2016 North Dakota State University Combined Research and Extension Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 06/13/2017

I. Report Overview

1. Executive Summary

Agriculture continues to be the dominant force in North Dakota's economy even though North Dakota has become the second largest oil producing state in the nation. The North Dakota Agricultural Experiment Station (ND AES) and North Dakota State University Extension Service (NDSU ES) serve as major sources of innovation, new tools and knowledge, and educational support to agriculture's continued success. The following examples illustrate recent contributions in the areas of cropping systems, natural resources, livestock systems, economic and community vitality, 4-H youth development, and human development and education.

Cropping Systems

Pulse Program Highlights
The fully integrated pulse program at NDSU includes two dedicated breeding programs and a pulse quality research program, which is unique in the U.S. The ND AES scientists on campus and at Research Extension Centers (RECs) are involved in cutting-edge research on pulse production and end use. Quality evaluations are completed annually by the Pulse Quality and Utilization Laboratory which is focused on assessing the chemistry, processing and nontraditional uses of raw pulses. Current projects include improving the taste of pea flour for gluten-free foods, using pea proteins to replace eggs in bakery products, utilizing pea proteins in protein drinks and comparing edible bean cotyledon and whole-bean flours in food products.

Addressing disease management problems in lentils, field peas, chickpeas and dry beans has been a focus of the Carrington REC. Current research includes studies to improve the management of root rots and bacterial blight of field peas and to optimize the use of fungicides for reduced losses to root and foliar diseases. Conventional lentil cultivars have no labeled herbicides that will control broadleaf weeds once the crop has emerged.
New research at the North Central REC in Minot aims to study how lentils respond and tolerate pre-emergent herbicides to better control weeds, particularly kochia and wild buckwheat. This REC team of research specialists have worked to find lentil genotypes that can tolerate pre-emergent applications of sulfentrazone for better weed control. While some lentil genotypes have been promising, research is continuing.

Faba bean, an emerging legume crop in North Dakota, is being tested in the cooler and moister areas of the state. Faba beans are the highest nitrogen-fixing legume in the world and can contribute 65 pounds of nitrogen to the soil for the next year's crop, based on a 50-bushel-per-acre yield. This potential cash crop provides growers with a win-win situation by reducing nitrogen fertilizer costs, while providing a 15 to 20 percent yield increase in crops grown the following growing season. Yield plots tested at the Carrington, North Central and Langdon RECs yielded more than 80 bushels per acre, with more than 90 bushels per acre recorded at the Langdon REC. Faba bean research and variety trials are ongoing.

Large-scale UAS Provides Valuable Information

High-resolution imagery from a large-scale unmanned aircraft system (UAS) is a win-win for the agriculture industry. Many companies and universities are utilizing many different styles and capabilities of small-scale UAS. The ND AES and the NDSU ES collaborated with Elbit Systems Ltd. of Israel to determine the usefulness of large-scale UAS. Elbit Systems provided a large-scale UAS, a Hermes 450 that contains a 4-cylinder engine and a 35-foot wingspan, and an ultra high definition camera. The UAS collected data on crop stand counts, nitrogen effectiveness, iron chlorosis deficiency and crop yields, and inventoried pastured cattle at altitudes of 3,000 to 8,000 feet throughout the 2016 growing season. The researchers and specialists compared the Hermes 450's imagery with data gathered by small UAS, satellites, in-field observations, on-the-ground sensors and soil analyses. This research is the first of its kind in the nation. Adding UAS technology to the precision management toolbox. Others involved in the project included technicians from Elbit's subsidiary, Elbit Systems of America, Fort Worth, Texas, to assemble the Hermes 450; personnel from the University of North Dakota's Center for Unmanned Aircraft Systems Research, Education and Training to fly it; and Civil Air Patrol pilots to fly a chase plane to monitor it in flight.

Meteorological Forecasts Aid Farmers in Decision Making

Weather almost always is a hot topic of conversation in most rural North Dakota coffee shops. Questions such as "How much will it rain this week?" and "When is the first hard freeze going to happen?" seem to dominate the minds of many farmers when planting season begins or harvest is wrapping up. NDSU's Crop and Pest Report is trying to make answering those questions a bit easier through the addition of a weather forecast section. Each issue contains information about insect and disease problems, pest alerts, integrated pest management strategies, pesticide updates, agronomy and fertility issues, horticulture problems, reports from the NDSU Plant Diagnostic Laboratory, NDSU Extension Service meetings and a weather outlook. The report also contains regional reports on agronomic and pest issues, plus crop development updates from RECs across the state. While meteorology can be unpredictable, the North Dakota Agricultural Weather Network's (NDAWN) purpose is to give North Dakota farmers the information and forecasts they need to make decisions about their operation. NDAWN tools include current conditions, growing degree day models, soil moisture data, and even disease and insect forecasting services. The NDSU Crop and Pest Report received the Extension and Education Community Award at the American Society of Agronomy annual meeting.

Natural Resources

Shedding Light on Saline Soil Remediation

A study aimed at evaluating the use of perennial grasses, legumes and cover crops to remediate saline soil is giving North Dakota farmers hope for their salt-affected land. Several factors contribute to the development of saline soils in North Dakota, but a high water table is a prime cause. Land use practices and rainfall patterns also have influenced the spread and severity of saline soil. The Carrington REC has spent six years planting 35 species of cover crops, 12 varieties of alfalfa, three species of legumes and 11 perennial grasses into saline soil to understand their effect on soil salinity. Some species of cover crops grown under no-till served to stabilize soil salinity. However, the perennial grasses have been able to lower the soil salinity, suggesting it could be possible to achieve remediation over time. But, total reclamation of saline soil is a long-term process. It took decades for some soils to become excessively saline, and it will take many more years to restore soil to its more natural state. While the process of remediating saline soil takes time, the whole team of agronomists and soil specialists at the Carrington REC would agree that they are making a difference for farmers facing soil salinity issues.

Oil, Biofuel Production Impacts Water Resources

Water is a vital resource, and activities such as oil, gas and agricultural production can impact its quantity and quality. Scientists in NDSU's Agricultural and Biosystems Engineering Department have been studying those impacts. Here is what they found:

Western N.D. Oil Production

- From 2008 to 2014, the industrial water use for Bakken shale oil development accounted for 0.5 to 10 percent of North Dakota's annual water use.
- Temporary oilfield workers accounted for about 15 percent of the Bakken's annual industrial water use.
- The Bakken development's impact on the regional water supply was limited because the water was managed and the region received, on average, more than 20 percent more precipitation than normal for 2008-2014.

Given that the use of hydraulic fracturing is still on the rise, the findings from this Bakken shale study will be of great importance to policymakers and communities in and around the hydraulic fracturing oil regions of the country.

Cellulosic Feedstock Production
The Energy Independence and Security Act (EISA) of 2007 has led to an increase in crops grown for biofuel production and an expansion of agriculture into previously unsuitable or less fertile land, which could impact water sources. NDSU research shows the magnitude of the spring snowmelt peak flows in the Red River remained unaffected. However:

- Downstream flows had greater variability after the EISA went into effect, which may lead to greater uncertainty in predicting spring floods in the Red River Valley.
- Sediment and nutrients in the Red River Basin water at the U.S.-Canadian border increased post-EISA.

