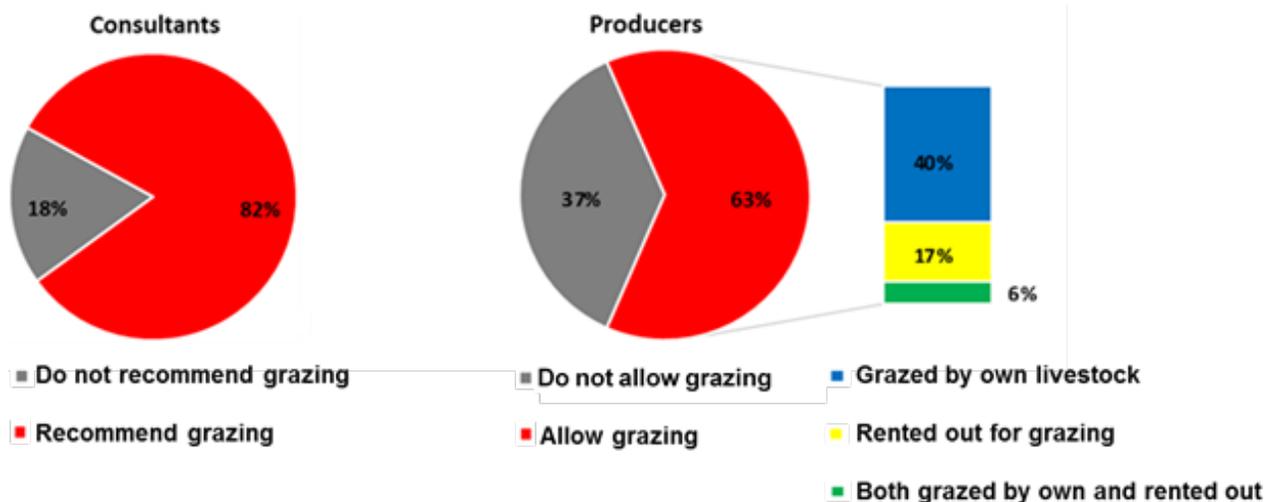


Crop Consultant Grazing Recommendations and Crop Producer Grazing Practices

The majority (82%) of crop consultants in our survey recommended grazing corn residue to their clients (Figure 2). Of the crop producers surveyed, 63% indicated that their corn residue was used for grazing (Figure 2).

Figure 2.

Crop Consultant Corn Residue Grazing Recommendations and Crop Producer Corn Residue Grazing Practices



Land Management Influences

Crop producers who allowed grazing reported significantly less ($p < .05$) rain-fed acres (2.9 ± 1.8) contributing to their total cropland compared to those who did not allow grazing (3.7 ± 1.6) (responses were provided through the use of a scale ranging from 1 to 5 that had increasing 20%-unit increments [1 = 0% to 20% and 5 = 81% to 100%]). Due to greater cow numbers in western Nebraska, we estimate that more corn residue acres are grazed in western Nebraska than in eastern Nebraska. Annual precipitation amount gradually decreases from east (34 in.) to west (16 in.) in Nebraska. As a result, irrigated corn acres are greater and rain-fed corn acres are fewer in western Nebraska than in eastern Nebraska. Thus, location within Nebraska may explain why crop producers with fewer rain-fed acres were also more likely to allow grazing.

Regarding survey questions on tillage and planting practices (Table 1), 34% of crop consultants indicated that "some to all" of their clients changed tillage and planting practices after grazing, and 64% indicated that "very few" changed tillage or planting practices. However, 93% of crop producers who allowed grazing responded that they did not change tillage or planting practices as a result of allowing cattle to graze corn residue.

