NDSU NORTH DAKOTA STATE UNIVERSITY

Letter of Intent

Apr 12, 2023

North Dakota State University is pleased to submit an application to:
ND Department of Environmental Quality

Title:
Livestock Environmental Nutrient Management Educational Support Program

Proposed Performance Period:	09/01/2023 - 01/31/2026
NDSU Proposal Reference #:	NOV0008242
NDSU Principal Investigator:	Mary Amber Keena
Department:	Ext Carrington R/E Ctr
PI email address:	Mary.Keena@ndsu.edu
Direct Cost:	$360,742
Indirect Cost:	$40,082
Total Requested US Dollars	$400,824.00
Committed Cost Share in US Dollars:	$267,216.00

This proposal has been institutionally reviewed and approved by the appropriate administrative and programmatic officials. Should this proposal be selected for funding, NDSU reserves the right to negotiate an award with terms and conditions that are appropriate for a public institution of higher education and consistent with NDSU's policies.

NDSU's institutional administrative information is available at https://www.ndsu.edu/research/for_researchers/proposal_development/institutional_information/ NDSU DUNS: 80-3882299 NDSU EIN #: 45-6002439

Any award that results from this application should be in the legal name of the North Dakota State University emailed to ndsu.research@ndsu.edu or sent to the address below. Please call 701.231.8045 if further assistance is required. For technical questions, please contact NDSU's PI.

Sincerely,

Assistant Director of SPA

1.0 PROJECT PROPOSAL SUMMARY SHEET

PROJECT TITLE: Livestock Environmental Nutrient Management Educational Support Program

LEAD PROJECT SPONSOR: North Dakota State University

CONTACT PERSONS:

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STATE: North Dakota WATERSHED: Statewide

HYDROLOGIC UNIT CODE: Statewide HIGH PRIORITY WATERSHED (yes/no): N/A

PROJECT TYPE: Information and Education NPS CATEGORY: Agriculture

WATERBODY TYPES: Lakes/Reservoirs, Rivers, Streams, Groundwater

CONTINUATION PROJECT: Yes. A summary of past accomplishments is provided in Appendix A.

SUMMARIZATION OF MAJOR GOALS:
Support livestock and crop producers by providing them with the information and education needed to implement livestock nutrient management practices to reduce surface and ground water contamination, more efficiently use manure nutrients and successfully operate and maintain livestock manure management systems. Provide educational and informational support to ongoing NPS 319 projects in the state with livestock nutrient management components.

PROJECT DESCRIPTION:
Due to the expanse of need and geographical production variation across ND, one livestock environmental management Extension specialist will be responsible for leadership of the program, providing educational support on livestock manure management, the use of livestock manures in crop production, guidance for custom manure applicators and technical support for producers, NDSU Extension, NDSU researchers and agency personnel. This specialist will be based out of the NDSU Carrington Research Extension Center.

FY 319 funds requested $400,824 Match: $267,216

Other Federal Funds $ Total project cost: $668,040

319 Funded Full Time Personnel: 1

2.0 STATEMENT OF NEED

This proposed project is a continuation of a multi-year project working in conjunction with NDSU Extension. The program has continued to focus on education of producers and agency personnel dealing with water quality issues arising from livestock enterprises. The Livestock Environmental Nutrient Management Educational Support Program has filled critical knowledge gaps and provided education to these groups through presentations, on-site visits, demonstrations, fact sheets, written publications and media outreach. A summary of past accomplishments from January 2019 to the present is included in Appendix A.

2.1 Consistency with Water Quality Priorities

Livestock production is a major industry in North Dakota with approximately 1,850,000 cattle and calves, 148,000 hogs, and 62,000 sheep being inventoried annually on over 26,000 farms. The manure produced by these livestock is identified as a major source of surface water contamination in many watersheds across the state according to the North Dakota 2018 Integrated Water Quality Assessment Report. Animal feeding and handling operations and poor grazing management are two of the impairment sources for 6,510 miles of rivers and streams and 35,005 acres of lakes and reservoirs.

Geographically, North Dakota has two distinct livestock production areas. The eastern portion of the state has a more rolling topography and receives higher rainfall giving rise to potholes and more year-round flowing streams with an increased risk of frequent water runoff events in the watersheds. Livestock operations in the eastern part of the state also tend to concentrate stock cows and calves for winter feeding. The western portion of the state has a steeper topography and receives significantly less rainfall but is prone to higher intensity of runoff during the less frequent weather events. Winter feeding in western ND is somewhat different than eastern ND in that the stock cows are generally fed in more open, unconfined areas on pasture or cropland, while the calves are fed in confined areas. These east-west differences require different management approaches.

In addition to the traditional beef, dairy or swine operations, a new class of livestock owner is becoming more common in ND. These new owners have smaller-scale operations that oftentimes require supplemental income sources. Most of these small-scale operations are also found near urban areas and are at risk for stockpiling excess livestock manure because of minimal land for application, less access to proper equipment, and limited space for winter feeding.

As of 2017, 10 counties are home to 45 percent of the total ND equine inventory (Burleigh, Dunn, McKenzie, Morton, Emmons, Stark, Mountrail, McHenry, Williams and Ward). This project will primarily target AFOs (Animal Feeding Operations) but will also gear educational and technical assistance toward producers with lesser manure management experience, including crop producers who do not own livestock and small-scale livestock owners. This strategy falls within Goal 3 of the ND State NPS Management Program document following the desire to focus on the agriculture industry as a whole and will complement the efforts of others working toward improving water quality in the state.

2.2 Justification for Target Audience

The North Dakota Department of Environmental Quality (NDDEQ) has regulations pertaining to animal feeding operations that require nutrient management planning and review and approval of plans for manure storage and runoff containment. For over 20 years, the NDSU Livestock Environmental Nutrient Management Educational Support Program, sponsored by NPS 319 grants, has made a concerted effort to promote sound nutrient management practices and provide educational support to producers and other NPS 319 projects in North Dakota. Previous and ongoing NPS projects focus primarily on facility design and best management practices (BMPs) for manure handling/storage with limited emphasis on nutrient management educational support, development of nutrient management benchmarks, or investigation of alternative livestock manure management strategies.

The NDSU Livestock Environmental Nutrient Management Educational Support Program, under the direction of the current Livestock Environmental Management Specialist, has evolved since its inception over 20 years ago. The focus has shifted from regulatory compliance issues to alternative livestock feeding options; proper handling of livestock manure once it is contained; and manure application accuracy. While nutrient management plan implementation remains a number one objective, the proposed program also looks to the future of nutrient management with objectives focusing on integrated crop and livestock systems, mortality and offal disposal methods, as well as a special focus on small-scale livestock manure management. Along with numerous invited talks, the current Extension specialist coordinates annual demonstration and workshop events, both at the NDSU Carrington Research Extension Center as well as on producer cooperators' farm sites. These events target not only producers, but also 319 watershed coordinators, NRCS and NDSU Extension personnel. Extension publications written or updated recently include *Common Manure Composting Problems and Their Solutions*; *Composting Animal Manures: A guide to the process and management of animal manure compost*; *Manure Composting Quick Guide; 4 Easy Steps for Composting Dead Livestock*; *Nutrient Characteristics of Solid Beef Manure in North Dakota*; *Solid Manure Sampling for Nutrient Management Planning*; *Manure Spreader Calibration for Nutrient Management Planning*; and *Manure Spills: What You Need to Know and Environmental Consequences.* This information is available on the NDSU Agriculture website, www.ndsu.edu/agriculture.

Crop and livestock producers are aware of the need to properly use all on-farm sources of nutrients. Because of the economic volatility being experienced both in the crop and livestock industries, producers feel the need to more intensely manage nutrients used to enhance crop fertility, specifically in this case, livestock manure. Containing runoff from livestock facilities, applying livestock manure consistently, uniformly or in a way that diminishes environmental risk to water quality and increasing crop yield are all factors that producers must take into consideration when dealing with livestock manure. Because of the sectored nature of modern-day agriculture, it is less likely that crop producers have adequate understanding of the fate and action of livestock manure as a fertilizer. Likewise, livestock producers don't necessarily understand the need for a consistent manure fertilizer product. Once producers learn how to economically use livestock manure as a fertilizer and about the secondary consequences of nutrient runoff, they will implement nutrient management plans that emphasize environmental protection and proper use of livestock manures. Livestock management practices are scrutinized more heavily each year. This position is more critical

than ever in preventing unintended compliance breaches that can threaten both livelihoods as well as the quality of North Dakota's surface and ground water. North Dakota State University, primarily through NDSU Extension, works closely to support livestock and crop producers and NPS projects around the state with applied research, educational materials and technical support relating to using livestock manure. Given the number of livestock facilities and NPS projects needing support, the expanse of the state, and the different cultures of livestock production and runoff management (east vs. west/ urban vs. rural/ small-scale vs. traditional), it is imperative that this project continues under the leadership of a livestock environmental management Extension specialist.

3.0 PROJECT DESCRIPTION

3.1 Goal

The goal of this project is to educate and assist crop and livestock producers in adopting nutrient management practices specific to manure to reduce adverse impacts on water quality. This project will deliver programs to provide education and information support to crop and livestock producers, 319 project coordinators, agency personnel and NDSU Extension agents/specialists. These educational programs will focus on livestock facility management and livestock manure handling and use. The majority of livestock operations in ND are small- to medium-sized. Therefore, this program will primarily focus on livestock systems defined as small or medium animal feeding operations. However, large operations will be offered assistance as needed.

The North Dakota NPS Pollution Management Program has funded a Livestock Waste Management/Engineering Extension Specialist since March 1998. Through effective collaboration with NDSU faculty, Extension agents, NRCS, and other agencies and groups, this individual developed a livestock waste facility design educational program that was well received by ND producers. The program continued to grow to support one and then two nutrient management Extension specialists as the need for educational assistance grew within the state. The current proposed program builds on this earlier work and involves the development and delivery of educational resources, innovative options for manure management for small-scale livestock owners appropriate for ND soils and climate, and expanding the scope of current work with custom manure applicators. The scope of the current program will also expand into a new focus area of individualized work on nutrient management plans and offal disposal options for butcher facilities. The program involves conducting workshops with producers, one-on-one consultations and cooperation with researchers. Close working relationships have been and will be maintained with 319 watershed project coordinators, the NDDEQ, NRCS, local soil conservation districts and other technical service providers. Emphasis will be given to coordination with all entities working with producers to assure the same criteria and recommendations are being used. Special emphasis will be given to program development in the areas of 1) creating and understanding nutrient management plans and offal disposal options for butcher shops; 2) appropriate handling and use of livestock manure nutrients in soil fertility programs; 3) general knowledge and awareness by ND custom manure applicators of the available nutrients and uses of manure; and 4) improved manure management on small-scale operations. On-farm demonstrations will be developed to showcase the best practices to preserve manure nutrients and future nutrient crediting when manure is land applied.

This proposed information and education project will work with a statewide audience of producers and will offer advice and alternatives for livestock manure handling, management and use. This project will also work with existing NPS 319 projects that have an identified livestock manure component. Impact of the program will be measured through ongoing evaluation of participants to determine their adoption of nutrient management practices.

3.2 Objectives

Objective 1: Provide education and advice to individual livestock owners and butcher shop owners on proper disposal and use of livestock mortalities and offal. Emphasis will be given to the processes of composting. Similar to regulations for animal feeding operations, NDDEQ, Division of Waste Management, has regulations pertaining to butcher shops that compost their offal product. They are required to complete a nutrient management plan for storage and runoff containment as well as spreading of the final product. Other disposal methods (i.e., above-ground burial with carbon, burial, landfilling, incineration) will be discussed on an individual basis as needed depending on environmental conditions. Additionally, time will be spent developing a state emergency mass livestock mortality disposal plan specifically regarding foreign animal diseases (such as avian influenza or African swine fever) or natural disasters, in cooperation with other state agencies (i.e., North Dakota Department of Agriculture, NDDEQ, North Dakota Department of Emergency Services, NDSU Extension Disaster Coordinator). Because of the requirements for nutrient management plans that accompany composting as a disposal option, special emphasis will be given to the use of the final product (where it will be spread, rate, timing, crop rotation, etc.) created within this objective.