This research indicates that more work needs to be done to better understand the benefits and/or consequences of meeting the EISA's goal of increasing biofuel production.

Research Leading to Stream Improvements
An NDSU Animal Sciences Department Extension specialist, is helping test an evaluation method that could become the North Dakota standard for assessing stream health. She teamed up with North Dakota Health Department, Natural Resources Conservation Service and Bowman-Slope Soil Conservation District personnel on the Little Missouri Assessment Project. They're determining the condition of intermittent streams in five Bowman County watersheds. The objective is to identify streams that qualify for federal water quality enhancement grants. If the team's evaluation method is successful, Health Department officials plan to use it statewide. The specialist hopes she also can help livestock producers, resource managers and landowners better understand the ecosystems along streams so they can manage and/or restore the stream banks. The team is gathering data on the streams' condition, including the state of the stream channel and risk of stream bank erosion. Team members also are collecting information on the land use and health of adjacent uplands, and assessing soil conditions, water movement and health of the plant communities. So far, the team found that contrary to the accepted management practice of removing grazing livestock to protect stream banks, it has the opposite effect in Bowman County. Removing livestock or reducing the number of animals grazing along the banks has allowed smooth bromegrass to flourish. This species has a shallow root system (3 feet), compared with native plant species (8 to 10 feet), which can lead to bank erosion and increased sediment loads in streams. This is the first study of its kind for prairie streams. The team plans to complete the project in 2017.

Livestock Systems

Beef Growth Promotants' Effect on Meat Tenderness
Anabolic implants and beta-adrenergic agonists (feed additives), which improve feedlot performance and carcass measurements, are the two most commonly used growth promotants in beef cattle production. However, they appear to decrease the tenderness of the meat and turn the meat a darker

color, making it less appealing to consumers. An ND AES researcher, a technician and two NDSU graduate students collaborated with two faculty and two graduate students from Kansas State University on a research project to determine why tenderness decreases, what else happens in the muscle during growth and just how these growth promotants impact cattle and meat quality. Kansas State provided and fed the cattle, and conducted tenderness tests, and the NDSU team analyzed the meat. They used a unique approach that let them evaluate hundreds of muscle proteins at once instead of using traditional techniques that only allow for the evaluation of one or two proteins at a time. By using this approach, they were able to identify proteins that were either increased or decreased in abundance in the meat from cattle given growth promotants. These identified proteins have roles in muscle structure, energy utilization, growth and cell function. This effort to determine the mechanisms that cause the decrease in tenderness and color change will contribute to research that prevents these unpalatable consequences which can occur in the pursuit of making beef more efficiently.

Finishing Diet Studies Can Save Cattle Producers Money

Research that ND AES scientists are conducting is helping beef cattle producers cut feed costs, which account for a large portion of cattle production expenses. In research funded by the North Dakota Corn Council, the scientists found that including dried corn distillers grains with solubles (DDGS) in finishing diets for steers resulted in improved growth and feed efficiency, or the amount of feed required to produce a pound of gain. The scientists investigated adding DDGS, a byproduct of ethanol production, at two levels: 20 and 40 percent of the steers' diet dry matter. The scientists also compared finely and coarsely dry-rolled corn in the diet. They discovered that increasing the fineness of dry-rolled corn before feeding it to the steers didn't have an impact on issues such as feed intake, growth and carcass characteristics such as fat thickness and rib-eye area. In a related study, the scientists evaluated the effects of less oil in DDGS. The ethanol industry is removing more oil from distillers grains for other uses. The good news is there are no differences in growth performance for the different levels of oil. Scientists at the Beef Cattle Research Complex near campus and the Carrington REC conducted the same research with the same results. These findings mean that producers don't need to go to the expense of further processing dry-rolled corn before feeding it to their cattle, and they can take advantage of DDGS, a good feed source that's readily available in North Dakota.

Researchers Dig Into Cattle Deaths

Research at NDSU is helping scientists, veterinarians and producers better understand a bacterium that can be fatal to cattle. When 20 cattle died from neurologic disease in the spring of 2015, Veterinary Diagnostic Lab (VDL) staff and a Microbiological Sciences Department scientist, collaborated to learn what made the animals sick. They discovered the cause was bacteria called listeria monocytogenes. Typically, that many cases of listeriosis in cattle do not occur during the spring. Part of the reason for the research was to determine what would cause the increase in cattle listeriosis cases. Listeriosis is a concern to producers because it has been linked to feeding cattle moldy or spoiled silage. North Dakota has about five cases a year. The researchers compared the various bacterial strains and sent the results to a worldwide database in France. Among the findings, two strains were identified that are completely unique and had never been identified before. They also discovered that three pairs of cows had the same strains even though the animals were hundreds of miles apart. The long-term goal of this research is to develop a database of listeriosis cases in the state so researchers can identify trends. The fact that unique strains were discovered and identifying pairs suggests some sort of a common link. This discovery might help in determining whether the disease strains affecting cattle are the same ones that cause human illness.

Economic, and Community Vitality

Farm Management Tools Aid in Complex Decisions

North Dakota producers have found NDSU ES's farm management and planning tools helpful in making decisions about everything from planting to farm bill program enrollment. Those tools include annual crop budgets. Extension specialists develop the budgets annually for nine regions in the state in PDF format or

as an Excel spreadsheet in which producers can input their own numbers. Budgets for up to 18 different crops project revenues based on projected yields and prices, along with line-item costs. Producers can complete a whole-farm cash-flow scenario using the budgets. Ag processors and financial institutions also have found the information useful. Other Extension-developed farm management tools include:

- Crop Compare - Producers enter the price for one crop and the tool will show what the price must be for all the other crops to generate the same return.
- Prevent planting analysis - This helps producers make decisions about whether to plant during a late spring.
- Farm bill calculator - It helps producers with their signup decisions.

Citizens Learn to Lead, Strengthen the Economy

Positive changes happen in communities when adults and youth become leaders and volunteers, but people often don't feel qualified to take on that role. To help citizens feel more prepared to serve as effective board, council or committee members, specialists in NDSU ES's Center for Community Vitality developed Lead Local, a fun, interactive one-day program. Participants learn about ethics, open-meeting laws, parliamentary procedure and dealing with conflict.

"I had been thinking of running for City Council for some time, and after taking the Lead Local program, it really gave me that extra confidence to move forward with that decision," a recent attendee says. "The process of running for and winning the City Council seat was a great experience, and I'm using the tools from Lead Local to help me be the best representative I can be."

Nearly 120 people, including county commissioners, legislators, city council members, township officers and agricultural producers, have attended one of seven Lead Local sessions held so far. Almost 92 percent report feeling better prepared to serve on a board. Communities also often struggle with strengthening their economy. To assist them, Extension partnered with USDA Rural Development on the Stronger Economies Together (SET) program. The idea is for communities to work collaboratively on an economic development plan that builds on the region's current and emerging economic strengths. As a result, community and business leaders in Logan, McIntosh and Emmons counties are looking at ways to combine their efforts to increase tourism, improve access to local foods and health care, and get more youth involved in leadership roles. To improve young people's engagement, Extension launched Lead Local for Youth this fall.