Table 1.
Perceptions of Crop Consultants and Crop Producers
Regarding Land Management Changes When Corn
Residue Is Grazed

Change to tillage or planting practices after grazing	% of responses
Consultants	
Some to all of my clients have changed	34
Very few of my clients have changed	64
My clients do not allow grazing	2
Producers who allowed grazing	

Yes, I changed	7
No, I did not change	93

Perceptions of Grazing Effects on Land Productivity

The majority of crop consultants recommended grazing; thus, a statistical analysis comparing those who recommended and those who did not recommend grazing could not be conducted. However, the majority of both crop consultants recommending grazing, and crop producers allowing grazing perceived the effect of grazing on subsequent grain yields to be neutral or positive (Table 2). Producers who did not allow grazing were more likely ($p > .02$) to perceive negative effects of grazing corn residue on subsequent corn yields (Figure 3) and soybean yields (Figure 4) relative to producers who allowed grazing. Using a scale ranging from 1 (*greatest decrease*) to 7 (*greatest increase*), producers who did not allow grazing rated the effect on corn yield at 3.79 ± 1.5 and the effect on soybean yield at 3.86 ± 1.8 , whereas producers who did graze corn residue ranked the effect on corn yield at 4.86 ± 1.2 and the effect on soybean yield at 4.54 ± 1.3 .

Table 2.

Perceptions of Crop Consultants Recommending Grazing and Crop Producers Allowing Grazing on the Effect of Grazing Corn Residue on Subsequent Crop Yield

Crop yield	Consultants recommending grazing ($n = 185$) ^a		Producers allowing grazing ($n = 92$) ^b	
	<i>f</i>	%	<i>f</i>	%
Corn				
Decrease	38	20.6	17	18.5
No effect	75	40.8	46	50.0
Increase	71	38.6	29	31.5
Soybean				
Decrease	28	15.1	17	19.1
No effect	89	48.1	43	48.3
Increase	68	36.8	29	32.6

^aOne crop consultant recommending grazing did not respond to the question regarding corn yield. ^bThree crop producers allowing grazing did not respond to the question regarding soybean yield.

Figure 3.

Crop Producers Allowing Versus Not Allowing Grazing: Perceptions of the Effect of Grazing Corn Residue on Subsequent Corn Yield