Task 1:

- Work individually with three livestock owners per year on changing their livestock mortality management practices.
- Host one demonstration per year pertaining to livestock mortality management either at the NDSU CREC or at a livestock owners' operation.
- Write two media pieces per year pertaining to livestock mortality management.
- Host one workshop for state agency partners in year two pertaining to above-ground burial with carbon. One technical expert will be contracted to teach during this workshop.
- Attend two online meetings annually with state agency personnel to modify and refine the North Dakota emergency mass livestock mortality disposal plan.

Approximately 15% of the project will be devoted to this task.

Products: One-on-one livestock owner education; group learning opportunities; two media releases; emergency mass mortality disposal plan.

Task 2:

- Work individually with three butcher shop owners per year, in cooperation with the NDDEQ, Division of Waste Management, on offal compost and nutrient management planning.
- Provide hands-on, on-site training for approved offal compost and nutrient management plan holders.

Approximately 5% of the project will be devoted to this task.

Products: One-on-one offal disposal and use nutrient management planning; hands-on, on-site training for butcher shop owners or those composting or using butcher waste products.

The estimated costs for this objective include the value of 20% of personnel time plus the costs for travel, supplies, communication and contractual services.

Estimated cost $80,165 – 319 grant, $53,443 – Match

Objective 2: Continue development of educational opportunities and materials for custom manure applicators in North Dakota. These opportunities will include assistance with manure application rates, calibrating equipment, education on nutrient management plans, environmental awareness, ND rules and regulations, manure gas safety, communication with clientele and conflict management and stress mitigation during volatile agricultural cycles.

Task 3:

- Proper manure application rates will be taught in a classroom setting using indoor calibration kits during one field day per year. These rates will be determined by manure type, nutrient content, soil type and crop rotation.
- The basics and the importance of nutrient management plans will be shown in a classroom setting and through one-on-one consultations in the field.
- Calibrations will be demonstrated one-on-one or in groups during one field day per year organized by 319 watershed coordinators, NRCS or NDSU Extension personnel. This training will take place with field-scale equipment when permissible.

Approximately 5% of the project will be devoted to this task.

Product: Fifty ND custom manure applicators will have increased confidence in their knowledge of the importance of NMPs, calibration techniques and proper application rates.

Task 4:

- Environmental awareness, ND rules and regulations regarding manure management, vehicle and road rules and restrictions, and business management including communication techniques and conflict management strategies will be taught in a group effort along with NDSU Extension agents, manure industry representatives, soil scientists, ND State Highway Patrol, farm business management specialists, and others when appropriate in various educational settings during one meeting per year in a general location.

Approximately 10% of the project will be devoted to this task.

Product: Develop a network specific to the ND custom manure applicators via classroom setting, social media and/or email where questions can be asked, and information shared regarding manure application and nutrient management. One annual educational meeting per year.

The estimated costs for this objective include the value of 15% of personnel time plus the costs for travel, supplies, communication and contractual services.

Estimated cost $60,124 – 319 grant, $40,082 – Match

Objective 3: Develop educational materials and create learning opportunities for traditionally smaller-scale livestock (e.g., equine, cattle, sheep, chickens, etc.) owners who need manure management assistance. When able, live demonstrations using appropriately-sized equipment will be conducted to show manure spreading, spreader calibration, evenness of spread, application rate differences and grazing management techniques to help manage manure distribution and consequently, parasite management. A social media campaign will be focused on reaching these smaller-scale livestock owners to further disseminate information.

Task 5:

- Two workshops per year pertaining to small-scale livestock manure management will be offered to increase knowledge regarding nutrient management and water quality. Whenever possible, these workshops will be held outdoors in an on-farm setting where lot management, paddock rotation, feedstuffs management, animal health and manure management can be demonstrated.
- Collaboration with NDSU Extension specialists and agents as well as agency personnel and experienced producers will occur.

Approximately 10% of the project will be devoted to this task.

Product: Workshops, demonstrations, informational video about small-scale grazing management and one fact sheet pertaining to managing small-scale livestock manure.

Task 6:

- Four educational webinars per year will be offered for equine owners via an online platform made available live during a specific time and recorded for later viewing. These webinars will include collaboration from NDSU Extension range, soil and environmental specialists, NDSU Extension agents, NDSU Animal Sciences faculty, industry partners, equine owners and agency personnel when appropriate.
- Three subject matter videos (i.e., plant identification, manure spreader calibration, spreading manure, bedding management) will be recorded during seasonally appropriate times and made available during the webinars to showcase topics requested by participants.

Approximately 15% of the project will be devoted to this task.

Product: A network of ND equine owners who have the knowledge and skills to effectively manage manure nutrients while not negatively impacting their land or water resources. Four educational webinars per year. Three subject matter videos will be created during the project period based on participant feedback with at least one accompanying fact sheet.

The estimated costs for this objective include the value of 25% of personnel time plus the costs for travel, supplies, communication and contractual services.

Estimated cost $100,206 – 319 grant, $66,804 – Match

Objective 4: Provide educational and technical support pertaining to general manure management questions and concerns to NDSU Extension, NRCS and other agency personnel as well as crop and livestock producers and urban and youth audiences.

Task 7:

- Provide individuals with printed information (i.e., presentation handouts and Extension publications) as well as individual, science-based management recommendations.
- Educational materials and programming focusing on the use of livestock manure will be shared. Educational materials include press releases for the public (i.e., manure spreader calibration, composting, manure nutrients), website material, social media material and Extension bulletins. Mass media and NDSU Extension Impact Reports will be used to inform producers and the public about successful efforts to reduce impacts on water quality.
- Participation via presentation of technical information in meetings, workshops, demonstrations, roundtable talks and tours that are held to share information with crop and livestock producers and those who advise and work with crop and livestock producers around the subjects of manure sampling, manure nutrient content, spreader calibration, manure composting, crop and livestock integration and the agronomic use of manure and commercial fertilizers. Five demonstrations and/or workshops will be participated in each year. The demonstrations/workshops will be spread throughout North Dakota and will be organized by NDSU Extension agents, NRCS, Soil Conservation Districts, 319 watershed coordinators, or producer organizations.
- Focus will be placed on BMPs that result in cost effective changes to minimize water quality impacts from manure nutrients while complying with current environmental regulations.

Approximately 30% of the project will be devoted to this task.

Product: Three workshops per year (i.e., CAFO Operator School, Junior Beef Producer, Feedlot School) and four demonstrations per year (i.e., Nutrient Management Day, crop and livestock integration demonstration, manure spreader calibration demonstration, manure compost demonstration) as well as ten producer meetings per year (i.e., Kidder County Cow Day, McIntosh County Crop Forum, McHenry County Cattle Feeders Update, Walsh County Livestock Day, Stutsman County Livestock Meeting, Lake Region Roundup, Central Dakota Ag Day, Hettinger County Coffee Talk, Logan County Café Talk) organized during the winter months by NDSU Extension agents/specialists or agency personnel in various ND counties.

The estimated costs for this objective include the value of 30% of personnel time plus the costs for travel, supplies, communication and contractual services.

Estimated cost $120,247 – 319 grant, $80,165 – Match

Objective 5: An evaluation specialist will be contracted to build surveys and analyze collected data from the surveys used for project evaluation. The evaluation specialist will be tasked with quantifying the ongoing and long-term impacts of the Livestock Environmental Nutrient Management Educational Support Program and implementation of practices by project participants. The results will be used to create programming and materials which will improve impact, expand potential clientele, and ultimately induce regional compliance for the benefit of water quality.

Task 8:

- Seek out an evaluation specialist to assist with evaluation of the entire project. This specialist will help draft appropriate questions, correct question structure, advise on timing of evaluations and summarize data from the project.

Approximately 10% of the project will be devoted to this task.

Product: Data showing long-term impacts and implementation of the Livestock Environmental Nutrient Management Educational Support Program.

The estimated costs for this objective include the value of 10% of personnel time plus the costs for travel, supplies, communication and contractual services.

Estimated cost $40,082 – 319 grant, $26,722 – Match

3.3 Milestone Table

See Appendix B: Milestone Table

3.4 Lead Project Sponsor

The lead project sponsor is NDSU Extension. With offices in every county in the state along with seven Research Extension Centers and NDSU main campus, NDSU Extension provides a statewide educational system. The educational system draws upon the research base of North Dakota State University and a network of other universities across the nation in the development of educational and informational materials and programs. NDSU Extension also draws upon the knowledge base of other agencies and organizations including the Natural Resources Conservation Service (NRCS), the North Dakota Department of Environmental Quality, Division of Water Quality (NDDEQ), and the North Dakota Department of Agriculture (NDDOA). Educational programs are delivered through local county Extension agents as well as on- and off-campus specialists. NDSU Extension has a long history of working with these partners in the development and delivery of educational programming and has the ability to access research and Extension specialist knowledge from the departments of Animal Sciences, Plant Sciences, Agricultural and Biosystems Engineering, Natural Resource Sciences, and Research Extension Centers.

3.5 Operation and Maintenance of 319 Funded BMPs

This section is not applicable to this grant proposal.

4.0 COORDINATION PLAN

4.1 Cooperating Organizations

This program will be coordinated with other state agencies and organizations involved in water quality and livestock manure management. NDSU Extension is the lead organization. The North Dakota Agricultural Experiment Station will collaborate with this program through applied research and demonstration projects. The NRCS will cooperate with technical resources and guidelines. The NDDEQ will help provide contacts with ongoing and proposed 319 water quality projects which have a livestock manure management component. The NDDEQ will provide guidelines, rules and regulations for livestock enterprises. Livestock producer organizations provide another conduit to the producers and represent the producers'

viewpoint. NDSU Extension agents and Soil Conservation District (SCD) personnel will provide contacts with producers in counties not represented by a 319 watershed project.

A Nutrient Management Advisory committee will be used to provide overall program direction. Membership will include NDSU Extension Ag Program Leader, Carrington Research Extension Center Director, ND Stockmen's Association's Environmental Services program leader, a representative of the ND dairy producers or ND Dairy Coalition, a representative of the ND pork producers, NDSU Soil Science Extension/researcher, NDSU Ag and Biosystems Engineering researcher, 319 Program Coordinator, NDDOA, NDDEQ AFO team, representatives from NRCS (i.e. state engineer staff and state agronomist), other state agricultural commodity groups, a custom manure applicator, NDSU Extension agent(s) and NDSU Extension district director(s). The advisory committee will meet annually to give overall direction to the program.

The NDSU Extension Ag Program leader and the Director of the Carrington Research Extension Center will make up a two-member steering committee charged with on-going supervision of the project and insure coordination with other livestock manure management efforts.

4.2 Local Support

North Dakota NRCS, NDDEQ, SCD personnel and county Extension agents have all indicated a need for this type of informational and educational program. Individuals working with local 319 funded water quality projects have also indicated a need.

Support letters have been solicited from the NDSU Extension Livestock Environmental Steward Specialist, the Stutsman County 319 watershed coordinator and one ND crop and compost producer. Copies of these letters can be found in Appendix C and will be kept on file at the CREC.

4.3 Coordination

This project will be coordinated with ongoing funded 319 projects and support them with technical information and educational assistance. Coordination with NDSU Extension and Agricultural Experiment Station personnel will also occur.