4-H Youth Development

4-H Teaches Real-life Skills

A public affairs director for an advertising and marketing firm in Bismarck credits 4-H for setting him on the right path. The director showed beef and sheep during county 4-H achievement days and the State Fair, attended 4-H livestock and conservation camps, and was involved in leather crafts, welding, woodworking, speech and demonstration, and livestock judging. "It helped enormously in terms of my communication skills," he says of the speech and demonstration projects. The director found livestock judging also was a great learning experience. It requires youth to evaluate and rank classes of animals and provide oral reasons for their decisions. "It helped me develop some incredible life skills," he says. He adds that working with animals also taught him valuable characteristics such as persistence and patience, which have served him well throughout his career.

For a senior vice president and director of agribusiness development at a bank in Fargo, the nine or 10 years he spent in 4-H taking care of and showing livestock and being involved in livestock judging instilled confidence in him, which has been very useful in his job. He often speaks to financial, commodity and other farm groups on agricultural lending and finance, and the global and agricultural economy. Participation in a 4-H club also taught him leadership skills. "I learned how to run a meeting and

listen to different sides of an issue in a respectful way," he says.

These are two of thousands of examples of 4-H's impact. Research shows that youth involved in 4-H do better in school, help others in the community, and are more likely to continue engaging in leadership and community-related activities after leaving 4-H than those enrolled in other youth organizations.

4-H Ag and Livestock Projects Stay Popular

Shooting sports is one of North Dakota's fastest-growing 4-H programs, but agriculture and livestock programs remain among the most popular. "Children get involved in the ag and livestock part of 4-H more because they've grown up with it, and they're very interested in seeing the different parts of the ag-related things and learning about different animals that they might not have on their farm," suggests a Kidder County 4-H'er. She shows beef cattle and rabbits, and is involved in livestock, dairy and range judging. "We're still an ag-based state, and 4-H allows a lot of kids to have livestock and have a project with animals," says an NDSU ES agriculture and natural resources agent. "With 4-H, you can raise and show livestock, even if you live in town," an Adams County 4-H'er says. "In our town, we are lucky to have a wonderful man donate the facilities of an old stockyard to house livestock for those who have no other place to house them." The opportunity to learn attracts a lot of youth. "With being able to show in 4-H as early as 8 years, it gives members a great head start if they are interested in learning about animals," the 4-h'er continues. "Through the process of raising livestock, we learn the costs of raising them, feeding them and showing them." These programs also remain strong because of family tradition, and youth can develop a relationship with an animal, share a common interest and engage in competition with other youth, and realize a sense of accomplishment. People like to see things grow.

Human Development and Education

Parents Get Geared Up for Kindergarten

A Fargo couple were worried about what would happen when their older son started kindergarten in 2015. Their son had been diagnosed with Asperger's syndrome, a form of autism. His parents weren't sure how he would react. Then the parents learned about NDSU ES's Gearing Up for Kindergarten (GUFK) program. GUFK is a multiweek program to help all parents and their children with the transition to kindergarten. Children learn school readiness skills, such as playing with others and taking turns, sensory and motor development, reading, math and science, while parents learn about parenting styles, children's learning styles, brain development and discipline. "Our son had a fantastic kindergarten year," the father says. "I do feel Gearing Up for Kindergarten was a positive influence on my parenting skills and my son's readiness for kindergarten." The father especially appreciated being able to bring his younger son, now a kindergartner, with him and his older son to the school where the GUFK classes were held. The younger son received child care while the father and older son were in sessions. "There was a huge value in being able to give my boys a pre-kindergarten experience in an actual elementary school setting with actual kindergarten teachers," the father says. GUFK also helped him realize that today's children need to be much better prepared than when he attended kindergarten, and he could meet the children who would be his boys' classmates and their parents. GUFK is invaluable for educators, too. "I can't say enough about what the program has done for our students and their readiness for kindergarten," says an Elementary School Principal. Research indicates basic academic and social skills are three times higher among children who complete GUFK. The program also is very cost-effective: $350 per student vs. $1,350 for remediation later.

Family and Consumer Sciences Programs Making a Huge Impact

Health and wellness are among North Dakota's biggest challenges. To help ensure the state has healthy people and communities, NDSU Extension's family and consumer sciences (FCS) programs focus on three key areas: family finance, human development and family science, and nutrition, food safety and health. They are making a difference:

• Family Nutrition Program -- 63 percent of adults in the program are spending their food budget more wisely.
• Expanded Food and Nutrition Education Program -- Participants improved at least one nutrition practice (83 percent) and one food safety practice (47 percent).

A resident of Rolette County signed up for the Nourishing Boomers and Beyond program because she, like many adults 50 and older, is concerned about keeping her family healthy. Now she includes vegetables in the lunches she packs for her husband and his brother.

Youth nutrition education and programs for older adults also make a substantial impact:

• Banking on Strong Bones -- Fewer youth choose soda pop instead of milk (dropped from 36 to 25 percent).
• On the Move to Better Health -- 62 percent of youth increased their daily physical activity, 58 percent chose more healthful snacks and 54 percent ate more fruit and vegetables.
• Stepping On (helps seniors stay in their homes and age in place) -- 79 percent reduced falling hazards at home.

A Donnybrook-area producer, who hopes to retire this year, found the Design Your Succession Plan program so helpful that he attended it twice. "It gave me a road map to do what I want to do," he says.Although Extension is among several agencies addressing health-related, financial or environmental problems, it does not duplicate the others' efforts. The NDSU ES targets primary prevention education work. Social services and health organizations target intervention work.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	59.2	0.0	84.5	0.0
Actual	156.0	0.0	100.0	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External University Panel
- Combined External and Internal University Panel
- Expert Peer Review

2. Brief Explanation

Research programs were subjected to four different types of scientific peer review. These reviews occur prior to, during and at the conclusion of each research project. First, research faculty who participate in

multistate research projects receive a critical review of their contributing project from fellow committee members, the administrative adviser and the North Central Multi-State Research Committee. Second, most faculty augment their multistate research funding with competitive grants. These grants are awarded on the basis of scientific merit and afford an opportunity for external peer review. Third, each research faculty member with the ND AES is required to have a station project that is reviewed for scientific merit by a Project Review Committee that is comprised of one faculty member from each discipline. Finally, all research is peer reviewed, either internally or externally, prior to publication.

Extension program leaders in agriculture and natural resources, family and consumer science, 4-H and youth development, and community resource development from the North Central Region meet twice a year to evaluate program needs and develop plans of work for the whole region. Ongoing efforts are made to update North Central regional logic models and develop and collect multistate impact indicators. State Extension specialists frequently submit grant proposals to regional and federal agencies and commodity groups to fund applied-research and Extension program activities. These proposals are externally reviewed prior to selection for funding. Extension bulletins are internally peer reviewed prior to publication.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Other (Input from State Board of Agricultural Research and Education)

Brief explanation.

