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Demonstration-Based Education Generates Behavior Change Related to Conservation Practices

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Abstract

Getting agricultural producers to make changes to their operations is difficult, especially related to complex systems such as the water cycle on managed agricultural lands. We surveyed participants who had watched a rainfall simulator demonstration during the summer of 2015. Results indicate that the demonstration was effective in providing educational outreach on the impact of the water cycle and prompting the adoption of conservation practices and monitoring techniques among producers. The study reinforces the importance in conservation education of learning experiences involving simulation, observation, and group discussion. Our findings may be applicable not only to Extension professionals working with agricultural producers but also to those involved in encouraging conservation practices among other audiences.

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Introduction

Experiential learning has been an effective way for Extension educators to teach youths and adults (Bechtel, Ewing, Threeton, & Mincemoyer, 2013; Torock, 2009). Richardson (1994) identified that learning opportunities that allowed for "doing" and "seeing" were preferred by Extension clients. Looking beyond learning preferences to adoption of practices, we evaluated the effectiveness of a demonstration-based agriculture education tool, called the rainfall simulator, in changing producer behavior related to conservation practices.

Research has shown that no-till farming techniques, the use of cover crops, and rotational grazing practices improve effects of the water cycle (Fu, Chen, & McCool, 2006; Lyons, Weigel, Paine, & Undersander, 2000; Wilson, Dalzell, Mulla, Dogwiler, & Porter, 2014). Yet implementation of these land-use practices remains relatively low in the United States (Conant, Six, & Paustian, 2003; Lal, 2002; Lal, Reicosky, & Hanson, 2007). Those who work closely with farmers and ranchers recognize the desire of producers to "do the right thing" when it comes to environmental stewardship. However, there sometimes are legitimate barriers to adopting certain sustainable agriculture practices (Baumgart-Getz, Prokopy, & Floress, 2012; Drost, Long, Wilson, Miller, & Campbell, 1996; Knowler & Bradshaw, 2007). Nevertheless, it is important for Extension and conservation groups to continue educational programming regarding the use of no-till, cover crops, and

rotational grazing practices because policies and incentives will continue to fluctuate but sound science will not.

Since 2009, the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), the South Dakota Grassland Coalition (SDGC), and South Dakota State University (SDSU) Extension have partnered to deliver educational programming on the effects of the water cycle on managed lands in South Dakota by using a mobile rainfall simulator developed by the NRCS (Figure 1). The rainfall simulator demonstrates the water cycle by showing runoff, infiltration, and soil particle dislodging. Prior to the demonstration, the presenter collects intact soil from fields managed by a variety of practices (no-till cropping with and without cover crops, conventional cropping, continuously grazed pasture, and rotationally grazed pasture) and then applies a 30-min rainfall simulation (Figure 1). During the simulation, the presenter explains how the water cycle works and encourages the audience to make observations, comment, and ask questions. After the simulation is completed, the presenter dumps the soil containers to reveal how wet or dry the soil is and discusses the water-holding capacity for plant growth. The main goals of the simulation are to demonstrate relative differences among management practices, rather than to collect quantitative data, and to encourage discussion around the practices of no-till, cover crops, and rotational grazing.

Figure 1.
Mobile Rainfall Simulator

These demonstrations have occurred about a dozen times annually as part of various tours, pasture walks, field days, and farm shows since 2009. Over the years, we have observed that some producers attending these events have seen the demonstration before. Thus, our team was curious about whether producers who had seen the demonstration before had implemented conservation practices and taken action to monitor relevant changes on their farms and ranches. In addition, we wanted to know whether we were continuing to reach new audiences, thereby justifying the need to continue the demonstrations.

Survey

We conducted a survey (IRB-1611027-EXM) of event participants watching the rainfall simulator demonstration at five events in the summer of 2015. These events included two annual tours, a pasture walk, a field day, and a regional farm show. We distributed a one-page survey (Figure 2) to event participants watching the demonstration. The survey took less than 5 min to complete.

Figure 2.
Rainfall Simulator Demonstration Survey

1. Are you a producer? Circle Yes or No.

2. Have you ever seen the rainfall simulator demonstration before today? Circle Yes or No.

3. If you have seen the rainfall simulator demonstration before today, please check where.

   _____ SDGC event

   _____ NRCS event

   _____ SDSU event

   _____ Leopold Tour

   _____ Online

   _____ Other

4. Have you made any changes to your operation because you previously saw the rainfall simulator demonstration? Circle Yes or No.