4.4 Duplication of Efforts

This program is not duplicated by other organizations or agencies. The agencies represented at the most recent Nutrient Management Advisory meeting identified this project and NDSU Extension as the lead on educational and research efforts pertaining to nutrient/manure management and water quality in North Dakota. Other agencies such as NRCS provide site-specific technical assistance on manure management projects but their limited resources require them to focus primarily on sites where cost share assistance is available. This project is not faced with such limitations and provides exceptional assistance in coordination of resources.

5.0 EVALUATION AND MONITORING PLAN

5.1 Plan for Evaluation

Individual workshop and meeting evaluations will be developed and used throughout the duration of this project to determine the knowledge and needs of producers (Appendix D). These evaluations will measure the increase in knowledge of participants as well as their increased likelihood of adopting enhanced manure management practices. However, the impact of the project will be determined by follow-up of individuals who have sought assistance from NDSU Extension or other agencies working in livestock manure management. Adoption of manure handling and nutrient management practices will be the focus of the program evaluations. Program evaluations will be based on Kirkpatrick's four levels of evaluation. Level 1 is what was thought about the training. Level 2 identifies the amount of knowledge gained during training and anticipated behavior change. Level 3 measures the changes in behavior. Level 4 tracks the long-term results from the education received. This is the evaluation system that is supported by NDSU Extension.

An evaluation specialist will be contracted to not only build surveys and analyze collected data from the evaluation strategy, but also help quantify the ongoing and long-term impacts of the Livestock Environmental Nutrient Management Educational Support Program. Appropriate questions, question structure, timing of evaluations and data summary from the project will be deliverables from the evaluation specialist. The results will be used to create programming and materials which will improve impact, expand potential clientele, and ultimately induce regional compliance for the benefit of water quality. The evaluation specialist is included above in Objective 5, Task 8.

5.2 Monitoring for Demonstration Projects

This section is not applicable to this grant proposal.

5.3 Collected Data

This section is not applicable to this grant proposal.

5.4 Monitoring Strategy

This section is not applicable to this grant proposal.

5.5 Data Storage, Management and Use

This section is not applicable to this grant proposal.

5.6 Models

This section is not applicable to this grant proposal.

5.7 O&M of Restoration Activities

This section is not applicable to this grant proposal.

6.0 BUDGET

The budget is detailed in the two budget tables (Appendix D and E). Appendix D details funding sources by year. Appendix E is a detailed budget of the section 319/non-federal budget. The following narrative will explain Appendix E. The salary and fringe lines include 319 and non-federal NDSU cash match monies (i.e., a salaried faculty member spending a portion of his/her time, for which s/he is paid, on a project). The 319 funds will be utilized to continue employment of one extension specialist, a full-time position at the Carrington Research Extension Center. The salary is annualized per year plus fringes, increased by 3% per year. Salary is also included at 10% for a research technician plus associated fringe benefits for the technician to manage and prepare the compost area and demonstrate procedures at workshops. The NDSU non-federal match in this line is the time devoted to the project by other NDSU faculty and staff who will be supporting the program (Appendix F).

This includes project support that will be tracked as match from the following:

1) NDSU Extension Specialists who provide program development and delivery in livestock environmental stewardship, livestock production, forage crops production, and farm and ranch safety.

2) North Dakota Agricultural Experiment Station Scientists who work with animal and agronomy outreach programs at the Carrington Research Extension Center. Education and outreach using nutrient management benchmarks and demonstration projects will be the focus of this collaboration.

3) NDSU County Extension Agents who will organize local educational efforts and help provide educational program delivery that is focused on the specific needs of producers in their region. Specific contributions to the project will include organizing and facilitating regional educational events such as workshops, tours and demonstration projects. These Extension agents will receive additional training on small farm manure management, traditional manure management, using manure as a fertilizer, and mortality management and incorporating this information into their livestock and crops educational programs.

The remainder of the budget is supported from 319 funds. This includes travel and operating support for the specialist. Regular travel includes travel to producer, regional, and national meetings as well as travel costs to bring expert speakers to programs. Printing costs are for production of educational materials including development of Extension bulletins and fact sheets and the development of field records and other printed material to be used by producers. Supplies include computers and printing (including $2,000 for a computer in year one of the project), one load of carbon for above-ground burial demonstrations, sampling supplies, calibration kits, meals for educational meetings and the advisory board (meals at educational events are calculated at $12/person for 20 people per event at two events; the educational events are typically day-long events outside an urban area), and instructional supplies to support the program. Communications costs are for long-distance telephone, internet access and mobile service costs for the specialist. Fees are included for manure and soil analyses, facility rental for workshops, video production, webinar production, and an evaluation specialist. Administrative costs are calculated at 10%.

List of Appendices:

- Appendix A: Past Accomplishments
- Appendix B: Milestone Table
- Appendix C: Letters of Support
- Appendix D: Examples of Evaluation Questions and Impact Statements
- Appendix E: Budget Table Part 1
- Appendix F: Budget Table Part 2
- Appendix G: Value of Time and Services Provided by Extension Personnel as non-Federal Match

Appendix A: Past Accomplishments (January 2019-September 2022)

Presentations

Presentations at producer meetings, professional meetings and in-service/train-the-trainer workshops may involve organization, speaking on specific topics, and/or conducting demonstrations or tours appropriate for the topic. Participation may also involve logistics and behind-the-scenes coordination to ensure relevant speakers and a successful event.

Date	Title of Presentation	Location	Role	Participants
2022 [17 presentations, 443 participants, 323 views online]				
08/11/2022	Manure Management	Shop Talk, Ransom County	Participated in answering round robin questions from attendees	10
08/09/2022	Manure Management	Junior Beef Producer Workshop	Co-hosted; prepared and presented material	12
07/19/2022	Pen Surface Management	CREC	Hosted Beef Production Tour for the Annual Field Day; Prepared and presented material	43
05/18/2022	Bedding and Manure Management	Horse Management Webinar Series	Co-hosted webinar and presented material	16 + 58 views online
05/12/2022	Composting Overview	Envirothon	Co-prepared and presented material	94
05/11/2022	Hay Management	Horse Management Webinar Series	Co-hosted webinar and presented material	30 + 86 views online
05/04/2022	Geriatric Horse and Foal Care	Horse Management Webinar Series	Co-hosted webinar	20 + 66 views online
04/27/2022	Mortality Management	Horse Management Webinar Series	Co-hosted webinar and presented material	21 + 90 views online
03/30/2022	Soil Health Cafe Talk	Logan County	Participated in answering round robin questions from attendees	20
03/23/2022	Manure as a Fertilizer	ND Custom Manure Haulers Annual Education Meeting	Hosted training; prepared and presented material	17
03/16/2022	Review of Manure Management Program	NDCDEA Tree Promotion Meeting	Prepare and present material	25
02/03/2022	Using Manure As A Fertilizer	Emmons County Livestock Production Winter Meeting	Prepare and present material	15

01/20/2022	Feedlot Manure Management	NDSU Feedlot School	Co-hosted; prepared and presented material	45
01/12/2022	Using Manure As A Fertilizer	Divide County Ag Day	Prepare and present material	30
01/06/2022	Controlling Weed Seed Spread Through Manure Management	North Dakota Weed Control Association Annual Conference	Prepare and present material	43
01/05/2022	Using Manure In Your Garden - How Much and What Kind	Lake Region Roundup	Prepare and present material	1 + 13 online views
01/05/2022	Controlling Weed Seed Spread Through Manure Management	Lake Region Roundup	Prepare and present material	1 + 10 online views
2021 [18 presentations, 398 participants, 451 views online]				
09/01/2021	Composting Butcher Waste	ND Solid Waste and Recycling Association	Prepare and present material	12
08/11/2021	Compost Demonstration Day	West Central Research and Outreach Center, Morris, MN	Co-planning, organizing and teaching at this demonstration day. I specifically taught the Site Selection section, the demonstrations of turning, sampling and calibration, lead the discussion during the Diagnostics section and moderated the Producer Panel.	23
07/21/2021	Compost Demonstration Day	Carrington Research Extension Center (CREC)	Co- planning, organizing and teaching at this demonstration day. I specifically taught the Site Selection section, the demonstrations of turning, sampling and calibration, lead the discussion during the Diagnostics section and moderated the Producer Panel.	8
07/20/2021	Managing Manure During Drought	CREC Annual Field Day	Co-hosted Beef Production Tour for the Annual Field Day; Prepared and presented material	36
06/29/2021	Swine Mortality Composting Workshop	Ramsey County	Hands-on workshop for employees of a CAFO swine unit	7
05/26/2021	Horse Management Webinar Series – Equine Conditioning	Online	Co-hosted webinar and facilitated questions	15 + 119 views online

05/19/2021	Horse Management Webinar Series – Manure Management	Online	Co-hosted webinar and presented material	8 + 61 views online
05/12/2021	Horse Management Webinar Series – Drought Management	Online	Co-hosted webinar and presented material	23 + 71 views online
05/05/2021	Horse Management Webinar Series – Grazing Management	Online	Co-hosted webinar and presented material	21 + 115 views online
04/15/2021	Real Colors	Online – Northern Great Plains Research Laboratory	Co-hosted training and presented material	34
04/08/2021	Manure Management	Online – Guest Lecture, NDSU Beef Production	Prepared and presented material	10
03/30/2021	Back Yard Composting Jeopardy	Oliver County	Prepared and presented material	100
02/25/2021	ND Manure Haulers Education Training	Burleigh County	Hosted training and prepared and presented material	10
02/23/2021	Real Colors	Online – ND Farmers Union	Co-hosted training and presented material	12
02/04/2021	Compost Management	CREC	Prepared and presented material on specific compost questions for Foster County NRCS/SCD personnel	3
02/02/2021	Composting and Butcher Waste Management	Online	Prepared and presented materials; mentored Extension agent on hosting a webinar series and preparing a presentation	25
01/20-21/2021	Feedlot Manure Management	CREC	Co-hosted NDSU Extension Feedlot School; prepared and presented material	25
01/13/2021	Winter Horse Management Webinar Series – Facilities Management	Online	Co-hosted webinar and presented material	26 + 85 views online
2020 [20 presentations, 1,310 participants, 1,243 views online]				
12/30/2020	Winter Horse Management Webinar Series –	Online	Co-hosted webinar and facilitated questions	44 + 89 views online

	Feeding Grain and Supplements			
12/16/2020	Winter Horse Management Webinar Series – Feeding Hay	Online	Co-hosted webinar and facilitated questions	56 + 141 views online
12/09/2020	Grazing Cover Crops Panel	Online – DIRT Workshop	Member of panel	241
12/09/2020	Soil Health Café Talk – Manure and Compost	Online – DIRT Workshop	Co-hosted, presented and facilitated questions during 3 rotating discussion groups	40
06/05/2020	Real Colors	Online – Farmer Edge	Co-hosted training and presented material	21
05/28/2020	Butcher Waste Management	Online	Co-hosted webinar with NDDEQ and NDDA	19
06/03/2020	Horse Immunity and Biosecurity Webinar	Online	Co-hosted webinar and presented material	45 + 88 views online
05/20/2020	Horse Parasite Management Webinar	Online	Co-hosted webinar and presented material	23 + 538 views online
05/06/2020	Horse Grazing Management Webinar	Online	Co-hosted webinar and presented material	46 + 135 views online
04/22/2020	Horse Manure Management Webinar	Online	Co-hosted webinar and presented material	71 + 252 views online
04/21/2020	Grazing Cover Crop Webinar Series – Alfalfa and Sainfoin	Online	Co-hosted webinar and facilitated questions	33
04/16/2020	Grazing Cover Crop Webinar Series – Cover Crop Characteristics and Identification	Online	Co-hosted webinar and presented material	72
04/14/2020	Grazing Cover Crop Webinar Series – Calculator and Toxicity	Online	Co-hosted webinar and facilitated questions	66
04/09/2020	Grazing Cover Crop Webinar Series – Research and Economics	Online	Co-hosted webinar and facilitated questions	117
04/07/2020	Grazing Cover Crop Webinar Series – Regulations and Herbicides	Online	Co-hosted webinar and facilitated questions	104