Building linkages with the public enables us to discover information about community/county/district/state assets and needs. Various methods for stakeholder input are utilized on an on-going basis. Advisory and commodity boards are used annually to identify issues and refine research and Extension programs. Examples include county extension advisory boards, Sustainable Agriculture Research and Education (SARE) advisory board, nutrient management advisory board, soil health advisory board, sugar beet research and Extension board, research extension center (REC) advisory boards, and the State Board of Agricultural Research and Education (SBARE). Input from stakeholders, the general public and from targeted audiences is used to develop our five-year plan of work and to make adjustments to the plan based on crisis situations that may develop in the state, e.g. drought, flood, insect infestations, plant diseases, high-risk issues of youth, bioenergy economics, animal welfare issues. Using several methods and several venues to collect data ensure that high priority issues are identified, people that have self-interest in the issue are brought to the planning meetings, and the appropriate research project or educational program and design is developed to address the issue using a variety of delivery methods.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

The State Board of Agricultural Research and Education (SBARE) is charged by the state legislature to determine the causes of any adverse economic impacts on crops and livestock produced in this state; develop ongoing strategies for the provision of research solutions to negate adverse economic impacts on crops and livestock produced in this state; develop ongoing strategies for the dissemination of research information through the NDSU ES; annually evaluating the results of research and extension activities and expenditures; and report the findings to the North Dakota Legislative Council and the State Board of Higher Education. SBARE actively solicits input from all sectors of agricultural interests (i.e. different commodity and livestock groups) and meets throughout the state to gather input.

County commissioners actively participate in county extension program reviews with extension district directors. The county extension budgeting process also results in strong engagement from county government. Local needs are also identified through input from crop and livestock improvement boards, soil conservation districts, 4-H councils, and area focus groups. End of program surveys are used at most county and state extension programs to identify emerging clientele needs.

In 1992, the North Dakota Department of Human Services and NDSU ES were legislated by the North Dakota state legislature to form a statewide Family Life Education Committee. The committee is composed of state legislators, an Extension specialist, an Extension Human Development Agent, citizens with a parenting self-interest, two administrators from the Child Division of the State Department of Human Services and the Extension Assistant Director, Nutrition, Youth and Family Science. As a result of this partnership, the state Department of Human Services provides funding opportunities to six state family life education centers through a request for proposal process. The availability of designated funds also directs the focus of the parenting education programs provided through the six family life education center coordinators. The six family life education coordinators provide evaluation feedback to the Family Life Education Committee of the state Department of Human Services on program impacts. These impacts are then shared with state legislators.

The ND Department of Health, under the direction of the Governor of North Dakota, formed an alliance of organizations in ND that provide significant support and leadership for health-related initiatives. NDSU ES is represented on this coalition. Networking among these professionals is invaluable, in addition to the legislative work.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals

Brief explanation.

The process of collecting stakeholder input was described above in III, 2(A),1 along with the process in identifying stakeholder groups and individuals.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

The State Board for Agricultural Research and Education (SBARE) is charged with developing ongoing strategies for the dissemination of research information through the ES; annually evaluating the results of research and Extension activities, recommending faculty and support positions and areas for program expenditures; and reporting the findings to the North Dakota Legislative Council and the State Board of Higher Education. Their findings directly affect the research and Extension budgeting process. The SBARE priority research and Extension needs can be found at: http://www.ag.ndsu.edu/sbare/. Commodity councils and research-education boards guide research and Extension program priorities and activities through their call for proposals, proposal review sessions, and grant funding. The staff from the seven RECs use the input from winter meetings with their advisory boards to set program direction for research projects and Extension programs at their centers.

During county staff evaluations each year, program input is gathered from commissioners who take part in the staff evaluations. This arrangement helps assure that extension programs are grass roots driven and are focused on local issues and needs. County commissioner input is also critical in determining the staffing level and emphasis within county Extension offices as 50 percent of the Extension agent's salary is paid by the county.

The statewide Family Life Education Committee, composed of state legislators, an Extension specialist, an Extension Human Development Agent, citizens with a parenting self-interest, two administrators from the Child Division of the State Department of Human Services and the Extension Assistant Director, Nutrition, Youth and Family Science determine the availability

of designated funds which direct the focus of the parenting education programs provided through the six family life education center coordinators. The six family life education coordinators provide evaluation feedback to the Family Life Education Committee of the state Department of Human Services on program impacts. These impacts are then shared with state legislators which in turn affect budgeting.

Stakeholders are frequently important contributors on the search committees of Extension state specialists and county commissioners are partners in the search committees and interview process of county staff. A SBARE member or another stakeholder is often a representative on faculty position searches.

Brief Explanation of what you learned from your Stakeholders

Our stakeholders are very supportive of the ND AES, NDSU ES and their activities and efforts. It is very important that Federal capacity be maintained to ensure NDSU's continued success. The ND AES and NDSU ES enhance the lives of the citizens of ND.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
3440785	0	2986032	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	2948656	0	2536274	0
Actual Matching	2948656	0	2536274	0
Actual All Other	8027334	0	7876066	0
Total Actual Expended	13924646	0	12948614	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	0	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Cropping Systems

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	15%		5%	
103	Management of Saline and Sodic Soils and Salinity	5%		15%	
202	Plant Genetic Resources	5%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	5%		10%	
205	Plant Management Systems	20%		10%	
211	Insects, Mites, and Other Arthropods Affecting Plants	15%		10%	
212	Pathogens and Nematodes Affecting Plants	15%		15%	
213	Weeds Affecting Plants	5%		10%	
216	Integrated Pest Management Systems	5%		10%	
405	Drainage and Irrigation Systems and Facilities	10%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	19.4	0.0	45.2	0.0
Actual Paid	43.1	0.0	43.6	0.0
Actual Volunteer	3.7	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
985380	0	1421525	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
985380	0	1421525	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1983696	0	4862756	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Meet with stakeholder groups to gather input and refine program directions.
- Develop improved crop cultivars acceptable to growers and those who use and process the grain.
- Present crop research results at field days and grower meetings, popular press, radio and TV spots, web sites, and educational classes and workshops to foster producer adoption.
- Evaluate the effectiveness and impact of the Extension programming.

2. Brief description of the target audience

The targeted audience will include but not be limited to:

1. Crop producers in North Dakota and surrounding states
2. Crop consultants and agricultural advisors
3. Commodity groups
4. Crop improvement associations
5. Extension personnel
6. Agribusiness and agricultural finance personnel
7. Government agencies

3. How was eXtension used?

Extension specialists were available to answer public questions from eXtension; for example, insect identification and sustainable pest management strategies.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	240163	4467031	6862	45122

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2016
Actual:	2

Patents listed
Potato - Dakota Ruby
Barley - ND Genesis

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	19	45	64

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of acres of hard red spring wheat and number of acres of durum wheat grown in North Dakota are seeded with ND AES derived cultivars.
2	Number of farmers adopting new practices to achieve highly productive crops in a changing environment.
3	Number of farmers adopting new practices to improve pest management in a changing environment.

Outcome #1

1. Outcome Measures

Number of acres of hard red spring wheat and number of acres of durum wheat grown in North Dakota are seeded with ND AES derived cultivars.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	3630000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wheat is a crop that has been climate adapted over the centuries. Developing cultivars suited to the northern great plains helps increase production in an area frequented with climate extremes. These cultivars in turn are propagated, multiplied and grown through the efforts of crop producers, crop consultants, nutritionists, crop consultants, commodity groups, Extension personnel, Crop Improvement Associations, and ultimately the consumer.