5. If you have made any changes to your operation because you had seen the rainfall simulator demonstration, please check one or more options from the following list that apply to your situation:

   _____ Started using cover crops

   _____ Started leaving more residue on cropland

   _____ Switched to no-till

   _____ Incorporated livestock grazing on cropland

   _____ Diversified crop rotation

   _____ Installed grass waterways or buffer strips

_____ Switched from continuous grazing to rotational grazing

_____ Other (briefly explain)

6. Have you started to take notice of the water cycle since seeing the rainfall simulator demonstration on your operation by doing any of the following activities?

_____ Measured water infiltration using the NRCS single-ring infiltration kit

_____ Recorded monthly rainfall on farm/ranch

_____ Observed less water erosion on fields

_____ Observed less gully formation on crop fields or in pastures

Note: SDGC = South Dakota Grassland Coalition. NRCS = Natural Resources Conservation Service. SDSU = South Dakota State University.

Results

We collected 169 surveys from about 350 participants (48% response rate) at the five demonstrations; survey participation rate across the events ranged from 29% to 56%. Of the respondents across all events, 62% were producers and 38% were nonproducers. Fifty-eight percent of the respondents had seen the demonstration before (Table 1).

Table 1.
Respondents' Prior Exposure to Rainfall Simulator Demonstration

Have you seen the demonstration before?	**Number**
Producers (*n* = 104)	
Yes	70
No	34
Nonproducers (*n* = 65)	
Yes	28
No	37

Of the 98 respondents who had seen the rainfall simulator demonstration before, the majority had seen it at an NRCS event (Table 2). Additionally, the total number of responses relating to whether participants had seen

the demonstration before was 172, indicating that some had seen the demonstration more than just one other time.

Table 2.

Event Sponsors and Numbers of Respondents Who Had Prior Exposure to Rainfall Simulator Demonstration

Event sponsor	Number of responses
Natural Resources Conservation Service	70
South Dakota State University	33
South Dakota Grassland Coalition	27
Sand County Foundation[a]	18
Other[b]	13
Online	11

[a]The Sand County Foundation sponsored the Leopold Conservation Award tour, for which our team was the primary collaborator. [b]The "other" category refers to events sponsored by local conservation districts or other nongovernmental agencies.

Because our focus was on addressing the impact of the rainfall simulator demonstration on *producers*, we isolated this group's responses to questions about changes in practices. Producers who had seen the demonstration before were asked whether they had made changes to their operations as a result. Seventy-six percent (53 out of 70) reported having made changes because of watching the rainfall simulator demonstration, and of these, most indicated having made multiple changes. The most frequently implemented practices were leaving more residue on cropland (55%), planting cover crops (53%), incorporating livestock grazing on cropland (38%), diversifying crop rotation (36%), switching from season-long continuous grazing to rotational grazing (36%), and switching to no-till (32%) (Table 3).

Table 3.

Management Changes Made by Producers After Exposure to Rainfall Simulator Demonstration

Action taken	Number of responses
Left more residue on cropland	29
Planted cover crops	28

Incorporated livestock grazing on cropland	20
Diversified crop rotation	19
Switched from continuous grazing to rotation	19
Switched to no-till	17

We also were interested in whether producers who had made changes to their farms or ranches had taken it upon themselves to monitor effects of the water cycle on their properties. Sixty percent (32 out of 53) had recorded monthly rainfall, and 25% (13 out of 53) had measured infiltration rates on their fields or pastures using an NRCS single-ring infiltration kit. We also found that 68% (36 out of 53) had noticed less water erosion in general and 47% (25 out of 53) had observed less gully formation on cropland and pastures.

Summary and Conclusion

Previous research has shown that simulations and active participation techniques can be effective tools for adult learning (Ota, DiCarlo, Burts, Laird, & Gioe, 2006). Our findings corroborate these results. The rainfall simulator demonstration discussed herein involved observation, discussion, and questioning in a group learning setting, and producers reported adopting conservation practices because of this learning experience. According to the results of our survey, the rainfall simulator demonstration is an effective educational outreach tool relative to the adoption of conservation practices on managed agricultural lands. Others in Extension can take this "idea at work" and apply it to their program areas.

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