03/05/2020	Soil Health Café Talk	Eddy County	Participated in answering round robin questions from attendees	26
03/04/2020	Soil Health Café Talk	McIntosh County	Participated in answering round robin questions from attendees	22
02/27/2020	ND Custom Manure Hauler Meeting	USDA ARS Mandan	Hosted training and prepared and presented material	16
01/22-23/2020	Feedlot Manure Management	CREC	Co-hosted NDSU Extension Feedlot School; prepared and presented material	31
01/17/2020	Manure and compost	Stutsman County – Ag in the Classroom	Prepared and presented material to youth	217
2019 [18 presentations, 948 participants]				
12/17/2019	Manure Management Jeopardy	Grant County – Coffee Talk	Prepared and presented material in a Jeopardy platform	6
12/17/2019	Manure Management Jeopardy	Adams County – Coffee Talk	Prepared and presented material in a Jeopardy platform	10
12/05/2019	Central Dakota Ag Day	CREC	Co-hosted regional producer education meeting	95
11/22/2019	Mortality Composting Management	Online	Prepared and presented material for CAFO swine barns in ND	7
09/11/2019	Manure Management for Cow/Calf and Feedlot Owners	Cass County – Stockmen's Supply Roundup Meeting	Prepared and presented material using Turning Technologies	50
09/10/2019	Manure Management for Cow/Calf and Feedlot Owners	Morton County – Stockmen's Supply Roundup Meeting	Prepared and presented material using Turning Technologies	190
06/25/2019	Equine Manure Management Plans	North Dakota 4-H Camp	Prepared hands-on presentation for youth	13
04/16/2019	Red River Basin BMP Workshop	University of Minnesota – Crookston	Facilitated roundtable discussion	25
04/17/2019	Red River Basin BMP Workshop	University of Minnesota – Crookston	Facilitated roundtable discussion	25
04/08/2019	Real Colors	Burleigh County	Co-hosted training and presented material	31
03/21/2019	Foster County Women's Ag Day	CREC	Co-planned, co-hosted, emceed event	73
03/06/2019	Lunch & Learn – Cover Crops	Pierce County	Participated in answering round robin questions from attendees	5

03/04/2019	Grazing Cover Crops – Manure Management	Stark County	Co-hosted meeting and presented material	42
02/21/2019	ND Custom Manure Haulers Meeting	USDA ARS Mandan	Hosted training and prepared and presented material	10 + 3 online
01/31/2019	Soil Health Café Talk	Griggs County	Participated in answering round robin questions from attendees	40
01/28/2019	Grazing Cover Crops – Manure Management	Grand Forks County	Prepared and presented material	42
01/24/2019	Feedlot Manure Management	CREC – NDSU Feedlot School	Prepared and presented material	30
01/18/2019	Who Does This Poo Belong To?	Stutsman County – Ag in the Classroom	Prepared and presented material to youth	251

Demonstrations and Tours

Demonstrations are an extension of the publications and fact sheets and encourage learning by participation either in large groups or one-on-one.

Date	Title of Demonstration	Location	Role	Participants
2021				
07/27/2022	Compost and Soil Health Demonstration Day	Traill and Steele Counties	Demonstrated proper manure composting techniques; sampling compost and turning demonstration	47
08/11/2021	Compost Demonstration Day – Morris	West Central Research and Outreach Center – Morris, MN	Demonstrated turning compost, sampling compost and calibrating a compost spreader	23
07/21/2021	Compost Demonstration Day – Carrington	CREC	Demonstrated turning compost, sampling compost and calibrating a compost spreader	8
07/14/2021	319 Watershed Coordinators Tour and Conference	CREC	Co-host and facilitate tour of CREC Best Management Practices	20
2020				
06/24/2020	Butcher Waste Composting Demonstration	CREC	Organized and hosted event; Demonstrated how to compost butcher waste	9
2019				
09/17/2019	Grazing Cover Crop Tour	CREC	Co-organize event; Present information	10
08/07/2019	Compost Demo Day – On-farm Demo	Renville County	Organized event; prepared and presented material;	26

			Demonstrated how a compost turner operates	
07/09/2019	Compost Demo Day – On-farm Demo	Trail County	Organized event; prepared and presented material; Demonstrated how a compost turner operates	20

In-Service Trainings and Train-the-Trainer Workshops

Date	Title of Workshop	Location	Role	Participants
09/29-30/2021	Livestock In-Service	CREC	Co-organized, co-hosted	41
01/13/2020	Cover Crops In-Service	CREC	Co-organizer, co-hosted and led hands-on activity	45
12/19/2019	Weed Resistance Management In-Service Training	CREC	Co-organized and co-hosted event	46
12/16/2019	Watershed Coordinator Briefing	Online	Organized and presented information	8
09/25-26/2019	Nutrient Management Training	CREC	Organized, hosted and presented information to NRCS, watershed coordinators, SCD technicians and NDSU Extension agents	55
09/04-05/2019	Livestock In-Service	USDA Northern Great Plains Research Laboratory	Co-organized, co-hosted, presented, moderated panel discussion	40
04/09/2019	Watershed Coordinator Briefing	Online	Organized and presented information	6
02/06/2019	Watershed Coordinator Briefing	Online	Organized and presented information	9

Presentations at Professional Meetings

Date	Title of Presentation	Conference	Role	Participants
2022				
08/03/2022	Manure Management Tools	North Dakota Nonpoint Source Pollution 319 Watershed Coordinators Conference, Carrington, ND	Prepare and present material	29

04/21/2022	Promoting Manure Composting for Livestock Operations	Waste to Worth, Toledo, Ohio	Presenter, Networking chairperson, Proceedings reviewer	20 + 7 online
2021				
10/13/2021	Small Farm Team Update	NDSU Extension and REC Fall Conference, Bismarck, ND	Prepare Information	22
10/13/2021	Making Your Webinars Wow	NDSU Extension and REC Fall Conference, Bismarck, ND	Co-presenter	21
07/15/2021	Project Successes and Challenges	North Dakota Nonpoint Source Pollution 319 Watershed Coordinators Conference, Carrington, ND	Presenter, Organizer of Conference Tour	20
2019				
04/26/2019	Adding Color to Your Program…People and Personalities.	Waste to Worth, Minneapolis, MN	Presenter, Co-organizer of conference, Proceedings chairperson	40

Site Visits

Participation in farm visits allows for one-on-one interaction between the specialist and the livestock owner or crop producer. This type of education allows for questions to be answered in a non-threatening environment while offering and teaching a technical service such as proper sampling technique or proper spreading rate.

Date	Reason for Visit	Location	Participants
04/11/2022	Producer visit – mortality management	LaMoure County	3
04/11/2022	Producer visit – mortality management	LaMoure County	3
04/11/2022	Producer visit – mortality management	Dickey County	3
04/27/2022	Producer visit – mortality management	Dickey County	2
05/06/2022	Producer visit – mortality management	LaMoure County	2
05/18/2022	Producer visit – mortality management	Dickey County	3
05/24/2022	Producer visit – mortality management	LaMoure County	3
06/07/2022	Producer visit – mortality management	LaMoure County	3
06/16/2022	Producer visit – mortality management	LaMoure County	3
06/24/2022	Producer visit – mortality management	LaMoure County	2
06/10/2020	Producer visit – horse lot drainage issues	Eddy County	3
03/12/2020	Site visit – butcher waste NMP	Rolette County	3
08/08/2019	Site visit – butcher waste composting	Burleigh County	2
07/23/2019	Producer visit – manure composting	Renville County	1
05/01/2019	Site visit – butcher waste composting	Stark County	3

Information Booths

Date	Booth	Location
08/31/2021	NDSU Animal Science Booth	Pigs, Diversifying for Profitability
10/22-24/2019	CREC Booth	NDSU Extension & REC Fall Conference
09/19-20/2019	Research Extension Center Livestock Units Booth	North Dakota Stockmen's Convention
02/12/2019	ND Ag. Experiment Station Livestock Units Booth	Agri-International

Extension Curriculum Development

M. A. Keena, Rogers, E., Hamilton, D., Wilson, M., Gould, M.C., Erb, K., Adams, B., Zhang, D., Halopka, R., Clark, J. 2021. *Manure Applicator Training – Wet Solid.*

Co-led the content creation of curriculum that can be used either online (self-paced) or in person (classroom style) for for-hire manure applicator training.

This course was created to give new hires an understanding of the ins and outs of safe and responsible manure handling and application. The nine modules contain either interactive knowledge checks and/or quizzes to solidify learner retention. Topics covered in the modules include why working safely is important, daily equipment inspection checklists, working safely around manure gasses, planning driving routes to fields, calibrating manure spreading equipment, spreader pattern, nutrient management plans, setback importance with state-specific resources, biosecurity, manure spill prevention and clean-up and professionalism within the industry.

This course was designed to be used by agriculture and natural resources Extension agents/specialists or business owners as part of their on-boarding process.

D. Hamilton, Wilson, M., **Keena, M. A.**, Erb, K., Adams, B. 2021. *Manure Applicator Training – Dry Solid.*

Assisted with content creation of curriculum that can be used either online (self-paced) or in person (classroom style) for for-hire manure applicator training.

This course was created to give new hires an understanding of the ins and outs of safe and responsible manure handling and application. The 10 modules contain either interactive knowledge checks and/or quizzes to solidify learner retention. Topics covered in the modules include why working safely is important, daily equipment inspection checklists, working safely around manure gasses, planning driving routes to fields, calibrating manure spreading equipment, spreader pattern, nutrient management plans, setback importance with state-specific resources, biosecurity, manure spill prevention and clean-up and professionalism within the industry.

This course was designed to be used by agriculture and natural resources Extension agents/specialists or by business owners as part of their on-boarding process.

K. Erb, **Keena, M. A.**, Wilson, M., Gould, M.C., Rogers, E., O'Brien, A., Halopka, R., Koepp, G., Clark, J., Nye, L., Adams, B., Zhang, D. 2021. *Manure Applicator Training – Liquid.*

Assisted with content creation of curriculum that can be used either online (self-paced) or in person (classroom style) for for-hire manure applicator training.

This course was created to give new hires an understanding of the ins and outs of safe and responsible manure handling and application. The 10 modules contain either interactive knowledge checks and/or quizzes to solidify learner retention. Topics covered in the modules include why working safely is important, daily equipment inspection checklists, working safely around manure gasses, planning driving routes to fields, calibrating manure spreading equipment, spreader pattern, nutrient management plans, setback importance with state-specific resources, biosecurity, manure spill prevention and clean-up and professionalism within the industry.

This course was designed to be used by agriculture and natural resources Extension agents/specialists or by business owners as part of their on-boarding process.

Extension Publications
Publications and fact sheets allow for dissemination of research and step-by-step instructions for accomplishing tasks such as manure spreader calibration, sampling manure for nutrient analysis or composting animal manures.

- **Mary Keena**, Miranda Meehan, Tom Scherer. 2022. Nitrogen Behavior in the Environment. NM1299, reviewed.

- **Mary Keena**, Miranda Meehan, Tom Scherer. 2022. Environmental Implications of Excess Fertilizer and Manure on Water Quality. NM1281, reviewed.

- **Mary A. Keena**, Chrysies Modderman, Melissa L. Wilson, Jeff Gale. 2022. Common Manure Composting Problems and Their Solutions. NM2046.