What has been done
The ND AES has led the way in the development of new and improved germplasm in 14 crops, including some with multiple market classes. Improved germplasm has improved resistance to abiotic and biotic stresses. The improved germplasm also has improved end use quality that is desired by those who use and process the harvested seed.

Results
In 2016 the top four varieties of durum were Divide, Carpio, Alkabo and Joppa, accounting for 60 percent of all varieties and all are releases from NDSU.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants

216 Integrated Pest Management Systems

Outcome #2

1. Outcome Measures

Number of farmers adopting new practices to achieve highly productive crops in a changing environment.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	750

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The US consumer has become concerned about where their food comes from and the stewardship of the natural resources used to produce their food. Producers are concerned that the practices they use today ensure that their farms and production units are sustainable in the future. Citizens are learning how to grow their own produce and add aesthetic value to their homes and lives, as well as serving others.

What has been done
The NDSU Extension Service organizes meetings designed to provide the best and latest information on wheat production practices and marketing. One of these key educational programs that is specifically focused on wheat issues is: The Best of the Best in Wheat Production and Marketing. This meeting is offered in two locations in western North Dakota each year. In these meetings, research-supported recommendations that address the major production challenges of spring and durum wheat growers are presented. Furthermore, important principles and skills are reinforced with hands-on sessions. An effort is made to include the most recent research findings and focus on the most relevant topics that impact the profitability of wheat production. A similar meeting is held in eastern North Dakota that focuses on wheat and soybean.

Results
When attendees of the meeting were asked to put a value on the information they learned at the meetings, the responses ranged from $10 to $15000 for wheat and $4.56 per acre for soybean.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
405	Drainage and Irrigation Systems and Facilities

Outcome #3

1. Outcome Measures

Number of farmers adopting new practices to improve pest management in a changing environment.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	705

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Each year, there are numerous crop pests (insects, diseases and weeds) and agronomic problems (early frost, drought, flooding and other situations) that can negatively impact North Dakota's crop production. Producers, agronomists of fertilizer/chemical/seed companies, crop consultants, state and federal agencies, field scouts and university extension and research workers need timely updates and the latest research on field crop pests, agronomy and weather problems to maximize crop yields and quality.

What has been done
The NDSU ES Crop & Pest Report is a weekly summer newsletter, which includes many articles on the occurrence and management of crop pests, and agronomic updates on crops and soil conditions. These articles are written by NDSU extension specialists. Valuable and timely information is described on crop pests, integrated pest management strategies, pesticide updates, agronomy, soil and fertility issues, new pest detections, important Extension

meetings/Field Days, local field reports from 'Around the State' and weather forecasts. Anyone can easily access it via internet, Facebook, or sign up for the weekly electronic mail list.

Results
Readers of the Crop & Pest Report were mainly comprised of producers, agronomists of fertilizer/chemical/seed companies, university extension/research workers and crop consultants from 10 countries on five continents! The number of readers has increased 16 fold since the inception of the report to nearly 4,500 readers today.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
405	Drainage and Irrigation Systems and Facilities

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

More than 70% of the participants at the **Best of the Best Wheat** meetings who completed a post-meeting survey indicated that they learned something new and useful, and in many cases indicated that they learned something that they planned to incorporate into their farming operation.

Subscribers to the Crop & Pest Report where asked their thoughts on the

publication. Results include:

- 87% of readers state that **Crop & Pest Report** is the major source of information on pests, integrated pest management and crop production.
- 95% of readers indicated that the **Crop & Pest Report** provided timely information, and was a reliable source of unbiased science-based information.
- More than 97% of readers reported sharing information from the **Crop & Pest Report** with other professionals.
- An average of 82% of readers said that they i**ncreased their knowledge** on pests, integrated pest management or crop production.
- Readers indicated that they **learned** from the following topics in the **Crop & Pest Report**: 90% on pest identification; 84% on pest scouting and using economic threshold for pest management; 80% on crop production guidelines; 78% on pesticide recommendations; 75% on fertility management; 70% on weather information; and 64% on harvest guidelines.
- 63% of readers used additional NDSU resources to further research topics. Some examples include: NDAWN, disease forecasting models, annual crop pest management guides, and extension publications.
- 59% of readers said that there was at least one article in the **Crop & Pest Report** that increased their profitability in 2016.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Natural Resources

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	25%		25%	
103	Management of Saline and Sodic Soils and Salinity	25%		25%	
205	Plant Management Systems	25%		25%	
405	Drainage and Irrigation Systems and Facilities	25%		25%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	10.6	0.0	12.6	0.0
Actual Paid	17.5	0.0	18.5	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
439809	0	445029	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
439809	0	445029	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
897340	0	904636	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Determine thresholds for salinity and sodicity to serve as management goals on affected soils
2. Produce systems to reclaim saline and sodic areas within farm fields
3. Determine the strengths and weaknesses of saline and sodic soil reclamation methods
4. Determine the interaction of salinity, sodicity and soil microorganisms
5. Survey and improve management recommendations for insect pests on the major crops
6. Devise improved range management methods to allow increased soil health in saline or sodic threatened soils
7. Provide improved guidelines to growers on best choice of crops for lands affected by salts or sodium
8. Translate scientific findings into practical producer applications and provide transformational education through workshops, field days and conferences, and resource materials
9. Conduct research on controlled drainage and subsurface irrigation to improve crop yield
10. Translate scientific findings into practical producer applications and provide transformational education through workshops, field days and conferences, and resource materials

2. Brief description of the target audience

The targeted audience will include but not be limited to:

1. Crop producers in North Dakota and surrounding states
2. Crop consultants and agricultural advisors
3. Commodity groups
4. Crop improvement associations
5. Extension personnel
6. Agribusiness and agricultural finance personnel
7. Government agencies

3. How was eXtension used?

The eXtension system was used sparingly in the area of soil science.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	33752	418086	843	4223

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	8	6	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of farmers and landowners who understand the source of salinity and sodicity, and take steps to prevent their spread.
2	Number of farmers and ranchers who better understand the relationship between range plants, crop plants, ground water management, and salinity and sodicity management.
3	Number of farmers and landowners who better understand surface and sub-surface moisture management and how it impacts soil health and crop production management.

Outcome #1

1. Outcome Measures

Number of farmers and landowners who understand the source of salinity and sodicity, and take steps to prevent their spread.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soil salinity and sodicity negatively impacts soil health and the ability of farmers and landowners to produce food and support their families economically, and in a larger scope feed the people of the world.

What has been done
Extension efforts have been coordinated by state and regional Extension specialists utilizing field demonstration plots throughout ND, large grower meetings, and small Café meetings to reach growers with methods that could be used to reduce soil salinity.

Results
A growing number of growers are adopting the use of cover crops, proper crop selection, improved drainage and modified no-till systems as a result of intensive educational efforts in salt and sodium reduction techniques.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
205	Plant Management Systems
405	Drainage and Irrigation Systems and Facilities

Outcome #2

1. Outcome Measures

Number of farmers and ranchers who better understand the relationship between range plants, crop plants, ground water management, and salinity and sodicity management.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soil salinity and sodicity decreases the overall productivity of the soil and ultimately the feed value of pasture and range, and soil health in general.

