

6-1-2005

Land Application of Manure: Minnesota Livestock Producers' Practices and Educational Needs

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Recommended Citation

Everett, L. A., & Vickery, J. (2005). Land Application of Manure: Minnesota Livestock Producers' Practices and Educational Needs. *The Journal of Extension*, 43(3), Article 16. <https://tigerprints.clemson.edu/joe/vol43/iss3/16>

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Land Application of Manure: Minnesota Livestock Producers' Practices and Educational Needs

Abstract

A combination of farmer focus groups and a pre-discussion survey was employed to determine adoption of recommended manure management practices and preferred Extension education methods. Eight focus groups followed a 2-year education program that addressed revised Minnesota feedlot rules and manure application practices. Constraints for practice adoption included uniformity of nutrient application with solid manure, access to spreader calibration scales and record keeping forms, and adequate spreading area away from water bodies. Preferred education topics included manure application related to phosphorus, environmentally sensitive areas, and equipment. Publication was the most preferred information delivery method.

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Introduction

This article reports farmers' responses to questions regarding manure management practices and future education needs, as reported in focus groups that followed a statewide feedlot and manure management education program in Minnesota. As background, Minnesota published revised state feedlot rules (Minnesota Pollution Control Agency, 2000) that resulted from negotiations among representatives of livestock producer organizations, environmental groups, and state agencies. The rules address feedlot registration, permitting, and design; manure-nutrient application rates; management of manure in environmentally sensitive areas; and other areas of environmental concern. They apply to all feedlot size categories, with progressively higher performance and documentation requirements for larger feedlot classes.

Anticipating that producers and agricultural professionals would need information about the rule revisions and associated manure management practices, the University of Minnesota Water Resources Center and the UM Extension Service (Extension) coordinated with state agencies to design and obtain funding for an education program. Although not involved in implementation of regulations, Extension recognized that the heightened awareness surrounding the rules publication would provide a "teachable moment" for manure management education, a major Extension topic.

In the first year of the program (2001), information was delivered at regional and county levels regarding feedlot registration, permitting, discharge restrictions, and basic manure management requirements to over 4,000 livestock producers. Education in the second year, reaching over 1,100 producers, focused on practices for land application of manure. Joint Extension and state agency teams prepared education materials and delivered the education sessions.

In order to identify impediments to farmer implementation of recommended or required manure management practices and to characterize future education needs, Extension conducted farmer

focus group sessions in four counties over four months following the education meetings. The counties selected (Benton, Fillmore, Polk, & Waseca), are geographically dispersed and represent the range of the state's livestock operations. The results of those sessions are reported here.

Methods

Eight farmer focus groups were conducted in four counties. The previous winter (2001-2002), county-level producer workshops on land application of manure had been held in each of these counties, as well as many others in the state. Each pair of focus groups in a county consisted of one group whose members had attended the winter workshop ("Attenders") and another group of participants who had not attended ("Non-Attenders"). Local Extension educators were requested to invite participants who were representative of producers in the region.

The focus group discussion was preceded by a 3-page questionnaire to prepare participants for discussion of the issues. The participants retained the questionnaire and were asked to refer to it at several points during the session. They were allowed to modify their questionnaire responses during the discussion.

All sessions were conducted by the same moderator. In addition to the moderator, each session was staffed by a county Extension educator, as well as a regional Extension educator or a Conservation District staff member. The focus group sessions were recorded on audiotape. Abbreviated transcripts for each session were prepared. The key findings from the focus groups were developed from the transcripts using the "long table analysis" procedure described by Krueger and Casey (2000).

Description of Questionnaire

The 3-page questionnaire consisted of three sections (Vickery, 2002):

1. Adoption of recommended practices: Participants responded to a list of ten practices (e.g., record keeping and soil testing) indicating whether or not they had adopted each practice prior to 2000, were using it currently (2002), and if they planned to by 2004.
2. Preferences for education topics: Participants responded to the question, "Would you attend?" to each of 10 topics that could be offered by Extension.
3. Preferences for education or information delivery methods: Participants ranked their preferences for each of seven delivery methods, such as publications, Web site, field days, and workshops.

Focus Group Questions

The focus group discussion was guided by a question sequence or "question route" as follows: (Abbreviated here. See Vickery, 2002 for full sequence.)

Part 1. Barriers to Adoption of Extension Recommendations

- "Please identify something about Extension's recommended rates (for nitrogen and phosphorus amendments) that makes them hard to use or follow."
 - What could Extension do to make it easier to follow the recommended rates?
 - What are some of the reasons for keeping good manure application records?
 - What is it about such record keeping that keeps it from getting done or done well?
 - What's the best thing Extension could do to improve manure application record keeping practices?
 - Which manure application setback, buffer, and incorporation rules are going to be the most difficult to work with?
 - What can Extension do to help you with the rules for sensitive areas?