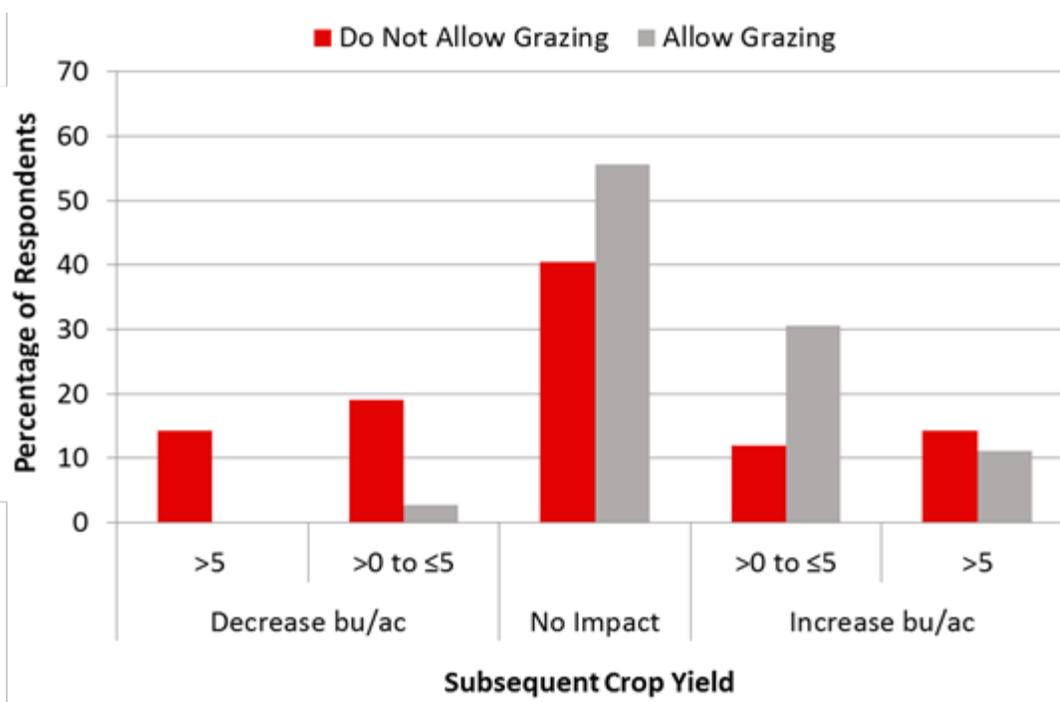
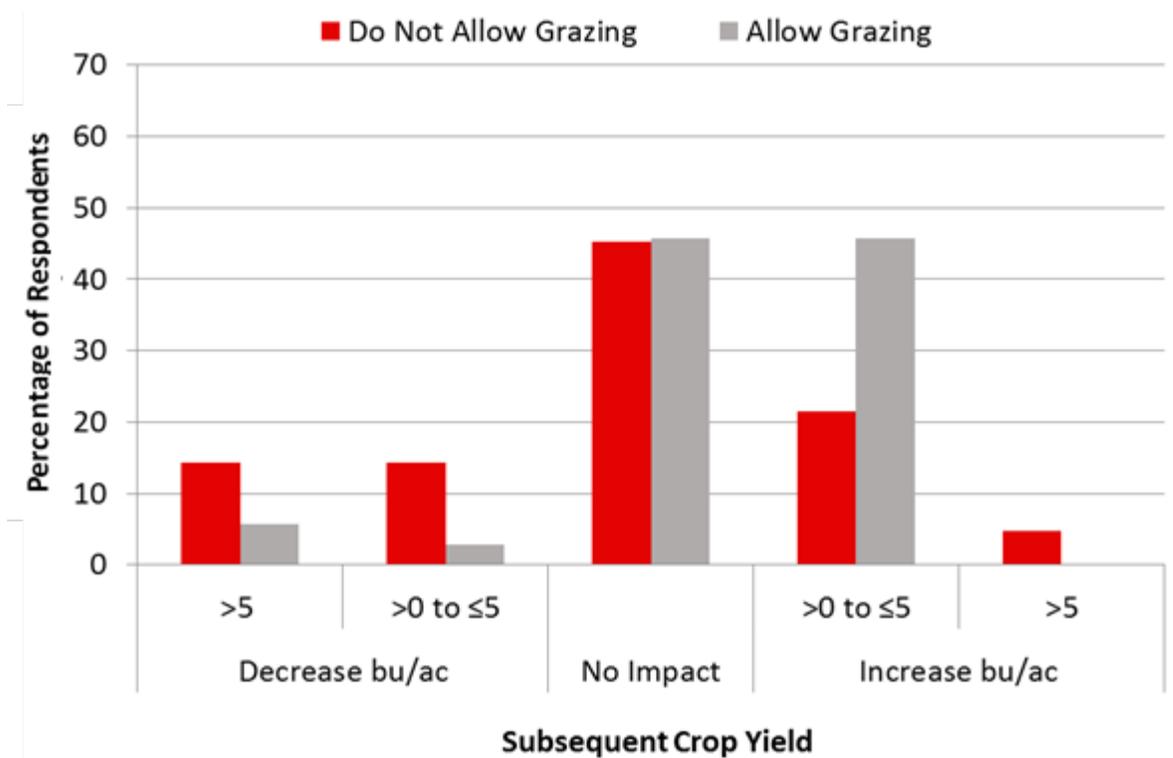


Figure 4.

Crop Producers Allowing Versus Not Allowing Grazing: Perceptions of the Effect of Grazing Corn Residue on Subsequent Soybean Yield



Corn Residue Rental Rates

The majority (82%) of the crop producers who rented out corn residue for grazing charged \$15 or less per acre (Table 3). Interestingly, a large proportion (42%) of producers who did not allow corn residue grazing indicated that they would allow cattle to graze their corn residue for a rental fee of \$15 or less per acre (Table 3). However, an equally large proportion (40%) of producers who did not allow grazing of corn residue responded that they would not allow grazing regardless of the rental fee offered (Table 3).

Table 3.

Corn Residue Grazing Rental Rates: Rates Charged by Crop Producers Renting Corn Residue to Livestock Producers and Rates Desired by Crop Producers Not Allowing Grazing

Grazing fee	Currently rent ^a (n = 26)		Currently do not allow grazing ^b (n = 50)	
	f	%	f	%
Free	6	23.5	7	14.0
\$1 to \$15 per acre	15	58.8	14	28.0
\$16 to \$25 per acre	5	17.7	4	8.0
\$26 to \$35 per acre	0	0.0	2	4.0
> \$35 per acre	0	0.0	3	6.0
Would not allow grazing regardless of rental fee			20	40.0

aQuestion: What rental fee do you charge for grazing? bQuestion: What rental fee would you need before you would allow cattle to graze?

