

2016 North Dakota State University Combined Research and Extension Plan of Work

Status: Accepted

Date Accepted: 06/03/2015

I. Plan Overview

1. Brief Summary about Plan Of Work

The NDSU Extension Service (NDSU ES) and the North Dakota Agricultural Experiment Station (ND AES) are integral units of North Dakota State University (NDSU). The main campus is located at Fargo, North Dakota. The NDSU ES and ND AES serve the citizens of the state through the main campus as well as 53 Extension offices located in 52 counties and one American Indian reservation, seven Research Extension Centers (REC) located across the state, and one area Extension office.

Agriculture is a critical component of North Dakota's economy and accounts for approximately 30 percent of total business activity in the state. According to the USDA Economic Research Service, in 2013 ND had crop and livestock cash receipts of \$8.7B. Crop production accounted for nearly 85 percent of total farm marketing with the remainder livestock, primarily beef cattle. The total business activity attributed to agriculture in North Dakota is approximately \$35.6B. North Dakota leads the nation in the production of 12-16 crop categories annually, including in leading the production of honey.

The combined ND AES and NDSU ES plan of work will focus on six program areas: cropping systems; natural resources; livestock systems, economic and community vitality; 4-H youth development; and human development and education.

The mission of the ND AES is to develop and disseminate technology important to the production and utilization of food, feed, fiber and fuel from crop and livestock enterprises. The research will provide for an enhancement of the quality of life, sustainability of production, and protection of the environment. In particular, plant breeding efforts will continue to develop high yielding cultivars and animal science research will improve the nutritional and reproductive efficiencies for increased global food security. Expanded research will continue on soil salinity and other water and soil management issues in a response to recent increased precipitation associated with climate variability. Research will continue on the economics of alternative bio and sustainable energy sources and research on feedstock processing will contribute to developing sustainable energy technologies. Applied research on the adoption of nutritional practices will benefit national goals of reducing obesity.

The mission of the NDSU ES is to create learning partnerships that help adults and youth enhance their lives and communities. The NDSU ES educational programs will contribute by improving crop productivity and adapting new crops; adapting cropping systems, responding to evolving pest issues, and improving soil management; assisting with the development of biofuels as sustainable energy sources; and training families on nutrition and wellness to address childhood obesity. Extension programs will also continue to focus on state identified needs in the areas of agricultural and natural resources; 4H youth development; family and consumer sciences; and community, leadership and economic development. Within these program areas, emerging areas of concern include animal welfare, response to natural disasters, transitional plans for farms and rural businesses, and rural business development and entrepreneurship.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2016	59.2	0.0	84.5	0.0
2017	59.2	0.0	84.5	0.0
2018	59.2	0.0	84.5	0.0
2019	59.2	0.0	84.5	0.0
2020	59.2	0.0	84.5	0.0

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

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

2. Brief Explanation

Research programs are subject 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 vitality 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. Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

The National Institute of Food and Agriculture (NIFA) has identified five science priority areas in which the ND AES and NDSU ES use to provide a framework for determining state programming needs. In addition to these priorities, ND AES and NDSU ES will gather input from the State Board of Agricultural Research and Education (SBARE), REC advisory boards, county advisory councils, focus groups and our own Extension staff to further refine the issues and details to be addressed within most planned program activities. These stakeholder groups will also identify state needs not defined within the NIFA priorities. Recent examples of SBARE identified priorities include enhancing crop development and protection, precision agriculture, improving livestock productivity, and sustaining water, air and land quality. These priorities were developed through direct testimony from stakeholders to SBARE. The targeted audiences for these programs were inclusive of all people with a vested interest in the issue. Many programs are on-going or multiple years in length and are conducted by either integrated teams or are conducted by faculty with integrated research and Extension appointments. This ensures that the research is delivered through Extension to the stakeholders.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?