- **Mary A. Keena**. 2022. Composting Animal Manures: A guide to the process and management of animal manure compost. NM1478, revised.

- **Mary A. Keena**, Chrysies Modderman, Melissa L. Wilson, Jeff Gale. 2022. Manure Composting Quick Guide. NM2047.

- **Mary A. Keena**, Paige Brummund, Alicia E. Harstad, Penny L. Nester. 2021. 4 Easy Steps for Composting Dead Livestock. AS1781, revised.

- **Mary A. Keena** and Chris Augustin**.** 2021. Nutrient Characteristics of Solid Beef Manure in North Dakota. NM2007.

- **Mary A. Keena**. 2021. Solid Manure Sampling for Nutrient Management Planning. NM1259, revised.

- **Mary A. Keena**. 2021. Manure Spreader Calibration for Nutrient Management Planning. NM1418, reviewed.

- Shafiqur Rahman, Karl Rockeman, Kevin Erb, **Mary Keena**. 2020. Manure Spills: What You Need to Know and Environmental Consequences. NM1555, revised.

- **Mary Keena**. 2020. Resource Guide for Livestock Manure Management. NM1320, reviewed.

- **Mary Keena**, Chris Augustin, Karl Rockeman. 2019. Alternative Winter Feeding Strategies for Beef Cattle Management. NM1726.

- Chris Augustin and **Mary Keena**. 2019. Containment Pond Management. NM1626, reviewed.

Professional Reports

- **Keena, M** and M. Meehan. 2022. NDSU Extension responds to highly pathogenic avian influenza outbreak. 2022 *North Dakota Livestock Research Report,* 17

- **Keena, M.** 2021. Horse management webinar series: Expanding NDSU Extension's reach to equine enthusiasts. *2021 North Dakota Livestock Research Report,* 56.

- Meehan, M.A., **M.A. Keena**, K.K. Sedivec. 2021. NDSU Extension hosts webinars to help ranchers navigate drought. *2021 North Dakota Livestock Research Report,* 62-63.

- **Keena, M.** 2020. Nutrient management educational support program: A five-year review. *2020 North Dakota Beef and Sheep Report*, 55-57.

- Meehan, M.A., **M. Keena**, M. Berti, K.K. Sedivec, M. Ostlie, E. Gaugler. 2020. Integration of Crop and Livestock Systems in North Dakota. *2020 North Dakota Beef and Sheep Report,* 48-50.

Media Outreach
Interviews may occur because of press releases or upcoming events and connect the reader/listener to a person. Media outreach in various formats provides a means of information dissemination.

Date	Description	Intervention Channel	Affiliation
2022			
09/01/2022	Highly pathogenic avian influenza returns to North Dakota	Article	NDSU press release
08/15/2022	2022 North American Manure Expo Review	Blog	Center Points
08/04/2022	Animal Composting, What Is It and How Does It Work?	Podcast	MHVvoice – Ashburton, New Zealand
07/25/2022	Be Aware of Toxic Cyanobacteria	Blog	Center Points
07/19/2022	Feedlot Pen Surface Management	Radio	KDAK – Greg Grenz

06/29/2022	Be aware of toxic cyanobacteria	Article	NDSU press release
05/10/2022	Reduce Muddy Conditions for Livestock Health	Article	NDSU press release
04/22/2022	Highly Pathogenic Avian Influenza Continues to Impact Wild and Domestic Birds	Article	NDSU press release
04/18/2022	Help Available for Livestock Death Losses Due to Blizzard	Article	NDSU press release
04/07/2022	NDSU Extension Offers Guidance on Handling HPAI-suspected Wild Birds	Article	NDSU press release
04/01/2022	NDSU Extension to Host Spring Horse Management Webinar Series	Article	NDSU press release
03/31/2022	Highly Pathogenic Avian Influenza	Podcast	NDSU Sound Ag Advice – Kelli Anderson
03/31/2022	HPAI, Wild Bird and Domestic Case	Radio	Ag News 890 – Eric Johnson
03/30/2022	Highly Pathogenic Avian Influenza confirmed in Wild and Domestic Birds in North Dakota	Article	NDSU press release
03/25/2022	HPAI, Introduction and Biosecurity	Radio	Ag News 890 – Mick Kjar
03/24/2022	Poultry Farmers Encouraged to Protect their Flock from HPAI	Article	NDSU press release
03/24/2022	Containment Pond Management	Radio	RRFN – Cierra Dockter
03/17/2022	Ranchers in Eastern North Dakota Should Prepare for Flooding	Article	NDSU press release
03/15/2022	Manure As A Fertilizer and Weed Management	Radio	Ag News 890 – Mick Kjar
03/09/2022	Consider Manure as a Fertilizer	Article	NDSU press release
01/04/2022	Manure As A Fertilizer and Weed Management	Radio	RRFN – Cierra Dockter
2021			
12/13/2021	Overwintered Cattle May Spread Weed Seeds	Blog	Center Points
12/13/2021	NDSU Extension Webinars Facilitate Adaptation of Drought Management Strategies	Article	NDSU press release
12/01/2021	Ensure Proper Disposal of Livestock Carcasses	Article	Dakota Farmer
10/26/2021	Overwintered Cattle May Spread Weed Seeds	Article	NDSU press release
09/29/2021	Be Aware of Purchasing Livestock Feed Containing Weed Seeds	Article	NDSU press release
08/23/2021	NDSU Extension Co-hosts 2021 North American Manure Expo	Blog	Center Points
08/12/2021	General manure management	Podcast	American Ag Network – Jessica Benson
07/20/2021	Composting manure and weed management	Radio	KFGO – Sarah Heinrich
07/20/2021	Manure management during drought	Radio	RRFN – Megan Overby

07/20/2021	CREC Field Day	Radio	KDAK – Greg Grenz
07/12/2021	Manure Composting Workshops	Blog	Center Points
06/14/2021	Sacrifice Area May Save Grazing Resources	Blog	Center Points
06/09/2021	Summer Manure Management	Podcast	NDSU Sound Ag Advice – Kelli Anderson
05/25/2021	Extension Hosting Manure Composting Workshops	Article	NDSU press release
05/13/2021	Drought May Facilitate Spread of Noxious Weeds	Article	NDSU press release
05/11/2021	Sacrifice Area May Save Grazing Resources	Article	NDSU press release
05/10/2021	Livestock Nutrient Management Important on Small Farms	Blog	Center Points
05/07/2021	Livestock Nutrient Management Important on Small Farms	Article	NDSU press release
04/28/2021	NDSU Extension Hosting Spring Horse Management Webinars	Article	NDSU press release
04/05/2021	Manure and Compost for Soil Health	Podcast	NDSU Soil Sense – Tim Hammerich
03/29/2021	Noxious, Troublesome Weeds Spread Through Manure	Blog	Center Points
03/25/2021	Noxious, Troublesome Weeds Spread Through Manure	Article	NDSU press release
03/08/2021	Spreading Manure Across the Frozen Plains	Blog	Center Points
02/22/2021	Is Your Ranch Prepared for Drought?	Blog	Center Points
01/18/2021	Meeting You Where You Are, Online	Blog	Center Points
01/01/2021	Alternative Winter Feeding Strategies for Beef Cattle Management	Article	Progressive Cattle Magazine
2020			
07/28/2020	Online Manure Composting Workshop	Television	KFYR Noon Report – Hope Sisk
06/26/2020	NDSU Extension Hosting Online Composting Workshop	Article	NDSU press release
05/28/2020	North American Manure Expo	Radio	Ag News 890 – Mick Kjar – Farm Talk
05/26/2020	NDSU Extension Hosting Horse Immunity and Biosecurity Webinar	Article	NDSU press release
05/12/2020	NDSU Extension Hosting Horse Parasite Management Webinar	Article	NDSU press release
04/27/2020	NDSU Extension Hosting Horse Grazing Management Webinar	Article	NDSU press release
2019			
12/23/2019	Sunrise	Blog	Center Points
11/04/2019	Hard Conversations	Blog	Center Points
09/25/2019	Pump Containment Ponds Before Unpermitted Release Occurs	Article	NDSU Press release
08/05/2019	Spreader Pattern	Blog	Center Points

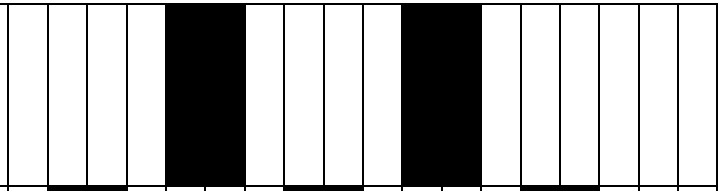
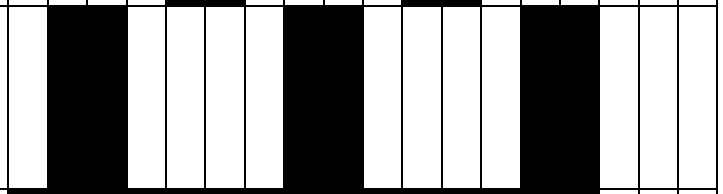
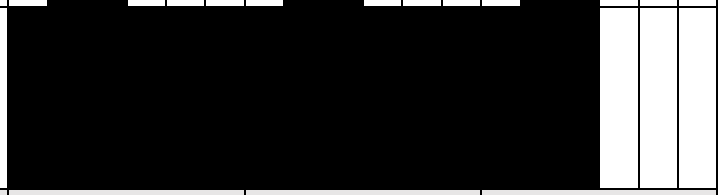
07/15/2019	Northwest Manure Compost Demo Day Set	Article	NDSU press release
07/12/2019	CREC Annual Field Day	Radio	KDAK – Greg Grenz
07/02/2019	Beware of Palmer Amaranth in Grain Screenings	Article	NDSU press release
06/17/2019	Manure Compost Demo Day Set	Article	NDSU press release
05/27/2019	Memorial Day Thoughts	Blog	Center Points
05/01/2019	LEM News, V8, I2	Newsletter	Livestock Environmental Management Program
04/29/2019	Avoid Introducing Weed Seeds through Livestock Feed	Article	NDSU press release
03/07/2019	Foster County Women's Ag Day	Radio	KDAK – Greg Grenz
01/23/2019	NDSU Feedlot School	Radio	KFYR/KFGO – Sarah Heinrich
01/14/2019	North American Manure Expo…What's in a NAME?	Blog	Center Points
01/10/2019	Mortality Composting	Radio	RRFN – Megan Ternquist
01/07/2019	Intentional	Blog	Center Points
01/07/2019	Producers Need Disposal Plan for Dead Livestock	Article	NDSU press release
01/02/2019	LEM News, V8, I1	Newsletter	Livestock Environmental Management Program

Appendix B: Milestone Table

Group 1 – NDSU LEM Extension Specialist; **Group 2** – NDDEQ; **Group 3** – NDSU Extension agents/specialists; **Group 4** – 319, NRCS; **Group 5** – Other (manure industry reps, out-of-state speakers, producers, farm business management specialist, etc.)