Part 2. Education Topics, Methods, and Formats

- Which topics would work well with (a) 'field day'?
- Did anyone give a high rank to (a) 'comprehensive website'?
- Did anyone give a high rank to 'newsletter' or 'update'?
- Did anyone give a high (low) rank to 'computer software for nutrient management'?
- For which topics do you need 'one-on-one assistance'?

These "priming questions" were each followed with other questions and requests to foster discussion and elaboration.

Results

A total of 51 producers attended the sessions. The number of participants per session ranged from four to eight, with a mean of 6.4. Most of the participants had operations in the 100-to-999 animal

units range. The participants were primarily beef (42%), hog (36%), and dairy producers (58%), with 40% raising more than one type of animal. Beef production was usually a secondary operation. Below is a summary of the key findings for the focus groups, followed by selected questionnaire results. The key findings presented summarize the themes or opinions expressed in relatively more sessions (more than 2), by relatively more producers. For a more extensive report of methods and results see Vickery, 2002.

Manure Application Practices

- **Nutrient variability and availability:** The variability in the composition (e.g., straw, water) of open-lot and other solid manure, as well as in the availability of nutrients in the first and second years after field application, makes it difficult to apply manure at rates that closely match crop needs.
- **Spreader calibration:** Many of the producers who spread their own solid manure need and request on-farm assistance with weighing their manure wagons/spreaders. Some have never calibrated their equipment.
- **Manure application record keeping:** Producers who apply their own manure requested field-by-field record keeping forms. A variety of options and formats should be made available in order to respond to individual preferences and to match the range in types and sizes of operations.
- **Nutrient Management Plans (NMP):** Most producers with some experience with NMP recognize that it is not something they can readily do or would want to do for themselves. Those who would like an NMP know they need assistance, but they may not have access to it. They suggested that more private-sector professionals be trained to provide this service.
- **Sensitive area management:** Most of the producers feel that the rules for manure application in environmentally sensitive areas are generally fair and workable. However, for some of the farmers, the required setbacks will be a hardship. Most of the producers who experience difficulty scrape and haul manure daily and have limited land available that is not classified as "sensitive" within a reasonable hauling distance. Winter application restrictions add to that difficulty.
- **Adoption of recommended manure and nutrient management practices:** For a group of 10 practices examined, the overall rate of adoption as indicated in the pre-discussion questionnaire had increased from 2000 (prior to the rules revision) to 2002 when the focus groups were held. Participants expressed the intention to further increase adoption by 2004, as indicated in Table 1. The intended adoption rate was higher for Attenders than for Non-Attenders by 2004 for 7 of 10 practices, but because of low sample numbers, was only statistically significant when data was pooled across practices. Participants expressed the intention to implement all of the individual practices at rates exceeding 80% by 2004, except for developing/updating manure management plans.

Table 1.

Average Adoption Rate for 10 Manure Management Practices and Results for Each Individual Practice for Three Time Frames, Averaged Across Groups

Item no.	Topic or 'practice'	Combination of groups	Percent 'Yes' answers		
			Adopted prior to 2000	Currently adopted (2002)	Plan to adopt by 2004
	Average for all 10 practices (Non-Attenders, N = 24; Attenders, N = 27)	Total / All participants	55**	72**	88**
		Attenders	52**	71**	91**
		Non-Attenders	60**	74**	83**
1	Do you calibrate your manure spreaders?	Total	32*	53**	81**
		Attenders	32	48*	80**
		Non-Attenders	32	59	82**

2	Do you have your manure tested for nutrient content?	Total	55	63**	88**
		Attendees	56	63**	93**
		Non-Attendees	54	63	83*
3	Do you have most of your fields soil tested every four years or more frequently?	Total	86	94	98*
		Attendees	93	96	96
		Non-Attendees	79	92	100*
4	Do you account for nitrogen available from prior manure applications and previous legume crops when calculating manure and fertilizer rates?	Total	86	96	96
		Attendees	89	96	96
		Non-Attendees	83	96	96
5	Do you follow UM Extension recommended nitrogen rates when calculating manure and fertilizer applications?	Total	69	86	91*
		Attendees	61	83	92*
		Non-Attendees	79	89	89
6	Do you adjust the amount of manure you apply according to soil phosphorus test results?	Total	38*	62*	80**
		Attendees	37*	63*	89**
		Non-Attendees	39	61	68*
7	Do you keep records of manure application amounts for each field?	Total	44*	64*	86**
		Attendees	41	65*	89**
		Non-Attendees	48	63	83*
8	Have you located the sensitive areas in your fields where there are special requirements regarding manure incorporation and phosphorus management?	Total	53*	75	89**
		Attendees	44*	74	93**
		Non-Attendees	64	76	85
9	Near water and open tile intakes, do you inject or incorporate manure within 24 hours or maintain a 50-100 foot vegetated buffer?	Total	60*	83	91**
		Attendees	44*	78	93**
		Non-Attendees	80	90	90