The major under-served and under-represented audience in North Dakota are Native Americans, and a continued emphasis is given to work more closely with this group, especially those living on the four Native Indian reservations in the state and those attending one of the five tribal colleges.

The NDSU ES has and plans to continue supporting a Tribal College Liaison program. The liaison works directly with the tribal colleges. The liaison's responsibilities include: communicating with the tribal colleges on the transfer of their students to NDSU to further the student's college education; explore opportunities for collaboration on grants, initiatives and research projects; coordinate exchange programs of students and faculty; facilitate communication between tribal colleges and 4-H; facilitate the communication and facilitation of Extension programming; and participate in the annual pow-wow.

Our Fort Berthold office is staffed with a full-time agriculture/4-H youth development agent and a full-time EFNEP and FNP nutrition education assistant. Our Sioux County office is staffed with a full-time EFNEP nutrition assistant, a full-time 4-H youth development agent, and shares an agricultural agent with an adjoining county. The other two reservations are served by the Extension agents in the county in which the reservation lies. Both of these Extension offices have specific programs directed towards Native American audiences. Extension programs include expanded educational efforts with Native American farmers both in crop and livestock production as well as targeted youth programming, and family and nutrition programming. The Standing Rock Sioux Reservation is the partner of a research and Extension AFRI integrated grant to improve beef production, and the Spirit Lake Reservation is active with the USDA's "Strike Force" which was initiated to increase partnerships with targeted persistent poverty communities across the country. The NDSU ES supports these partnerships through the tribal college liaison and participates in an annual meeting with the reservations to discuss how USDA services can better meet the needs of the American Indian audiences living on the reservations. Special emphasis has been placed on sustainability in the Native Nations through current Sustainable Agriculture Research and Education (SARE) programming efforts. Many nutrition programs focus on both Native American and low-income families. These programs provide education on selecting and preparing nutritious meals on a limited budget. Diabetes is a major problem with the state's Native Americans, so a planned

program focuses on the reduction of the incidence of diabetes through diet and exercise.

A major youth program on the Standing Rock Sioux Reservation focuses on community gardening and a community orchard to improve food resources, increase knowledge about food choices, and promote healthy eating by including more fruits and vegetables in the diet. This program is supported by resources from other community agencies. Another program on the same reservation is helping youth through a popular outdoors skills project. The Operation Military Kids program also provides support to youth of military families who live on reservations.

3. How will the planned programs describe the expected outcomes and impacts?

The planned programs that are submitted have specific outcomes that will occur over a period of five years. In some programs, outcomes and impacts will occur in the first year, but many impacts will occur throughout the five-year period and beyond. Under each planned program, specific progress toward the outcomes and impacts will be documented through research publications, REC annual reports, a joint ND AES/NDSU ES annual highlights report, and NDSU ES impact reports.

4. How will the planned programs result in improved program effectiveness and/or

At NDSU, research and Extension programs have a historic and strong connection that increases the effectiveness of both entities. All Extension specialists on campus are integrated into departments to foster communication and nearly all campus Extension specialists hold joint Extension-research appointments to ensure integration of programs. In addition, research scientists and Extension specialists are employed at seven REC's located across the state. Co-location of these REC personnel greatly increases the efficiency of collaborative research and Extension projects. The REC's also provide important local contacts with stakeholders (each REC has its own state mandated advisory board) and serve as originating and receiving locations of Extension programs delivered through our interactive video system. In most programs areas, Extension education and demonstration activities serve a dual purpose of education, but also gather input from stakeholders, which is then communicated to the research community.

IV. Stakeholder Input

1. Actions taken to seek stakeholder input that encourages 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, SARE advisory board, nutrient management advisory board, sugar beet research and education board, REC advisory boards, the Soil Health Advisory Board, and 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 will be 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.