Task/Responsible Organizations	Output	Qty.	Year 1	Year 2	Year 2.5
Objective 1					
Task 1 – Individually assist livestock owners with changing mortality management plans. (3/yr.; Group 1 & 3)	One-on-one producer education.	7			
Task 2 – Individually assist butcher shop owners with offal disposal plans and NMPs. (3/yr.; Group 1 & 2)	One-on-one education.	7			
Objective 2					
Task 3 – Demonstrate manure spreader calibration and teach the basics and importance of NMPs to manure applicators. (2/yr.; Group 1, 3 & 4)	One-on-one or group applicator education.	5			
Task 4 – Aspects of the ND custom manure applicator industry, including environmental awareness, ND rule and regulations, vehicle and road rules and business management will be taught in a classroom setting. (1/yr.; Group 1, 3 & 5)	A network of 50 or more ND custom manure applicators who can ask questions and received information pertaining to manure application and nutrient management.	2			

Objective 3																							
Task 5 – Hands-on workshops for small-scale livestock owners where lot management, paddock rotation, feed management, animal health and manure management will be discussed and demonstrated. (2/yr.; Group 1, 2, 3, 4 & 5)	Workshops and demonstrations pertaining to small-scale livestock management.	5				■						■											
	Fact sheet regarding small-scale livestock manure management.	1																■					
	Video pertaining to small-scale grazing management.	1				■																	
Task 6 – Hands-on workshops pertaining to soil, range, grazing and manure management will be held among counties containing the highest equine inventory. (4/yr.; Group 1, 3 & 4)	Equine owners with the knowledge and skills of how and why to management manure nutrients.	8				■						■											
	Videos pertaining to plant identification, small-scale manure spreading and manure spreader calibration.	2											■										
Objective 4																							
Task 7 – Provide educational and technical support pertaining to general manure management issues to producers, NDSU Extension	Provide Groups 2, 3, 4 & 5 with science/based manure management recommendations (5/mo.)	150	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					

and agency personnel. (Group 1, 2, 3, 4 & 5)	Workshops (3/yr.) and demonstrations (4/yr.)	14	
	Educational Producer Meetings (10/yr.)	25	
	News Articles (5/yr.) and blog posts (3/yr.)	20	
Objective 5			
Seek out an evaluation specialist to assist with evaluation of the entire project.	Data showing long-term impacts and implementation of the LEM Educational Support Program.	1	

Appendix C: Letters of Support

NDSU | ANIMAL SCIENCES

September 21, 2022

Greg Sandness
NPS Management Program Coordinator
North Dakota Department of Environmental Quality
4201 Normandy Street
Bismarck, ND 58503

Dear Greg,

It is a pleasure to provide this letter of support for the Livestock Environmental Management Educational Support Program and associated position at the Carrington Research Extension Center (CREC). Over the last seven years, I have had the pleasure of collaborating with Mary to provide education to farmers, rancher, Extension personnel, consultants and agency personnel in my position as the NDSU Extension Livestock Environmental Stewardship Specialist and more recently as the Disaster Education Coordinator.

In 2022, North Dakota producers experienced two disasters that resulted in mass livestock mortalities, Highly Pathogenic Avian Influenza (HPAI) and the April blizzards. Mary was critical in providing education and support on managing livestock mortalities associated with these events. She worked closely with agency personnel and producers to ensure that HPAI mortalities disposed of via composting were completed properly. One of the challenges impacting the response to this event was the lack of knowledge amongst local responders (Extension agents and emergency managers). Objective 1 of Mary's project will help to address the knowledge gaps encountered during these response efforts, enabling us to better support those impacted by foreign animal diseases and mass livestock mortalities.

In the state of North Dakota, livestock are one of the leading sources of nonpoint source pollution. Mary's educational programing and technical support to Extension agents, technical service providers, custom manure haulers and farmers is critical in promoting best practices to reduce nonpoint source pollution and enhance water quality in the state. In recent years, there has been growing interest in the use of manure and livestock integration into crop systems. As a result, Mary fields numerous questions and conducts consultations with producers regarding nutrient valuation and management in these systems.

I have no doubt that the evaluation component of this program will show the significant impact this program has on individual participants and its value to livestock production, crop production and natural resources in the state. I strongly support the continued funding of this program and position at the CREC.

Sincerely,

Miranda Meehan, PhD
NDSU Extension Livestock & Environmental Stewardship Specialist
NDSU Extension Disaster Education Coordinator
PO Box 6050 Fargo, ND 58104
miranda.meehan@ndsu.edu

Steve and Dorothy Enger
14549 16th St. NE
Hatton, ND 58240

September 19, 2022

Greg Sandness
ND NPS Management Program Task Force
918 E. Divide Ave., 4th floor, Gold Seal Center
Bismarck, ND 58501

Dear Greg and Task Force,

We support funding for the Livestock Environmental Nutrient Management Educational Support Program position.

Mary is a positive person with a passion for her work. We have worked with her several times involving our no-till and organic farming operation. We make our own compost for our farm using manure as one of the compost ingredients. Her depth of knowledge is remarkable. We have worked with Mary over the course of many years. She has been involved with tours on our farm where we demonstrate soil health and composting techniques. Mary willing gives her time and input for positive results. Mary researches information for our questions and quickly returns her findings to us. She is a wealth of information for producers on small and large-scale projects.

Farmers continually need to be informed of new ways to improve their soil health. Structured farmers are slow to change their farming operations. Mary quickly shares her expertise with farmers and ranchers to promote soil health and how to regenerate the soil. Compost and manure are key ingredients to improve biological structure in the soil.

Mary's work is vital for our state, producers, ranchers, and those working in agricultural positions.

Sincerely,
Steve and Dorothy Enger

STUTSMAN COUNTY
SOIL CONSERVATION DISTRICT

Stutsman County Soil Conservation District
1301 Business Loop East - Jamestown, ND 58401 - Phone (701) 252-1920 X 3

September 20, 2022

Greg Sandness
ND NPS Management Program Task Force
4201 Normandy Street, Bismarck, ND 58503-1324

I am writing this letter of support for the continuation of funding for the Livestock Environmental Nutrient Management Educational Support Program position. This position is very beneficial to our area farmers and ranchers who annually apply nutrients to their fields. It is also beneficial to us as 319 watershed coordinators.

As a 319-watershed coordinator we have utilized this position many times for educational workshops and as a resource for our agriculture producers to contact with questions. Education and outreach to agriculture producers is critical, as many livestock operations can contribute to water quality issues.

Therefore, we feel it is important to fund this program and have this position as a resource.

Sincerely,

Dustin Krueger
319 Watershed Coordinator
Stutsman County Soil Conservation District

Appendix D: Examples of Levels 1, 2 & 3 evaluations and NDSU Extension Impact Reports

2021 NDSU Feedlot School
NDSU Carrington Research Extension Center
January 20-21, 2021

Please complete the following evaluation in order to help us prepare for next year's NDSU Feedlot School.

1. Which best describes you? (Check all that apply)
   ____Feedlot Owner ____Backgrounder ____Feedlot Manager
   ____General Cattle Feeder ____Feedlot Employee ____Cow/Calf Operator
   ____Industry Rep ____Student ____Other: ____

2. How did you learn about the 2021 NDSU Feedlot School?
   ___Newspaper ___Magazine ___NDSU Extension
   ___Website ___Waitlist Notification ___Other: _____

3. On a scale of 1 through 5, with 1 being very low and 5 being very high, please rate the usefulness of the following topic areas/presentations. Circle your response.

a. Feeding Cattle in North Dakota (Hoppe)	1	2	3	4	5
b. Facility Design and Equipment(Ressler)	1	2	3	4	5
c. Budgets for Different cattle feeding Scenarios (Parman)	1	2	3	4	5
d. Cattle Requirements/Feed Processing/Mixing (Hoppe)	1	2	3	4	5
e. Implants and Growth Promotion Technologies (Neville)	1	2	3	4	5
f. Feed Additives and VFDs (Hoppe)	1	2	3	4	5
g. Feed Sampling, Testing and Nutrient Analysis (Block/Nordby)	1	2	3	4	5
h. Ration Formulation (Block/Hoppe)	1	2	3	4	5
i. Using Cowbytes to Balance Rations (Block/Hoppe)	1	2	3	4	5
j. Beef Quality Assurance (Pederson)	1	2	3	4	5
k. Feedlot Diseases and Treatments (Stokka)	1	2	3	4	5
l. Q & A Session Wednesday Night	1	2	3	4	5
m. CREC Feedlot Research Facilities Overview (Neville)	1	2	3	4	5
n. Low Stress Working Facilities (Neville)	1	2	3	4	5
o . Feed Bunk Reading and Manure Visual Observation (Neville)	1	2	3	4	5
p. Bunk Reading and Feed Delivery (Hoppe)	1	2	3	4	5
q. Manure and Nutrient Management (Keena)	1	2	3	4	5
r. Livestock Outlook (Petry)	1	2	3	4	5
s. Price Protection with Hedging and LRP (Petry)	1	2	3	4	5
t. Carcass Quality and Marketing on the Grid (Maddock)	1	2	3	4	5
v. Overall Facilities	1	2	3	4	5
w. Meals/Breaks	1	2	3	4	5
x. Feedlot School Publications Flash Drive	1	2	3	4	5
y. Ease of Registration	1	2	3	4	5

Directions: Please rate your learning from this program. Your honest responses are valued. Circle the appropriate number to indicate your response using a scale of 1 – 5.

	Nothing		Some		A Lot
Overall, how much did you learn from the 2021 NDSU Feedlot School?	1	2	3	4	5

Please rate each of the following:	Low		Moderate		High
My knowledge of animal requirements, available feeds, feed additives, feed testing, etc.					
Before Participation	1	2	3	4	5
Now, After Participation	1	2	3	4	5
My knowledge of feed nutrient analysis, feed processing, ration formulation, etc.					
Before Participation	1	2	3	4	5
Now, After Participation	1	2	3	4	5
My awareness of feeding/feedlot facilities, low stress working facilities, etc.					
Before Participation	1	2	3	4	5
Now, After Participation	1	2	3	4	5
My knowledge of feedlot diseases, treatments, and health programs.					
Before Participation	1	2	3	4	5
Now, After Participation	1	2	3	4	5
My understanding of carcass quality and marketing on the grid.					
Before Participation	1	2	3	4	5
Now, After Participation	1	2	3	4	5
My knowledge of using market information to manage risk with pricing opportunities.					
Before Participation	1	2	3	4	5
Now, After Participation	1	2	3	4	5

What did you learn from the 2021 NDSU Feedlot School that you plan to take home and use?

The most important information I learned from the 2021 NDSU Feedlot School:

What additional topics should be included in next year's NDSU Feedlot School?

What suggestions do you have to improve next year's NDSU Feedlot School?

Other comments:

2020 NDSU Extension Spring Horse Management Webinar Series 6 Month Follow-up

Since attending the Spring Horse Management Webinar Series, have you made any changes to your operation or practices based upon information obtained from the topics presented during the workshop?

	Did you make changes?	
	Yes, I made changes	No, I did not make changes
Manure Management	○	○
Grazing Management	○	○
Parasite Management	○	○
Horse Immunity and Biosecurity	○	○

If applicable, please indicate what specific changes you did make based on the information obtained from the Spring Horse Management Webinar Series.

_____

Please indicate what future topics you would like to see us host on this webinar platform.

_____

2020 Online Manure Composting Workshop Evaluation

On a scale from “excellent” to "poor", how would you rate the following aspects of this online workshop?

	Excellent	Good	Fair	Poor	Not applicable
Timeline of the workshop (videos released 1 wk prior to live discussion)	○	○	○	○	○
Format of the workshop (self-paced videos followed by live discussion)	○	○	○	○	○
Amount of material in the workshop (13 videos and a 2-hr live discussion)	○	○	○	○	○
Topics covered	○	○	○	○	○
Registration ease	○	○	○	○	○
How was your internet access and its ability to access all of content of this course?	○	○	○	○	○
Overall, how did you like viewing the videos?	○	○	○	○	○
How did you like the live discussion?	○	○	○	○	○
How did you like the diagnostic video quiz?	○	○	○	○	○

Please provide any additional comments or suggestions to any of the above aspects of the workshop:

_____

_____

If you were to retake this workshop, would you rather it be in-person with your colleagues and instructors, or online and on your own? Please explain which you would like better and why?