10	Do you or does your consultant develop or update a manure management plan each year?	Total	31	46**	78**
		Attendees	19	38**	85**
		Non-Attendees	43	54	70

*Significant at P < 0.05

** Significant at P < 0.01, comparing 2000 with 2002 (column 1), 2002 with 2004 (column 2), and 2000 with 2004 (column 3). Percentages and tests of significance were adjusted for non-responses to individual questions. Comparisons were made using a 2x2 contingency table with Pearson's Chi-square test.

Preferred Topics and Formats for Future Education

Table 2 summarizes the participants' rankings of education and information delivery methods.

Table 2.
Participant Rankings of Educational Items or Opportunities

Item or opportunity	Group combinations								
	All groups			Attendees, 4 counties			Non-Attendees, 4 counties		
	Average of the group medians*	N = 51		Average of the group medians*	N = 27		Average of the group medians*	N = 24	
		No. of times ranked			No. of times ranked			No. of times ranked	
	First	Last		First	Last		First	Last	
Publications	1.81	19	5	1.75	9	2	1.87	10	3
Workshops	2.44	12	4	2.12	9	1	2.75	3	3
Farm tours / demonstrations	2.25	14	4	2.12	7	2	2.37	7	2
Newsletter, 'update', or periodic bulletin	2.25	11	9	2.37	5	7	2.12	6	2
Comprehensive Web site	3.37	4	17	3.50	2	9	3.25	2	8
Nutrient management computer software	3.81	6	22	4.00	3	11	3.62	3	11
Farm visit by specialist or consultant, or one-on-one assistance	2.69	13	14	2.12	8	7	3.25	5	7

*Average of the group medians of the rank assignments from each participant group.

[Example: if the median of the individual participant rank assignments in each of four focus groups was 2, 2, 3, and 2, the statistic in this case is the sum of the four values (9), divided by the number of groups (4).]

Key findings regarding priority topics for education programs and methods of delivery include the following.

- **Website as a source of information:** There is a large range in the level of interest and proficiency when it comes to computers and the internet. However, most of the participants are not likely to frequently use an Extension website.
- **Extension as a source of research and education:** Farmers continue to expect Extension to play an important role in research, on-farm demonstrations, educational events, and in providing informational materials and services. This was expressed in a general sense in the

context of, for example, "What is the most important thing Extension could do with regard to....?" asked at the end of each major discussion area. It was also expressed with respect to specific topics such as rates, nutrient management planning, and sensitive areas.

- **Preferred topics for Extension programs:**
 - Field selection with regard to soil phosphorus levels and manure application rates
 - Managing sensitive areas
 - Applying and incorporating manure: methods, implements, uniformity, timing
- **Preferred format for obtaining manure management information:** Of a list of seven educational items or opportunities, publication was the format most preferred. The most marked differences between Attenders and Non-Attenders is that the former expressed a higher level of interest in workshops (an obvious conclusion) and the latter showed higher interest in newsletters.

Discussion

Methods

In our study, we used a combination of focus groups (qualitative) with an in-session questionnaire (quantitative) to characterize the adoption of recommended practices by and define the education needs of "Attenders" and "Non-Attenders" of Extension-sponsored workshops. (See Schulze, 2003, for a discussion of combining qualitative and quantitative methods.) Because the resources required for focus group organization and narrative analysis severely limit sample size, questionnaires used in this context must be viewed as largely a tool assisting with the qualitative focus group process: differences have to be large to reach statistical significance with small samples. We found the combination useful in that:

1. By beginning with the questionnaire, participants had time to reflect on the questions prior to entering into discussion.
2. Because the farmers retained the questionnaires throughout the course of the session and were allowed to make changes in their responses, the questionnaire results more accurately portray the participants' practices and preferences.
3. The discussion phase helped us better interpret the questionnaire results. For example, "farm tour/demonstrations" was one of the preferred education formats identified by the questionnaire. However, from the focus group discussions, we learned that most participants would probably not attend. Farm tours just ranked high compared with the other choices offered.

Focus Group Responses

It was evident from focus group responses that a few actions could be taken immediately to address needs identified by farmers, but others would require more long-term approaches. Record keeping forms have subsequently been designed and made available statewide. Additional publications on nutrient and manure management have been and are being developed. On-farm research and demonstration sites comparing manure-nitrogen rates using farm-scale equipment have been installed and results will be published as an Extension bulletin. This project demonstrates that evaluation techniques, if forward-looking rather than just retrospective, can be valuable in determining the most appropriate next steps in education and related activities.

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