SBARE is charged by the state legislature with determining the causes of any adverse economic impacts on crops and livestock produced in this state; developing ongoing strategies for the provision of research solutions to negate adverse economic impacts on crops and livestock produced in this state; developing ongoing strategies for the dissemination of research information through the NDSU ES; annually evaluating the results of research and Extension activities and expenditures; and reporting 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. SBARE sends out over 300 letters of invitation to commodities, associations, agencies, interest groups and individuals for input and comment.

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 North Dakota 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 will be 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 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.

SBARE is charged with developing ongoing strategies for the dissemination of research information through the NDSU 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.

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 uses 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.

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Cropping Systems
2	Natural Resources
3	Livestock Systems
4	Economic and Community Vitality
5	4-H Youth Development
6	Health and Human Development Education

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Cropping Systems

2. Brief summary about Planned Program

The first objective of the cropping systems program is to develop and release improved crop cultivars for producers in North Dakota and adjacent areas in the United States, and to those who use or process the crops that are produced. This objective is being accomplished using traditional breeding methodologies. Traits receiving top priorities are improved grain quality, resistance to Fusarium plant diseases, and improved agronomic performance. Breeding programs exist for wheat, durum wheat, canola, corn, soybean, barley, oat, flax, dry bean, edible legumes, and potato. A second objective is to provide educational training to growers to increase the adoption of new cultivars and new crops to increase productivity. A third objective is to provide educational training to producers to adopt new management technologies to increase their production or efficiency and profitability.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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	10%		10%	
103	Management of Saline and Sodic Soils and Salinity	10%		10%	
202	Plant Genetic Resources	10%		10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%		10%	
205	Plant Management Systems	10%		10%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		10%	
212	Diseases and Nematodes Affecting Plants	10%		10%	
213	Weeds Affecting Plants	10%		10%	
216	Integrated Pest Management Systems	10%		10%	
405	Drainage and Irrigation Systems and Facilities	10%		10%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

North Dakota has natural resources that allow for highly productive crop and livestock sectors. However, the combination of environmental factors such as alkaline soils, typically lower rainfall, cold winters, short growing season and pests can limit the productivity of crops. The large number of crops grown in North Dakota creates a demand for improved new cultivars that are adapted to the environmental conditions, have tolerance to diseases and other evolving pests, and retain high quality grain characteristics. Genetic resistance in the host plant is the most cost-effective and environmentally safe means of reducing crop losses. Consequently, basic and applied plant breeding is conducted to provide information that will facilitate achievement of our breeding goals and enhance our understanding of the crops that we breed. Information on these new cultivars are communicated to growers through the NDSU ES so appropriate growers can make adoption decisions.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will remain available to conduct the research. Insect and disease pests will continue to evolve resistance and attack current crops. Growers will accept new cultivars with improved disease resistance and agronomic performance under favorable and marginal growing conditions. End users will seek and accept new cultivars developed by researchers at ND AES.

2. Ultimate goal(s) of this Program

Development and adoption of improved crop cultivars that require fewer grower inputs, have improved disease resistance, and have higher yields under favorable and marginal growing conditions.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2016	19.4	0.0	45.2	0.0
2017	19.4	0.0	45.2	0.0
2018	19.4	0.0	45.2	0.0

2019	19.4	0.0	45.2	0.0
2020	19.4	0.0	45.2	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

- 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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> • Education Class • Workshop • Demonstrations • Other 1 (Field trials) 	<ul style="list-style-type: none"> • Newsletters • TV Media Programs • Web sites other than eXtension • Other 1 (News Releases) • Other 2 (Magazine Articles)

3. Description of targeted 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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 Target

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. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 216 - Integrated Pest Management Systems

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 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 - Diseases and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 216 - Integrated Pest Management Systems
- 405 - Drainage and Irrigation Systems and Facilities

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 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 - Diseases and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 216 - Integrated Pest Management Systems
- 405 - Drainage and Irrigation Systems and Facilities

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect 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.)

Description

Natural disasters such as extreme weather, drought, excess precipitation, etc. may directly affect research sites and the ability to obtain reliable data that can be provided to stakeholders. Changes in public policy and government regulations may alter what crops growers choose to grow and agronomic practices they use for producing these crops.