What has been done
Extension specialists have included programming in larger and smaller grower meetings to explain the source of salinity and sodicity and recommend proper forage crop selection and salinity reduction techniques to ranchers.

Results
Ranchers are better informed regarding the source of salinity and sodicity on their land and some are making progress through better forage crop/species selection to stop the further spread of salinity on their land.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
205	Plant Management Systems
405	Drainage and Irrigation Systems and Facilities

Outcome #3

1. Outcome Measures

Number of farmers and landowners who better understand surface and sub-surface moisture management and how it impacts soil health and crop production management.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1008

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Excess rain has raised water tables, increased soil salinity and affected crop production in many areas of ND. Farmers have lost soil productivity, yields and economic return thus the interest in the use of subsurface drainage and water management.

What has been done
As in past years, a 2-day tile drainage design workshop was conducted in conjunction with University of Minnesota Extension. Thirteen (13) presentations on subsurface drainage and irrigation topics were presented at various venues across ND plus there were 9 farm visits to solve site-specific problems.

Results
Over 1,000 people were educated on subsurface drainage and irrigation issues. Three (3) of the thirteen presentations were to educate our federal congressional delegations and state legislators on subsurface drainage issues

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
405	Drainage and Irrigation Systems and Facilities

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluations of field demonstration days and winter grower/rancher meetings large and small showed increased learning of concepts and a desire to implement some of the strategies covered or demonstrated by a smaller proportion of attendees on their land.

On-line training was also utilized. Evaluations were generally positive, but on-line participants did think the modules used with the irrigation training were too long.

Key Items of Evaluation

Demonstrations in the field were highly effective. Educational program delivery by multiple layers of educators (specialist and county agent; or even better utilizing a specialist, county agent, and independent ag consultant or early grower/rancher adopter) was also highly effective in increasing grower/rancher desire to consider and change soil health practices.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Livestock Systems

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
121	Management of Range Resources	25%		15%	
301	Reproductive Performance of Animals	30%		35%	
302	Nutrient Utilization in Animals	30%		35%	
305	Animal Physiological Processes	15%		15%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	6.3	0.0	18.9	0.0
Actual Paid	22.1	0.0	18.8	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
487858	0	476703	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
487858	0	476703	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
998755	0	1102084	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Educational programming will be conducted using a variety of methods including: face to face meetings, webinars, news releases, media interviews, in-service training programs, needs assessments, advisory boards, and social media. Research activities include livestock and forage research, laboratory activities, and pursuit of grant funds.

2. Brief description of the target audience

The targeted audience will include but not be limited to:

1. Livestock producers in North Dakota and surrounding states
2. Livestock consultants and agricultural advisors
3. Veterinarians
4. Commodity groups
5. Livestock improvement associations
6. Extension personnel
7. Agribusiness and agricultural finance personnel
8. Government agencies

3. How was eXtension used?

The eXtension system was used sparingly.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	60950	1967552	2032	25769

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2016
Actual:	1

Patents listed
Provisional patent for pregnancy diagnosis in cattle.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	12	31	43

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of ND livestock producers with increased knowledge of practices to improve the efficiency of livestock production systems, including use of improved livestock genetics and use of practices to improve reproductive efficiency.
2	Number of ND livestock producers with increased knowledge of practices to improve livestock stewardship practices and use of improved nutrition.

Outcome #1

1. Outcome Measures

Number of ND livestock producers with increased knowledge of practices to improve the efficiency of livestock production systems, including use of improved livestock genetics and use of practices to improve reproductive efficiency.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	585

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Improved efficiency of livestock production is an increasingly important issue for livestock producers, consumers, and the general public. As world population grows to nearly 9 to 9.5 billion over the next several decades, livestock producers must improve the efficiency at which nutrients and other inputs are converted to muscle protein. This issue also directly impacts resource use efficiency and the impact of livestock production on the environment.

What has been done
Educational programs were conducted which directly and indirectly addressed these topics. Specialists had face to face educational meetings, webinars, developed written bulletins, and used a variety of forms of media to deliver these messages and programs. In addition, direct contact on the farm or ranch was also used in the educational effort.

Results
In a study on artificial insemination (AI), 78% of participants indicated a $15,500 increase in whole herd value per operation after participating in an NDSU ES AI breeding education program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals

305 Animal Physiological Processes

Outcome #2

1. Outcome Measures

Number of ND livestock producers with increased knowledge of practices to improve livestock stewardship practices and use of improved nutrition.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	600

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Livestock stewardship is an increasingly important issue with consumers, livestock producers and food companies. Consumers are demanding more transparency with food production including the means by which animals are produced, how they are handled, what they have been fed, and certifications that they have been cared for in a humane manner. Livestock producers need to be aware of these trends and understand that, in some cases, the marketplace is demanding these attributes.

What has been done

Meetings were held to educate dairy producers about good livestock stewardship practices. In addition, educational programs were developed to educate livestock producers, veterinarians, and county agents about new regulations related to the use of antimicrobials in feeds. An advisory board provided input into stewardship programming efforts. This advisory board consists of livestock producers, allied industry personnel, veterinarians, restaurant owners, and consumers.

Results

Producers gained a better understanding of low stress livestock handling techniques. Audiences had increased awareness of regulations related to antimicrobial use. The advisory board provides a mechanism by which programming can be prioritized and feedback provided for Extension specialists.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
302	Nutrient Utilization in Animals
305	Animal Physiological Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Our evaluations indicated that the programming efforts were successful at increasing knowledge regarding livestock production, good stewardship practices, and methods to improve production efficiency.

Key Items of Evaluation

A broader effort is needed to improve awareness regarding antimicrobial resistance (AMR), the veterinary feed directive (VFD) and stewardship.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Economic and Community Vitality

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
602	Business Management, Finance, and Taxation	35%		100%	
608	Community Resource Planning and Development	15%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	50%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	8.8	0.0	7.8	0.0
Actual Paid	20.6	0.0	19.1	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
438554	0	193017	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
438554	0	193017	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1164640	0	1006590	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Educational programming will be conducted using a variety of methods including: face to face meetings, webinars, new releases, media interviews, in-service training programs, needs assessments, advisory boards, and social media. Research activities include develop new risk management tools for under served commodities. Educational activities include use of the real-time commodity training room, and training through the Rural Leadership North Dakota (RLND) program.

2. Brief description of the target audience

1. Crop producers in ND and surrounding states
2. Livestock producers in ND and surrounding states
3. Small business entrepreneurs
4. Agribusiness and agriculture finance personnel
5. Civic leaders
6. Commodity groups
7. Government agencies
8. extension communities of practice
9. Extension personnel

3. How was eXtension used?

The eXtension system was used sparingly.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	79903	1586111	1998	15980

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	14	7	21

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of growers and industry personnel who utilize price risk management strategies, production risk management strategies, and financial risk management strategies.
2	Number of individuals involved in new leadership roles as a result of leadership programs.

Outcome #1

1. Outcome Measures

Number of growers and industry personnel who utilize price risk management strategies, production risk management strategies, and financial risk management strategies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	10412

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Risk management training is needed for lenders to make informed lending decisions, producers to mitigate declining commodity prices, and industry stakeholders to minimize risks and increase revenues.