Reasons for Not Grazing Corn Residue

When crop consultants who did not recommend grazing were asked to rate the importance of reasons why, the three reasons receiving the highest ratings were as follows (using a scale of 1 = *very important* to 5 = *not at all important*):

1. Grazing has a negative effect on farming practices (2.03 ± 1.0).
2. Grazing reduces subsequent crop yields (2.31 ± 1.2).
3. Livestock producers would not pay for the worth of corn residue (2.38 ± 1.3).

When crop producers who did not allow grazing were asked to identify their reasons why by indicating all applicable answer choices for a "select all that apply" question, the top three reasons were

1. soil compaction (47%),
2. inconvenience (lack of water and fencing) (49%), and
3. other—lack of access to livestock (23%).

However, when we compared responses of crop producers who did not allow grazing but indicated that they would for a fee and crop producers who indicated that they would not allow grazing regardless of fee offered, we found differences in their reasons for not grazing (Table 4).

Table 4.

Reasons for Not Grazing: Comparing Crop Producers Who Do Not Graze but Would for a Fee and Those Who Would Not Graze Regardless of Fee

Reason corn residue is not grazed ^a	Would rent for a fee	Would not graze regardless
	(<i>n</i> = 30) %	of rental fee (<i>n</i> = 20) %
Reduces subsequent crop yields	0.0	10.0
Has a negative effect on farming practices	10.0	55.0
Lack of water for livestock	26.7	40.0
Lack of fencing	10.0	30.0
Livestock producers will not pay for worth of stalks	30.0	25.0
Interferes with fall field work	23.3	25.0
Causes soil compaction	20.0	65.0
Other	60.0	30.0

^aSurvey item was a "select all that apply" question; therefore, percentages sum to greater than 100%.

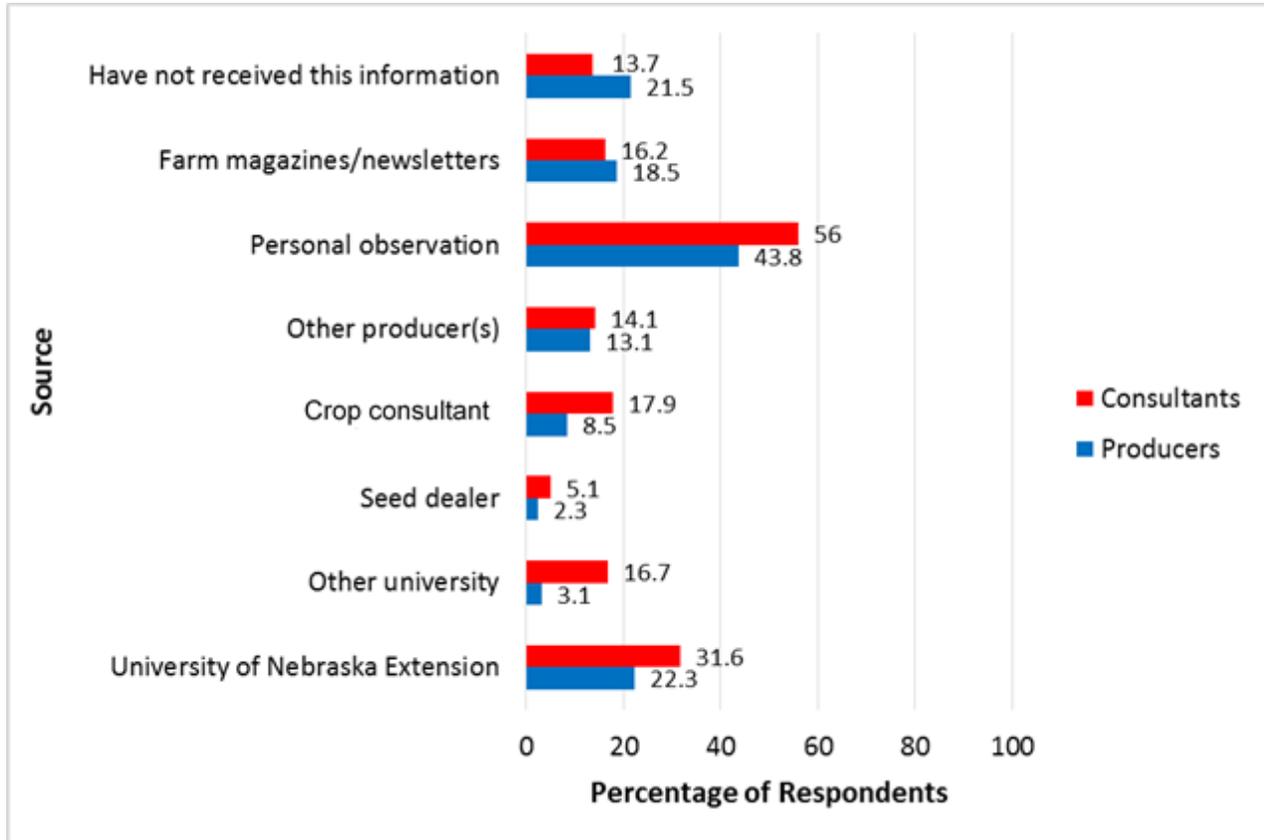
The majority of crop producers who would not allow grazing regardless of rental fee offered indicated that they felt grazing caused compaction (65%) or had a negative effect on their tillage or planting operation (55%). However, 60% of the producers who would allow grazing for a rental fee selected "other," and according to their comments, approximately 70% of those respondents indicated that they did not have access to livestock for grazing. Thus lack of access to livestock was the highest ranked reason (42%) for not grazing among crop producers who were not grazing but indicated that they would allow grazing for a fee.