With the increasing gap in knowledge of how food is produced by our US consumers, new challenges are faced each day in production agriculture. Moreover people making regulatory policies do not have first-hand knowledge of production agriculture. Without consistent priorities in extramural

funding, developing a research program to address the needs of our citizens is difficult. Moreover, producers are facing more social pressures as they develop food, and therefore this alters the direction of Extension programs.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Data will be collected on which crop cultivars are being grown by producers in North Dakota. Annual surveys are done on barley and wheat cultivars produced in North Dakota and other crops as well. These surveys will allow us to accurately determine if growers are adopting the cultivars developed by NDSU.

Each program team is trained in evaluation and provided with evaluation support to design evaluation tools that provide data for the production of impact reports. A combination of quantitative pre and post educational surveys, evaluations, follow-up assessments, and focus groups along with qualitative statements will be used to measure program and educational effectiveness.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Natural Resources

2. Brief summary about Planned Program

The ND AES and ND ES will work towards practical solutions for relief and reclamation of saline affected soils, and to investigate the biosystems in regards to soils, plants and pests during the reclamation process to produce a healthier soil and greater, more efficient agriculture for the state.

Together, the ND AES and the NDSU ES will develop and deliver subsurface water management guidance that includes information on tile drainage design and operation; use of controlled drainage structures to release and store water; and sub-irrigation design and management.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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 (Situation and Scope)

1. Situation and priorities

Researchers will examine causes of salinity and sodicity in ND, and develop improved strategies for recognizing impairment and determining impairment thresholds relevant to our soils and climate in ND and the region. Research will also be directed to examining insect vectors that might be favored with or without salinity, plants that would serve to be more adapted to saline conditions in both range and crop production, and the soil microbial communities that are affected by salinity and sodicity. The goal of Extension will be establishment of county-based demonstrations coordinated in such a manner as to allow accumulative analysis over all of the counties for both local and regional application of salinity and sodicity remediation techniques.

Producers will continue to seek information and best management practices to control their risk by

managing the water table for wet and dry conditions in order to increase yields. The technologies for subsurface water management are relatively new for the flat and northern growing region in the state. Extension will advise producers to deal with both dry soil conditions and wet conditions. Research and education will help to increase the management options available under increasingly variable climatic conditions, and help producers mitigate some of the negative effects of weather changes.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will remain available to conduct the necessary research and Extension activities. Variable weather conditions will continue to occur in North Dakota. Crop production will remain a major economic activity in North Dakota. Growers will seek new knowledge of cropping systems and soils as affected by salinity and sodicity. On-going programs on moisture conserving tillage systems will aid growers in moving towards lower intensity tillage systems should dry conditions become the norm. Crop production continues to be a major economic driver in the economy of North Dakota.

2. Ultimate goal(s) of this Program

The ultimate goals are to: understand better the salinity and sodicity soil thresholds for reducing crop production, and use this knowledge to improve crop production practices and increase productivity on degraded lands; and to reduce production risks and stabilize crop production yields at a higher level in order to maintain profitable farming systems in North Dakota.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2016	10.6	0.0	12.6	0.0
2017	10.6	0.0	12.6	0.0
2018	10.6	0.0	12.6	0.0
2019	10.6	0.0	12.6	0.0
2020	10.6	0.0	12.6	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Newsletters ● TV Media Programs ● Web sites other than eXtension ● Other 1 (News Releases) ● Other 2 (Magazine Articles)

3. Description of targeted 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
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V(G). Planned Program (Outputs)

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 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 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

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 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

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

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. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Natural disasters such as extreme weather, drought, excess precipitation, and climate variability may directly affect research sites and the ability to obtain reliable data that can be provided to stakeholders. Commodity price may affect the affordability of adopting some of these practices. Changes in public policy and government regulations may affect legal use of irrigation and drainage practices such as tiling, and also alter what crops growers choose to grow and agronomic practices they use for producing these crops.