What has been done
Agricultural Lenders Outlook: A one day conference was held in four locations within North Dakota. This Outlook is comprised of professional development sessions that help to prepare lenders for the upcoming agricultural loan renewal season

Crop Insurance Conference: A one day conference was held for crop insurance agents from North Dakota, South Dakota and Minnesota for professional development.

Commodity Trading training sessions: Focused training in an actual commodity trading environment is provided for stakeholder groups and their members for professional development and market forecasts.

Results
Respondents to multiple surveys indicate that 84% of attendees utilized information gained at these training in their day-to-day activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation

803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #2

1. Outcome Measures

Number of individuals involved in new leadership roles as a result of leadership programs.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	309

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
North Dakotans have been concerned with the shortage of leaders in communities and organizations across North Dakota, especially in rural areas. During a ND statewide needs assessment in late 2015, participants expressed concern with gaps in participation and commitment at the local level. They indicated a need for leadership, community involvement and volunteerism.

What has been done
Since 2003, the 18-month Rural Leadership North Dakota cohort program has been offered to increase leadership skills. In 2009, a Rural Leadership Short Course was added to provide North Dakotans that were unable to participate in the longer event due to time constraints, the chance to learn about themselves, their communities, and the state. These programs are offered annually by NDSU Extension.

In 2015, Lead Local, a one-day boardsmanship training was added to the course offerings. This ongoing program helps build the confidence of participants serving on boards, councils and committees by helping them understand meeting basics, parliamentary procedure, and handling conflict in groups.

In 2015-2016, the Stronger Economies Together program was implemented in one region of the state to help build a regional economic development plan. In addition to building this plan, the program encourages current and aspiring leaders to be engaged in the process for community betterment.

In 2016, a leadership development conference was held in Bismarck,the state's capitol city titled "Igniting Legendary Leaders." The conference goals were for participants to increase their networks of contacts and resources, expand their knowledge of personal leadership and making an impact, and discovering ways to grow their business, organization, community, and themselves.

Results

As of the end of 2015, 140 individuals have completed the 18-month RLND program. Over $4 million has been invested in the 100+ RLND projects, five businesses have been started, and nine individuals have run for public office. Over 80% of alumni have taken leadership for various community projects and 20 of them have been asked to serve on boards and councils they had not served on before. During the 2016 election, three RLND participants were elected to statewide offices and are currently serving.

Seven RLND Short Course programs have been offered in 15 communities with 140 participants since inception. Two of the participants have run for public office and several local projects have been accomplished.

Lead Local had added value by increasing knowledge of participants in ten sites on various issues such as:
?Feeling confident in running a meeting using parliamentary procedure - 75% after training
?Understanding how to use the components of an effective meeting - 86.1% after training
?Feeling prepared to serve on a local board, council or committee - 91.7% after training

The Stronger Economies Together (SET) program concluded in 2016 and there is evidence of five individuals moving into leadership roles. They are serving as committee chairs and one serves on the statewide SET support committee. In addition, Individuals are stepping up in the community to work on a regional health care facility plan, develop tourism opportunities through the Germans from Russia heritage programs, and assisting youth through a civic forum and providing instruction to youth through a Youth Lead Local pilot leadership program. The Igniting Legendary Leaders conference helped bring over 120 people together from across the state to learn ways they can make a difference in their communities as well as to network effectively with others across the state. Participant surveys indicated that both objectives were accomplished and the utilization of the networks built continues.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Available capital)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Each leadership program is evaluated using various methods such as quantitative surveys, qualitative focus groups, case studies and observation. A longitudinal study is ongoing with the Rural Leadership North Dakota course to determine:

- the effectiveness of creating a network of people across ND and beyond that leadership program participants utilize
- increase in participants' leadership, critical thinking and communication skills
- improvement in quality of life for participants, their organization and their community
- participants' preparation to work with an issue they are passionate about in their community or organization

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

4-H Youth Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	50%		0%	
806	Youth Development	50%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	9.3	0.0	0.0	0.0
Actual Paid	20.1	0.0	0.0	0.0
Actual Volunteer	51.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
417100	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
417100	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
781975	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

A variety of different programs and methods are used to reach North Dakota youth, including after school programming, Operation Military Kids (OMK), club learning experiences and science related events such as the 4-H Aerospace Event, Geospatial and Robotics Technologies for the 21st Century (GEAR-Tech-21) Camp, 4-H Camps, Kids Power, Children, Youth and Families at Risk (CYFAR) Project, 4-H Robotics Event, 4-H Film Festival and National 4-H Youth Science Day.

In an effort to increase the science related knowledge and confidence level of county staff and volunteer leaders several trainings are offered. These trainings have used the inquiry based and experiential learning methods for youth.

2. Brief description of the target audience

North Dakota 4-H Science programs reach more than 12,000 youth with hands-on learning experiences to prepare the next generation of science, engineering, and technology leaders. A special effort is made where Native American youth on four reservations are targeted as an underserved audience.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	15079	113934	226192	1453221

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. Outcome Measures

Number of 4-H youth indicating they would like to have a job related to science.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	272

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
North Dakota's situation parallels that of the United States. There are opportunities to hold a job in a science related field. However, there is a shortage of individuals to fill these positions. Thus, the job market is turning to educational entities to assist them in generating a pool of young people who may be interested in holding science related positions. However, in order to interest youth in science, they must first be engaged in science. Consistent with 4-H's mission and purpose, this engagement should be done through hands-on, experiential learning opportunities. Therefore, 4-H is the perfect fit to provide non-formal, experiential learning opportunities to educate youth about science. Hopefully this engagement will encourage them to pursue science related career opportunities.

What has been done
The North Dakota 4-H program offers several science related educational opportunities. They include National 4-H Youth Science Day, Agriculture in the Classroom type programs, North Dakota 4-H Film Festival, Robotics Challenges, Aerospace Camp, Geospatial Projects, Scratch computer programming, and other science based 4-H project work. Additionally, there is hands-on science training for agents and adult volunteers.

Results
Adult volunteers reported from program evaluations that they plan to use more science activities at 4-H club meetings. Afterschool program staff reported youth were more motivated because they were involved in hands-on, active learning activities as part of the program. Because of the experiential learning activities utilized, youth learned important science principles. They also learned important life skills such as critical thinking and teamwork. After participating in National 4-H Youth Science Day, youth shared that they are more interested in science and are able to

teach others about what they learned.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #2

1. Outcome Measures

Number of 4-H youth indicating that they think science will be important in their future.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	283

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
North Dakota's situation parallels that of the United States. There are opportunities to hold a job in a science related field. However, there is a shortage of individuals to fill these positions. Thus, the job market is turning to educational entities to assist them in generating a pool of young people who may be interested in holding science related positions in the future. However, in order to interest youth in science, they must first be engaged in science. Consistent with 4-H's mission and purpose, this engagement should be done through hands-on, experiential learning opportunities. Therefore, 4-H is the perfect fit to provide non-formal, experiential learning opportunities to educate youth about science. Hopefully this engagement will encourage them to pursue science related career opportunities and understand that science will be important in their future.