_____

_____

On a scale from "**strongly agree**" to "s**trongly disagree**", how would you rate the following aspects of this course:

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
This workshop was valuable/worthwhile.	○	○	○	○	○	○
The workshop covered the content as advertised.	○	○	○	○	○	○
I have a deeper understanding of manure composting as a result of this workshop.	○	○	○	○	○	○
I would recommend this workshop to others.	○	○	○	○	○	○

Please provide any additional comments or suggestions to any of the above aspects of the course:

_____

_____

On a scale from “strongly agree” to “strongly disagree”, do you have a better understanding of ...

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
the basics procedures of manure composting	○	○	○	○	○	○
how to calibrate a compost or manure spreader	○	○	○	○	○	○
compost sampling	○	○	○	○	○	○
how to interpret your compost nutrient analysis	○	○	○	○	○	○
how to troubleshoot and remedy common compost problems	○	○	○	○	○	○
land application principles and calculations	○	○	○	○	○	○
economics of composting manure	○	○	○	○	○	○
real-world compost operations and how they work	○	○	○	○	○	○

Please provide any additional comments or suggestions on the topics, format, presenters, or other aspects of the workshop presentations.

_____

_____

What do you think were the best aspects of this workshop?

_____

_____

How do you think this workshop could have been improved upon?

_____

_____

What other manure-related topics would you be interested in learning about?

_____

_____

2021 Manure Composting Workshop Follow Up Survey

1. Which manure composting workshop(s) did you attend? (select all that apply)

- [ ] Online videos (created in 2020)
- [ ] Carrington, ND workshop, July 21, 2021
- [ ] Morris, MN workshop, August 11, 2021
- [ ] I did not attend any of the workshops or watch any of the videos

2. As a result of this workshop, did you alter your manure composting practices?

- ○ Yes
- ○ No
- ○ Not yet
- ○ N/A (I don't compost manure)

3. What is your situation that led you to choose "N/A"?

- ○ I am an advisor (livestock advisor, crop consultant, agronomist, etc.)
- ○ I work for university extension/research
- ○ I am agency staff (NRCS, SWCD, MPCA, Dept. of Ag, DEQ, SWCS, SCD, 319, etc.)
- ○ I am a farmer who never intended to compost manure
- ○ Other (please explain) _____

4. How has this workshop impacted you, your work, and/or your relationship with your clients?

_____

5. What composting changes do you intend to make?

○ Start composting manure

○ Improve my existing composting operation

○ Other (please explain) _____

6. What has caused you to delay your composting changes? (choose all that apply)

☐ Economics

☐ Lack of time

☐ Lack of equipment

☐ Other (please explain) _____

7. How will your intended changes impact you and/or your operation?

_____

8. Why have you chosen to not alter your composting practices?

○ I am happy with my current operation / no need to make any changes

○ Other (please explain) _____

9. What manure composting change(s) did you make? (choose all that apply)

☐ Started composting manure

☐ Improved my existing composting operation

☐ Other change (please explain)
_____

10. How have these changes impacted you and/or your operation?

_____

11. Other comments
_____

Creating Educational Opportunities for Small Farm Operators

Public Value Statement
Tailoring resources to small farm operators can ensure *all* of North Dakota's agriculture producer's educational needs are met, which in turn has the potential to not only influence food choices, but also impact both rural and urban economies.

The Situation

A 2018 survey of North Dakota small farmers indicated their largest challenges are in education on weeds, pest and soil management, small farm regulations and food safety practices, economic and financial management, identifying and applying for grants, incorporating organic practices and marketing products.

Extension Response

NDSU Extension agents and specialists teamed up with NDSU researchers to provide a webinar series held each Tuesday in February of 2021 on the following topics: Composting manure; Butcher waste disposal; High tunnel cut flower production; Farm-to-school and farmers markets; Creating your own food product; Connecting producers to consumers with local meat; High value crops research update; and Fruit production in North Dakota.

Impacts

- A total of 152 people joined the live webinar discussions. Twenty-four states (52% of registrants were from ND) and one Canadian province were represented.

- 10 months following the webinar series
  - 94% of survey respondents either agreed or strongly agreed the webinar series increased their knowledge of small farm food and management resources.
  - 50% of survey respondents had applied things they learned from both the "Farm-to-School and Farmers Market" and "Creating Your Own Food Product" sessions.

Feedback

In response to asking participants 10 months following the webinar series what they applied as a result of the information that was shared, they said:

Primary Contact

Mary Keena, Extension Specialist
Livestock Environmental Management
Carrington Research Extension Center
PO Box 219; 663 Hwy 281 N, Carrington, ND 58421
701-652-2951, Mary.Keena@ndsu.edu

Collaborators

Lindy Berg, Travis Hoffman, Ph. D., Julie Garden-Robinson, Ph. D., Esther McGinnis, Ph. D., Jan Stankiewicz, MS, MPH, Brooks Warner

Non-Extension Collaborators

Harlene Hatterman-Valenti, Ph. D., NDSU Plant Sciences; Kathy Wiederholt, NDSU Carrington Research Extension Center

Horse Management Webinar Series

Expanding NDSU Extension's Reach to Equine Enthusiasts

Public Value Statement
Addressing the relevant management concerns of our constituents today helps them make decisions now, which will have a positive environmental impact in the future.

The Situation

The 2012 North Dakota horse inventory was 45,271. This is the last time horse data was gathered by the National Agricultural Statistics Service. Based on positive feedback from 2016 horse meetings, combined with current requests NDSU Extension agents were receiving, it was determined that hosting horse management related programming was necessary and relevant for our constituents.

Extension Response

Initial plans were to host educational meetings in 4-5 counties with a high concentration of horses across ND. When COVID-19 restrictions were implemented, meetings moved to an online format. Based on a needs assessment, we learned that most ND horse owners work during the day in non-horse related careers, so a live, noon webinar series was created and recorded for later viewing. Four spring-related webinars and two winter-related webinars were held during the 2020 reporting year. Topic areas were picked based on feedback gathered during each webinar. Two hundred fifty-two unique individual registered for the webinar series, with 66% being from ND and 13% from MN. We also hosted international participants from Australia, Canada, France, Germany and Peru. Eighty-three percent of the participants who joined sessions in real-time were either horse owners or stable owners/managers.

Impacts

- **98% of the participants** who joined sessions in real-time said the **webinars were either useful or extremely useful.**
- The webinar videos were either **watched in real-time or viewed via the recording a total of 914 times** with the topic breakdown shown in the figures below.
- A 6-month survey was sent to the spring webinar registrants where **they indicated management changes** were made because of the webinar information (indicated by lightbulbs in figure).

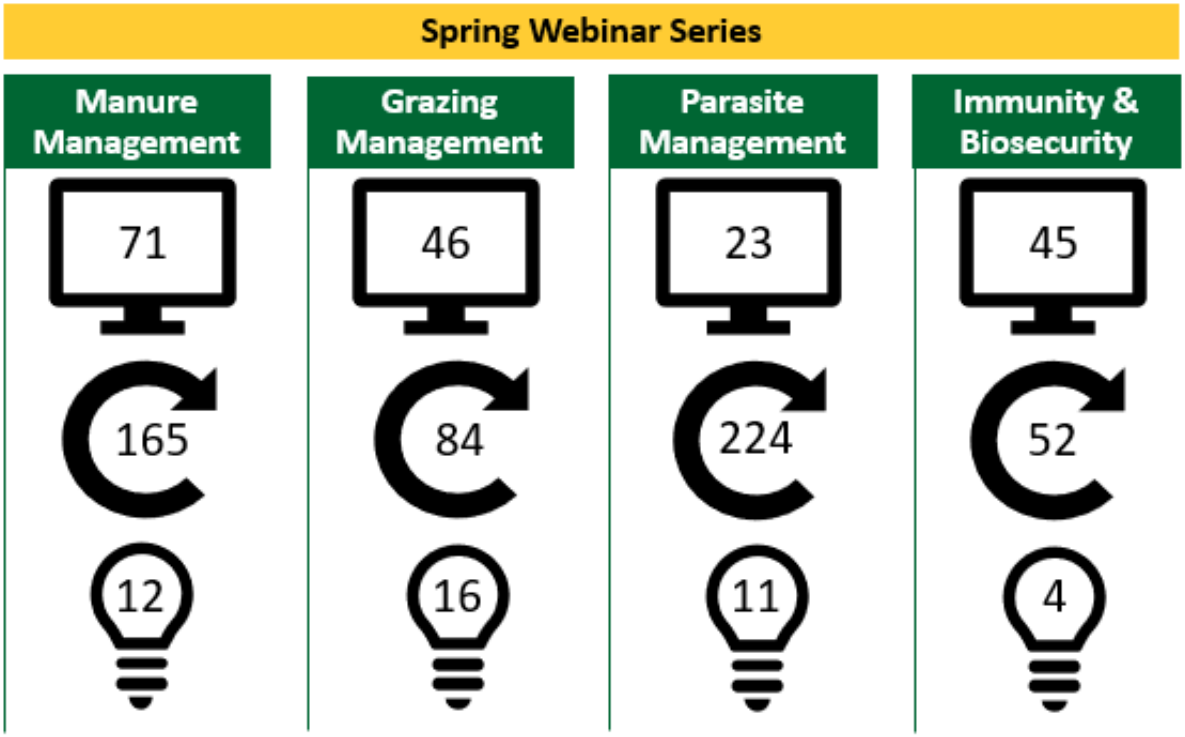
Feedback

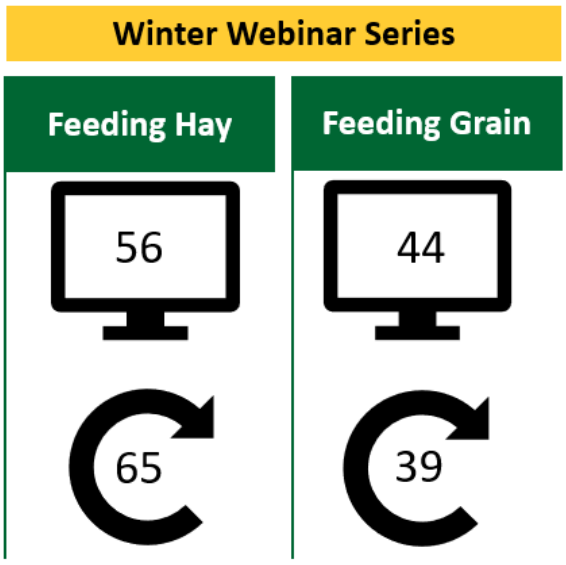
The following comments are from participants who made changes within 6 months of the spring webinar series:

"I changed my pasture size, rotation schedule and let one over grazed area rest for the year."

"Helped my landlord with some composting tips with the manure piles from previous renters who had horses. Changed up my parasite control to help reduce resistance and also more frequently with the summer parasite concentrations we had."

"Bought a manure spreader."





Resource Link
https://www.ag.ndsu.edu/lem

Primary Contact
Mary Keena
Livestock Environmental Management Specialist
NDSU Carrington Research Extension Center
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Jerry Stokka, D.V.M., M.S.

Non-Extension Collaborators
Carrie Hammer, Ph.D., D.V.M.

Promoting Manure Composting for Livestock Operations

Public Value Statement
Composting is a process producers in all sectors of agriculture can use, whether they raise livestock, crops, vegetables or companion animals. Composting creates a stable, nutrient rich product which can prevent surface water pollution while also being beneficial for plant growth.

The Situation

While both raw and composted manure benefit soil health and crop production, there are benefits to creating and land-applying composted manure over raw manure. Product uniformity, volume, weed seed, pathogen and parasite reduction and nutrient stability are just a few of the benefits. However, composting manure in Minnesota and North Dakota have yet to gain popularity.