With the increasing gap in knowledge of how food is produced by our US consumers, new challenges are faced each day in production agriculture. Moreover people making regulatory policies do not have first-hand knowledge of production agriculture. Without consistent priorities in extramural funding, developing a research program to address the needs of our citizens is difficult. Moreover, producers are facing more social pressures as they develop food, and therefore this alters the direction of Extension programs.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Evaluation will be part of assessing the education of farmers, ranchers, land owners, ag-industry and the general public. A variety of tools will be used. The focus of the evaluations will be on increasing understanding of salinity and sodicity and tracking adoption of preferred techniques for reclamation, increasing producer/landowner knowledge of soil water management, and evaluation of producer/landowner experiences in implementing sub-surface water management techniques and

practices.

Each program team is trained in evaluation and provided with evaluation support to design evaluation tools that provide data for the production of impact reports. A combination of quantitative pre and post educational surveys, evaluations, follow-up assessments, and focus groups along with qualitative statements will be used to measure program and educational effectiveness.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Livestock Systems

2. Brief summary about Planned Program

This program will enhance North Dakota livestock producer's knowledge and skills in the areas of reproductive physiology, nutrition, genetics, animal health, and meat science. It will also use basic and applied research to solve problems impacting livestock production in North Dakota and the region. Area of primary focus will be the cow-calf sector with regards to reproductive and feed conversion efficiencies.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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 (Situation and Scope)

1. Situation and priorities

North Dakota's livestock industry includes beef cattle, swine, dairy cattle, sheep, and horses. Beef cattle is the largest sector with approximately 875,000 head of breeding females (stock cows) and 845,000 calves available for sale. These industries contribute over \$1 billion in cash receipts to the state's economy each year. Research and Extension programs in Livestock Systems enhance the economic well-being of the state by providing the necessary tools to solve problems and develop solutions for enhanced productivity and animal well-being. Reproductive efficiency, feed costs and efficiency, and handling systems are major issues.

2. Scope of the Program

- In-State Extension

- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will remain available to conduct the necessary research and Extension activities. Variable weather conditions will continue to occur in North Dakota. Livestock production will remain a major economic activity in North Dakota. Livestock producers will seek new knowledge of improved genetics and improved livestock performance under favorable and marginal environmental conditions. North Dakota livestock producers will respond to economic signals related to their industries and seek appropriate research and Extension programs necessary to take advantage of opportunities and solve problems as they occur.

2. Ultimate goal(s) of this Program

The ultimate goals of the livestock program center on enhancing producer knowledge of practices necessary to improve efficiency of livestock production. This includes development of new and/or improved livestock feeding systems, adoption of research based stewardship practices and increased efficiency in reproductive rates.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2016	6.3	0.0	18.9	0.0
2017	6.3	0.0	18.9	0.0
2018	6.3	0.0	18.9	0.0
2019	6.3	0.0	18.9	0.0
2020	6.3	0.0	18.9	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations ● Other 1 (Advisory Boards) 	<ul style="list-style-type: none"> ● Newsletters ● TV Media Programs ● Web sites other than eXtension ● Other 1 (Social Media) ● Other 2 (Webinars)

3. Description of targeted 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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 Target

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. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 121 - Management of Range Resources
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 305 - Animal Physiological Processes

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 121 - Management of Range Resources
- 302 - Nutrient Utilization in Animals
- 305 - Animal Physiological Processes

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Natural disasters such as extreme weather, drought, excess precipitation, etc. may directly affect research sites and the ability to obtain reliable data that can be provided to stakeholders. Changes in public policy, dietary recommendations concerning the consumption of beef, and government regulations such as use of public lands for grazing may alter what livestock producers choose to raise and practices they use for producing these animals.