Sources of Information Regarding Grazing Corn Residue

We found that personal observation is often used by crop consultants and crop producers as a source of information (Figure 5).

Figure 5.

Crop Consultants' and Crop Producers' Sources of Information Regarding Grazing Corn Residue



Limitations of the Survey

Limitations of our survey include the potential for population bias due to the distribution method used and response population. All crop consultants and crop producers who were surveyed likely collaborate with University of Nebraska Extension service providers because the mailing list used was collected from Extension educators. Another bias that can be difficult to control and account for is nonresponse bias. An increased variety of survey delivery formats and reminders could have increased the response rate. Incentives also could have encouraged increased participation by consultants and producers. However, the return rates of both the consultant survey (25%) and the producer survey (24%) are similar to those for other recent agriculture-related surveys, such as 21% (Dahlen, Hadrich, & Lardy, 2014) and 22% (Boyd et al., 2015).

Implications

The majority of crop consultants and crop producers did not perceive that grazing corn residue negatively affects subsequent crop yields. Instead, crop producers' reasons for not allowing grazing were related to concerns about soil compaction, lack of access to livestock, and perceptions of negative effects on farming practices.

On the basis of these responses, we believe there is an opportunity to increase the number of corn residue acres grazed in Nebraska through targeted Extension programming.

- A program connecting cattle producers looking for corn residue and farmers interested in renting out their

corn residue for grazing would be beneficial as many crop producers in our survey indicated an interest in renting out grazing for a fee that is within the range of current rental rates.

- More education is needed related to the effect of grazing corn residue on soil compaction. Research pertaining to the effects of grazing corn residue on compaction does not support the concerns expressed by crop producers in our survey. In a long-term study (16 years), Rakkar et al. (2016) concluded that fall grazing at the recommended stocking rate had no effect on soil compaction. This disconnection between research results and crop producer perceptions highlights the need for increased dissemination of research results.
- There is an opportunity for peer-to-peer learning regarding the need for changes to tillage and planting practices due to grazing. The overwhelming majority of crop producers who currently graze corn residue indicated that they did not change tillage or planting practices due to grazing. Likewise the majority of crop consultants indicated that very few of their clients had to change practices due to grazing.

Lastly, when crop consultants and crop producers were asked about sources of information they used to make decisions regarding corn residue, "personal observation" was ranked highest by both groups. We believe that the reliance on "observations" indicates a need to help both consultants and producers understand that without a proper control treatment an individual has no way to truly compare effects of management practices and thus may be misled. Education on the value of using information based on scientific methods will help consultants and producers make sound management decisions.

Acknowledgments

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