What has been done
The North Dakota 4-H program offers several science related educational opportunities. They include National 4-H Youth Science Day, Agriculture in the Classroom type programs, North Dakota 4-H Film Festival, Robotics Challenges, Aerospace Camp, Geospatial Projects, Scratch computer programming, and other science based 4-H project work. Additionally, there is hands-on science training for agents and adult volunteers.

Results

Adult volunteers reported from program evaluations that they plan to use more science activities at 4-H club meetings. Afterschool program staff reported youth were more motivated because they were involved in hands-on, active learning activities as part of the program. Because of the experiential learning activities utilized, youth learned important science principles. In fact, after participating in National 4-H Youth Science Day, youth shared that they are more interested in science and are able to teach others about what they learned. Hopefully this engagement will in help them understand that science will be important in their future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The North Dakota 4-H program is in its early stages of fully utilizing the 4-H Common Measures resources to evaluate program impact. 4-H Common Measures is a national library of evaluation instruments available to 4-H staff nationwide. The instruments are applicable to a broad range of programs and have been tested for reliability and validity. One of the "libraries" of instruments includes items specifically addressing science programming. Throughout the next program year, more data will be collected to more fully evaluate the North Dakota 4-H Science program.

- 98% of middle school age youth who attended GEAR-Tech-21 camp reported they would feel comfortable teaching robotics to others.
- 75% of North Dakota youth who participated in the Drone Discovery/National 4-H Youth Science Day experiment reported it made them more interested in science.
- 68% of the youth who participated in the Drone Discovery/National 4-H Youth Science Day experiment reported the experiment helped them work as a team.

After attending a two-day aerospace event, 70% of youth reported that they would be interested in an aerospace career.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Health and Human Development Education

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
607	Consumer Economics	20%		0%	
703	Nutrition Education and Behavior	30%		0%	
724	Healthy Lifestyle	30%		0%	
806	Youth Development	20%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	4.8	0.0	0.0	0.0
Actual Paid	32.7	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
179955	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
179955	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
2200928	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Educational programming will be conducted using a variety of methods including: face to face meetings, webinars, news releases, media interviews, in-service training programs, needs assessments, advisory boards, and social media.

School-based curricula, including "On the Move to Better Health", "Banking on Strong Bones", and "Go Wild for Fruits and Vegetables" will continue to be used with children. Community-based programs, including the "Nourish Your Body" series of lessons will be implemented for adults. A "Designing Your Succession Plan" curriculum will be developed and used at multiple sites across ND, eventually culminating in a succession planner "certification" program.

2. Brief description of the target audience

The targeted audience will include but not be limited to:

1. Children, teens and adults targeted in educational programming related to nutrition, food safety and health.
2. Crop and livestock producers in North Dakota and surrounding states
3. Agricultural, agribusiness and financial advisors
4. Accountants and attorneys
5. Commodity groups
6. Extension personnel
7. Government agencies

3. How was eXtension used?

The eXtension system was used for professional development, specifically the impact statement reporting course.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	56709	2916655	118027	192112

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	11	4	15

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of adults and children participating in education curricula conducted in formal and informal situations reporting improvements in one or more healthy lifestyle behaviors.
2	Number of participants in the "Succession Planning" program initiating the development a succession plan for their business.

Outcome #1

1. Outcome Measures

Number of adults and children participating in education curricula conducted in formal and informal situations reporting improvements in one or more healthy lifestyle behaviors.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	23270

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
More than 30 percent of North Dakota children 2 to 5 years of age are considered overweight or obese (with a BMI-for-age above the 85th percentile). According to the Youth Behavior Risk Surveillance Survey (2015), 42 percent of North Dakota students in grades nine to 12 consumed vegetables less than one time daily, 75 percent of adolescents were not physically active at least 60 minutes per day, and about 12 percent were not physically active 60 minutes on at least one day during the seven days prior to the survey. Improving health behaviors can increase quality of life and save millions of dollars in collective health-care costs for North Dakotans throughout their lifetime.

What has been done
On the Move to Better Health and On the Move to Better Health Junior are five-week school-based curricula for fifth-graders and second-graders, respectively. The programs are based on MyPlate, the current icon for good nutrition. The curriculum aims to increase fruits, vegetables and calcium-rich foods in the diets of children and improve fitness habits. Parents receive newsletters and participate in goal setting and other family-based activities. In addition to the curricula for which evaluation data is presented as follows, Extension educators use Banking on Strong Bones, Go Wild for Fruits and Vegetables and other curricula.

Results
In 2015-16, 1,676 students in 25 counties completed the On the Move Junior program. They improved their knowledge of nutritional recommendations as shown by test scores. Surveys showed that 89 percent ate more fruit, 80 percent ate more vegetables, 87 percent tried a new food, 80 percent tried fruits of different color and 90 percent engaged in more exercise. According to survey results, 83 percent of parents read the weekly newsletter. Parents reported that their

children asked questions about food (62 percent), offered help with food preparation (48 percent), requested healthful snacks (49 percent) and tried a new food (47 percent).

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
806	Youth Development

Outcome #2

1. Outcome Measures

Number of participants in the "Succession Planning" program initiating the development a succession plan for their business.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	186

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farm and ranch transition planning is a critical need for North Dakota producers. Surveys completed by commodity groups, producers and financial institutions place a high priority on meeting the need for educational programs addressing farm and ranch succession planning which encompasses business, retirement, transition and estate planning. Our state's farmers and ranchers now average roughly 60 years of age, and many are looking toward retirement and transitioning their business. In the next 15 years, billions of dollars of agribusiness and farming assets will be transferred from one generation to the next in North Dakota.

What has been done
NDSU ES held Design Your Succession Plan workshops in 23 North Dakota locations reaching participants from 37 counties in the region during the 2015-2016 programming year with a total of 204 participants. Of these, 62% were 55 years and older. This program emphasizes the need to start a succession plan, communicate with family, and be prepared to work with professionals to create a customized succession plan that secures the farm/ranch legacy. The DYSP program provides the information and framework to help families prepare for a successful and satisfying

transition

Results
Participants reported:
??I felt it was very timely for me and will be very helpful in discussion and communication areas.?
??The training was excellent. We are planning to see an attorney this spring. We?ll now have our information (workbook) organized.?
??I feel motivated to complete the plan. I appreciate the workbook with its extensive guide step by step. Great service NDSU Extension is providing to the state.?

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Post-surveys with 2,910 children in the On the Move to Better Health in 2015-16 showed the following as a result of the program. About 50 percent consumed more dairy, 55 percent drank less pop, 52 percent chose healthier snacks, 57 percent increased daily physical activity and 50 percent ate more fruits and vegetables. Surveys with 1,053 parents in 2015-16 showed the following: 81 percent of parents/caregivers read the newsletter and 37 percent set a weekly goal, 35 percent increased their fruit consumption and 31 percent increased their vegetable consumption, 13 percent increased whole-grain intake, and 18 percent increased their dairy consumption.
Post-surveys of the Design Your Succession Plan indicated 35% of all participants intend to transition their business in under five years with 76% planning to transition in under ten years. 22% of participants were 39-years-old or younger, 16% were 40 to 54 years of age, 41% were 55 to 64, 19% were 65 to 74 years of age, and 2% were over the age of 75. 44% of participants were female and 56% were male.

Key Items of Evaluation

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
0	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.