With the increasing gap in knowledge of how food is produced by our US consumers, new challenges are faced each day in production agriculture. Moreover people making regulatory policies do not have first-hand knowledge of production agriculture. Without consistent priorities in extramural funding, developing a research program to address the needs of our citizens is difficult. Moreover, producers are facing more social pressures as they develop food, and therefore this alters the direction of Extension programs.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Data will be collected from livestock producers on their knowledge of practices to improve the efficiency of livestock production systems including use of genetics, reproduction, nutrition and livestock stewardship.

Each program team is trained in evaluation and provided with evaluation support to design evaluation tools that provide data for the production of impact reports. A combination of quantitative pre and post educational surveys, evaluations, follow-up assessments, and focus groups along with qualitative statements will be used to measure program and educational effectiveness.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Economic and Community Vitality

2. Brief summary about Planned Program

North Dakota leads production of 12-16 commodities annually, however many of these commodities have limited production in the rest of the U.S. Outside of ND there has been little incentive to develop new risk management products for these commodities that are critical to ND. Risk management in agriculture will continue to increase in importance. Risk has many dimensions (yields, prices, input costs, crop insurance safety net, land costs, food safety). Research and Extension programming efforts will focus on the development of risk management training programs that encompass marketing strategies, efficient insurance markets, assessments of crop production risks, risk based lending, financial stress testing, loan portfolio analysis, and global agricultural risks issues.

The NDSU ES Community Vitality program will work in three areas; leadership, community development and economic development. Leadership programming will focus on strengthening citizens engaged in agriculture and rural North Dakota. Community development programs will focus educational efforts on marketing and strategic planning through the use of structured community conversations. Economic development for small business programs will assist manufacturers, and rural and agricultural entrepreneurs in identifying local businesses opportunities, and promote developing new and/or enhancing existing businesses that capitalize on those opportunities.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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 (Situation and Scope)

1. Situation and priorities

North Dakota is highly dependent on a prosperous agricultural economy. Sustaining this infrastructure and the affiliated rural communities is important, yet challenging. Commodity prices experience significant variability. Effective risk management strategies are critical to assist farmers to take advantage with hedging mechanisms and forward contracts, especially in crops grown primarily in ND. Another aspect of maintaining a sustainable economy is maintaining healthy rural communities through the development of a network of agricultural and rural leaders. Long term economic strength and personal income growth requires a base of small businesses. For ND that small business base must capitalize on our strong agriculture base and reflect our rural nature. Additionally, rapid growth of many rural communities as the result of an "oil boom" is placing a strain on an infrastructure ill equipped to meet the demands of an exploding population. Smart community planning is critical to future healthy communities.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will remain available for economic vitality. Agribusiness will remain a major economic activity in ND and key determinant to the financial stability of ND. However, energy production will continue to add to ND's prosperity for the foreseeable future. This new wealth will continue to have a tremendous impact on the state's smaller communities. Community vitality will continue to depend substantially on the efforts of other NDSU Extension and research personnel as well as other NDSU employees and the support of other ND agencies along with Extension colleagues located throughout the country.

2. Ultimate goal(s) of this Program

The ultimate goals for the Economic and Community Vitality program include: development of a better understanding and use of risk management tools in both crops and livestock; stronger and sustainable rural communities; and development of more leaders from within ND.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2016	8.8	0.0	7.8	0.0
2017	8.8	0.0	7.8	0.0
2018	8.8	0.0	7.8	0.0

2019	8.8	0.0	7.8	0.0
2020	8.8	0.0	7.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Other 1 (Social Media-Facebook & Twitter) 	<ul style="list-style-type: none"> ● Newsletters ● TV Media Programs ● eXtension web sites ● Web sites other than eXtension ● Other 1 (News Releases) ● Other 2 (Webinars)

3. Description of targeted 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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 602 - Business Management, Finance, and Taxation
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 608 - Community Resource Planning and Development
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect 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)

Description

Agribusiness in ND is heavily weather dependent. Natural disasters such as flooding, droughts, severe winters and other weather patterns affect agriculture. Energy development and exploration activities can be unpredictable and this results in fast, uncontrolled community growth which can raise havoc with existing infrastructure, economies and leadership. Conversely, declining rural populations and number of farms may reduce small business opportunities as can public policy and regulatory changes. The flow of capital, both private and public, also can influence business growth and success.