A group of compost producers, who ultimately partnered with us for workshops, were consulted on the reason composting manure is not more common. One said, “It is lack of understanding and time management that holds most other farmers back from composting manure; they do not know how much composting can help their operation.” Another mentioned, “When I started researching composting for my farm, I took a three-day class in Illinois because there wasn’t anything available in North Dakota or Minnesota. Most farmers are not willing to travel that far. There is a need for composting education programs in the two-state area.”

Extension Response

NDSU Extension partnered with the University of Minnesota Extension with the original plan of holding four workshops in two years (two each in ND and MN). When implications from the COVID-19 pandemic ensued, we changed our plans to host an online workshop in 2020 and were able to continue with two in-person workshops in 2021.

The online workshop consisted of 13 videos that were sent to registrants 2 weeks before an online, live discussion was held in August 2020 with the presentation team as well as 3 producer cooperators. One of the videos consisted of on-farm interviews with each of our producer cooperators in an effort to showcase to registrants the ability to manage compost differently with similar results. The videos are still available and have been viewed collectively 1,845 times.

The in-person workshops were held in July and August of 2021. Each workshop covered the same material as the online workshop and all three producer cooperators attended each event. The producer cooperators were responsible for helping attendees with the compost diagnostics activity as well as answering questions during a panel discussion.

Workshop attendees gathered around a compost pile with producer cooperators and worked through a compost diagnostic worksheet. UMN photo.

Impacts

Two compost-related publications for producers were created for use while at the compost rows:

- Manure Composting Quick Guide
- Common Manure Composting Problems and Their Solutions

Online Workshop

- 180 people registered for the online workshop and 50 joined the live discussion with presenters and producer cooperators
- 43 responded to the immediate follow-up survey where
  - 76% thought the self-paced format was excellent
  - 64% thought the amount of material was excellent

- 62% thought the topics covered were excellent
- 15 months after the online workshop, 21 people participated in a follow-up survey and as a result of the workshop, **58% reported they had altered their manure composting practices**.
- When asked what manure composting change(s) they made, **58% reported they improved their operations** adding,
  - "I have more confidence in my ability to compost successfully and have a better understanding of the environmental impacts of composting."
  - "I no longer have to pay someone to haul away our waste"
  - "Although not composting on a commercial level, I manage several community gardens where large volumes of biomass are accumulated. After learning additional techniques, my piles were hotter and decomposed more quickly. The key? More moisture!

In-person Workshops

- 31 people attended the in-person workshops in ND and MN, of which 10 participated in a 4-month follow-up survey
  - 67% of those who made changes as a result of the workshop stated **they started composting manure**
- 100% of those who did not make changes were either agency or university Extension/research personnel who reported the workshops impacted them, their work, and/or their relationship with their clients by:
  - "Allowing me to be more educated about manure composting so that when producers inquire about composting I am able to give them accurate information."
  - "Using workshop information to inform clients of another manure handling method to consider; composting."

Feedback

"Well organized and executed. Appreciated that videos were individual by topic area, short, and focused. That allowed me to watch what was relevant and fit it into my day more easily."

- Online participant

"Really enjoyed the discussion and interaction between the three cooperators. Also appreciated having enough time to flesh out the information, i.e., didn't try to squeeze it into one hour."

- Online participant

Primary Contact

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Collaborators

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Melissa L. Wilson, Ph. D., UMN Extension

Non-Extension Collaborators

Kurt Dagel, MN agronomist
Joel Ekberg, UMN research technician
Steve and Dorothy Enger, ND farmer
Jesse Nelson, NDSU livestock technician
Curtis Reese, UMN research scientist
Jay Schnell, ND farmer

Resource Links

https://www.ndsu.edu/agriculture/ag-hub/events/manure-composting-workshop

UNIVERSITY OF MINNESOTA EXTENSION

SARE Sustainable Agriculture Research & Education

NDSU EXTENSION Making a Difference

NORTH DAKOTA STATE UNIVERSITY EXTENDING KNOWLEDGE ›› CHANGING LIVES

Impact Statement

NDSU Extension Webinars Help Ranchers Navigate Drought

Public Value Statement
The drought webinars hosted by NDSU Extension provided timely information to aid ranchers in the development of drought management plans and strategies for their ranches, increasing the drought resilience of these ranches. Increased drought resilience retains the producers and their operations that are the foundation of rural communities, their respective economies, and the state of North Dakota.

The Situation

During the 2021 growing season, all of North Dakota experienced some level of drought. The drought started in the fall of 2020 and developed into one of the most severe droughts on record. Extreme drought (D3) and exceptional drought (D4) were introduced on March 18 and May 20, respectively. This is the earliest these conditions have been introduced during the growing season since the inception of the US drought monitor in 2000.

Extension Response

To aid ranchers in developing drought plans and navigate the on-going drought, NDSU Extension specialists hosted webinars. In February and March, Extension hosted a the Preparing Your Ranch for Drought Webinars, a series that focused on preparing for drought. This series included six webinars, topics covered included: drought outlooks, drought trigger dates and grazing management, supplemental feed and forage, water quantity and quality, herd management, and managing farm and ranch stress. This series was followed by the Navigating Drought on Your Ranch Webinars, an on-going monthly webinar series held April through October, which focused on strategies to address drought at the ranch level.

Impacts

The drought webinars hosted by NDSU Extension provided timely information to aid ranchers in the development of drought management plans and strategies.

Preparing for Drought Webinars
140 live viewers **1,306** video views

Navigating Drought Webinars
73 live viewers **1,070** video views

100% of participants indicated the webinars increased their knowledge of drought management.

19 participants indicated they created a new drought plan or updated an existing drought plan **IMPACTING** **4,141** head of livestock grazing **41,020** acres.

28 participants reported making management changes **IMPACTING** over **7,300** head of livestock and **93,555** acres of grazing land.

Common management changes reported by respondents included adapting grazing systems, adjusting stocking rates, purchasing supplemental feed, monitoring water and feed quality and implementing strategic culling strategies.

14 participants intended to make changes potentially impacting an additional **2,003** head of livestock and **12,708** acres of grazing land.

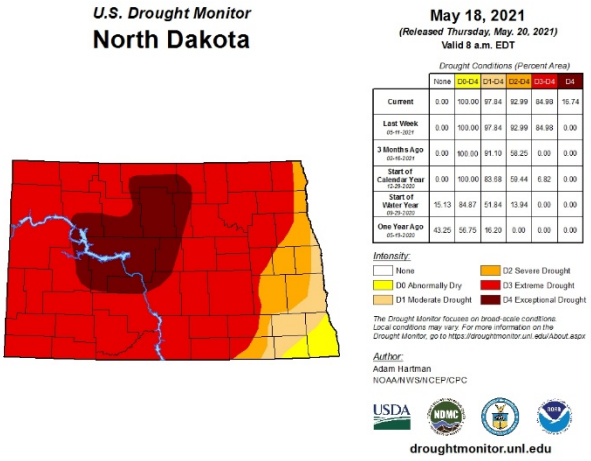
Feedback

“In February 2021, NDSU Extension started a series of webinars called Preparing Your Ranch for Drought presenting information on rainfall, soils, and grassland production trends based on many years of collecting data. This data shared was a vital component in developing a destocking and management plan for my ranch this year; in other words, how many yearlings and cow/calf pairs per acre, trigger dates for moving cattle based on changing weather patterns, and how the drought will affect total grass production.” Krista Reiser, Reiser Ranch

“We used the drought webinars as a planning tool throughout the spring and summer of 2021. We used the webinars to gauge our grass inventory, cattle inventory and whether or not we should be culling cattle based on the numbers.” Trish Feiring, Feiring’s Cattle Co.

"The drought webinar series helped guide me to make drought management decisions early. Including delaying pasture turn-out, reduce herd earlier, thus making me more money per head, and rotating cattle quicker to increase regrowth opportunity when we received some rain in June. Thank you NDSU Extension for providing a program to help prepare ranches for the drought." Rancher from Beach, ND

“The session on stress in farming and ranching was outstanding. I applaud you for bringing such an overlooked topic to the forefront.” Preparing for Drought Webinar participant



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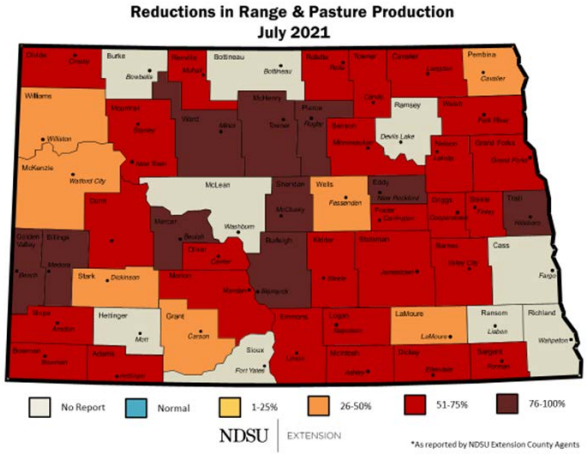
Lilah Krebs, ND Beef Commission

Resource Links

Drought Webinar Recordings:
https://youtube.com/playlist?list=PLnn8HanJ32l5O6GSBv5b2sdweInbmcn5T



Appendix E: Budget Table Part 1

Budget Table for Livestock Environmental Nutrient Management Educational Support Program

Part 1: Funding Sources	**2024**	**2025**	**2026**	**TOTAL**
319 Funding	158,745	156,840	85,239	400,824
NDSU Non-federal Match**	105,830	104,560	56,827	267,216
Total	264,574	261,399	142,066	668,040

** The sources and value of cash match provided by NDSU staff is provided in more detail in Appendix G.

Appendix F: Budget Table Part 2

Livestock Environmental Nutrient Management Educational Support Program

Part 2 Section 319/Non-Federal Budget

	9/1/23 - 8/31/24	9/1/24 - 8/31/25	9/1/25 - 1/31/26			
Fiscal Year	**FY2024**	**FY2025**	**FY2026**	**Total 319 Funds**	**NDSU Non-federal Match FY24-26**	**Total**
Personnel/Support						
1) Salary (1.0 FTEs)	68,763	70,826	38,256	177,845	178,144	355,989
Salary - technical support	4,320	4,450	2,404	11,174		
2) Fringe	36,397	37,490	20,250	94,137	62,350	156,487
3) Travel	10,900	12,400	7,028	30,328		30,328
4) Printing	1,820	1,820	1,348	4,988		4,988
6) Supplies	7,500	2,800	1,468	11,768		11,768
8) Communication	3,570	3,570	1,872	9,012		9,012
9) Fees (manure and soil sample analysis) (site rental) (evaluation specialist) (webinars, videos)	9,600	7,800	4,090	21,490		21,490
Subtotals	142,870	141,156	76,715	360,742	240,494	601,236
Administrative	15,874	15,684	8,524	40,082	26,722	66,804
Total 319/Non-Federal Budget	158,745	156,840	85,239	400,824	267,216	668,040

Appendix G: Value of Time and Services Provided by Extension Personnel as non-Federal Match

Livestock Environmental Nutrient Management Educational Support Program

Value of Time and Services Provided by Extension Personnel as non-Federal match

Fiscal Year	FTE	2024	2025	2026	Total
Personnel/Support					
State and Regional Specialists	0.04	2,893	2,858	1,553	7,304
Research Scientists (1 staff)	0.03	2,187	2,161	1,175	5,523
Extension Agents (10 staff)	0.89	65,473	64,688	35,157	165,317
TOTAL		70,553	69,707	37,885	
Fringe Benefits		24,694	24,397	13,260	62,350
Administrative		10,583	10,456	5,683	26,722
Total Non-Federal Match Budget* **		105,830	104,560	56,827	267,216

*** Matching funds are estimated at the beginning of the two and a half-year period. Amounts are subject to change with changing staff and changing salaries. Total match will always meet agency requirements.