Adults participating in RLND is dependent on a strong economy as these participants need to secure sponsors for their tuition and need to take leave from their employment to attend the training seminars.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each program team is trained in evaluation and provided with evaluation support to design evaluation tools that provide data for the production of impact reports. A combination of quantitative pre and post educational surveys, evaluations, follow-up assessments, and focus groups along with qualitative statements will be used to measure program and educational effectiveness.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

4-H Youth Development

2. Brief summary about Planned Program

To address increased demand for science, engineering and technology workers, 4-H is working to reach new young people in science programs ultimately anticipating this will lead to more youth being interested in a career in a science related field. Currently, 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. These experiences are supported by more than a 3,000 volunteers dedicated to placing 4-H youth on a path toward successful careers.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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 (Situation and Scope)

1. Situation and priorities

The United States faces a future of intense global competition with a startling shortage of scientists. In fact, only 18 percent of U.S. high school seniors are proficient in science (NAEP 2005) and a mere five percent of current U.S. college graduates earn science, engineering, or technology degrees compared to 66 percent in Japan and 59 percent in China.

2. Scope of the Program

- In-State Extension
- Multistate Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

To address increased demand for science, engineering and technology professionals, 4-H is working to reach new young people in science programs ultimately anticipating this will lead to more youth being interested in a career in a science related field. Currently, 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.

2. Ultimate goal(s) of this Program

4-H's approach is to use inquiry based learning to provide constructive learning through hands-on experience that help youth provide solutions to real world problems.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2016	9.3	0.0	0.0	0.0
2017	9.3	0.0	0.0	0.0
2018	9.3	0.0	0.0	0.0
2019	9.3	0.0	0.0	0.0
2020	9.3	0.0	0.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
----------------	------------------

<ul style="list-style-type: none">● Education Class● Workshop● Group Discussion● Demonstrations● Other 1 (Camps)	<ul style="list-style-type: none">● Newsletters● TV Media Programs● eXtension web sites● Web sites other than eXtension
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3. Description of targeted 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.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of 4-H youth indicating they would like to have a job related to science.
2	Number of 4-H youth indicating that they think science will be important in their future.

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

The engagement of youth in 4-H clubs and their subsequent level of activity may be affected by a number of external factors including the overall economy. Competition for youth participation in programs include sports, organized school activities, work, community involvement and other social activities. Declining rural populations and number of farms may reduce the number of youth in 4-H.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

4-H Youth Development will be transitioning into using Common Measures as a component of their evaluation. We will be joining states from the North Central Region as we begin this work. Our Signature Program 4-H Science will be the first program to begin using Common Measures.

Each program team is trained in evaluation and provided with evaluation support to design evaluation tools that provide data for the production of impact reports. A combination of quantitative pre and post educational surveys, evaluations, follow-up assessments, and focus groups along with qualitative statements will be used to measure program and educational effectiveness.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Health and Human Development Education

2. Brief summary about Planned Program

Overweight and obesity plus physical inactivity continue to be issues in North Dakota with long-term consequences, including chronic disease (heart disease, type 2 diabetes and certain types of cancer). Educational curricula continue to be developed or updated to reflect current Dietary Guidelines for Americans and will be delivered through a network of county agents to reach youth in schools and adults in communities. The curricula are based on both improved nutrition and increased physical activity.

Farm and ranch transition planning is emerging as a critical need for North Dakota producers. ND farmers and ranchers now average about 60 years in age, and many are looking toward retirement and transitioning their businesses. Without an adequate plan to transition the farm/ranch business there is an increased risk the business will not survive the transition. A program has been developed to assist families in making informed decisions about transitioning their business to the next generation and distributing their estates. The program will be delivered in multiple locations across the state targeting farm and ranch families. The program is designed to define the process, develop communication skills and to identify and work with professionals.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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%		50%	
806	Youth Development	20%		50%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

North Dakotans are not meeting current recommendations for nutrition and physical activity, which places them at risk for obesity and chronic disease, including heart disease, type 2 diabetes and cancer. Priorities are promoting the development/maintenance of healthy lifestyles for individuals/families within

homes, worksites and communities, with a special focus on baby boomers and older Americans. Extension staff have access to youth through classrooms, school nutrition programs and 4-H youth development.

Farm and ranch transition planning is emerging as a critical need for North Dakota producers. Our state's farmers and ranchers now average about 60 years in age, and many are looking toward retirement and transitioning their businesses. Over \$262 billion in wealth will be transferred within North Dakota over the next 50 years. A good portion of that wealth will be agriculture related land and assets. Will our producers be ready to transfer those assets to whom they want, how they want and when they want it transferred? Will they transfer a viable business to the next generation? Farm and ranch operators realize the importance of creating a succession plan and are looking for reliable, unbiased information to help them begin the process and work with professionals to create the plan best for their families and businesses. The planning process includes exploring options, communicate with family, successors, and business partners. Successfully transferring our state's farms and ranches will positively impact livelihoods, families, communities and the state farm-based economy.

2. Scope of the Program

- In-State Extension
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Overweight and obesity plus physical inactivity will continue to be a problem in North Dakota, which increases risk of chronic disease and potentially decreases quality/length of life. Low income families will continue to struggle to make healthy and nutritious meal plans because of high costs of fresh fruits and vegetables. Many North Dakota families that qualify for supplemental nutrition programs have not enrolled, which can limit their access to educational opportunities.

As North Dakota's farmers and ranchers age there is an identified concern that many family operations are not adequately prepared to successfully transition their business to the next generation. Farm and ranch business owners need a basic understanding of the succession process, the terms used and assistance in identifying the types of professionals who can assist them in implementing a plan. A business transition can cause conflict with in families and between business partners. Basic communication skills and conflict management tools are needed to successfully develop a succession plan.

2. Ultimate goal(s) of this Program

The health and human development education program has two primary goals: one, to improve lifestyle-related behaviors associated with the prevention of chronic disease (heart disease, diabetes, etc.); and two, participants in the Succession Planning program will indicate their intent to develop a succession plan for their business.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2016	4.8	0.0	0.0	0.0
2017	4.8	0.0	0.0	0.0
2018	4.8	0.0	0.0	0.0
2019	4.8	0.0	0.0	0.0
2020	4.8	0.0	0.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Newsletters ● eXtension web sites ● Web sites other than eXtension ● Other 1 (News Releases) ● Other 2 (Social Media)

3. Description of targeted 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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 Target

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. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle
- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 607 - Consumer Economics

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect 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.)

Description

Inclement weather which includes blizzards and spring flooding, a frequent occurrence in the past 5 years, has closed schools and prevented the instruction of these curricula at times. North Dakota's population is rapidly changing as a result of the oil industry in the western part of the state, and the student enrollment in small rural schools can change dramatically and alter the number of youth targeted. The federal reduction in the Family Nutrition Program has affected staffing in several counties. The final implications are unknown at this time. In addition, the availability and interest of youth and adults to health-related education be limited because of competing activities, especially for youth.

Changes in the economy, government tax regulations and agriculture programs may have an impact on when or how a farm/ranch is transitioned and if the business is viable for a successful succession plan.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each program team is trained in evaluation and provided with evaluation support to design evaluation tools that provide data for the production of impact reports. A combination of quantitative pre and post educational surveys, evaluations, follow-up assessments, and focus groups along with qualitative statements will be used to measure program and educational effectiveness.