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**AGENCY OVERVIEW****640 NDSU Main Research Center****Date:** 12/07/2012**Time:** 14:00:13

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**Statutory Authority**

ND Constitution Article XIX; North Dakota Century Code Chapter 4-05.1.

**Agency Description**

The North Dakota State University Main Research Station is located on the campus of the North Dakota State University of Agriculture and Applied Science. The station is the administrative location of the North Dakota Agricultural Experiment Station. The station conducts research and coordinates all research activities of the Agricultural Experiment Station. The purpose of the research is the development and dissemination of technology important to the production and utilization of food, feed, fiber, and fuel from crop and livestock enterprises. The research provides for an enhancement of economic development, quality of life, sustainability of production, and protection of the environment. The Main Research Station keeps detailed records of all activities and publishes the information that will be of value to the residents of this state.

**Agency Mission Statement**

The agricultural experiment station shall develop and disseminate technology important to the production and utilization of food, feed, fiber, and fuel from crop and livestock enterprises. The research must provide for an enhancement of the quality of life, sustainability of production, and protection of the environment.

**Agency Performance Measures**

Per North Dakota Century Code 4-05.1-19 the State Board of Agricultural Research and Extension (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on March 13, 2012. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and the NDSU Extension Service. A copy of the information is on file in the legislative council office.

**Major Accomplishments**

1. Released high yielding, disease resistant, and high quality hard red spring wheat cultivars Prosper (eastern ND), Velve (central ND), and Elgin (western ND).
2. Released Jury, an oat variety well adapted throughout eastern and central ND, with high yield potential, improved disease resistance, and high quality traits, including high beta-glucan levels.
3. Released the durum cultivar Carpio, high yielding and excellent quality traits for central and western ND.
4. Released the red bean Rio Rojo, a high yielding, disease resistant small red bean that meets both domestic and export markets.
5. Developed, maintained, and improved disease forecasting systems that are important tools for crop disease management.
6. Reduced leafy spurge infestation from its peak of 1.5 million acres to 600,000 acres by 2011, the lowest amount since 1971, providing an estimated \$14.0 million in additional revenue due to landowners.
7. Developed and implemented an early detection and rapid response system to prevent invasive weeds from establishing in the state.
8. Determined that nutrient intake of the mother influences progeny performance of livestock via epigenetic modification of gametes.
9. Identified methods to reduce the cost of feeding cattle using the new Beef Cattle Research Complex.
10. Developed in-house assays that target the detection of petroleum byproducts in rumen contents.
11. Established the nation's first Pulse Quality Lab that works with both the breeding program and with the industry to evaluate the level of quality of the ND pulse crop.
12. Identified improved genetic resistance to many plant diseases found in the state, saving the ND farmer millions in lost yield.
13. Investigated the feasibility of using CRP biomass for ethanol production while preserving and enhancing the production, diversity, and stability of CRP.
14. Developed low cadmium durum wheat lines, which is highly desired in some global markets.

**Future Critical Issues**

The NDAES continues to focus on developing an infrastructure in which to do quality research. Shortfalls occur in laboratory research facilities, especially those for plant-based field research laboratories at the REC's and the Main Station. Cereal and grain quality laboratories, critical to maintain and enhance quality parameters for new crop varieties, are in desperate need of renovation/replacement. Developing separate laboratories for quality evaluation of transgenic experimental breeding lines also is required, due to the separation of transgenic material required by Federal policies on transgenic material. Laboratory space at the Main Station needs to be renovated/enhanced in order to carry out both applied and fundamental research on crops and livestock. Disease evaluation by the Veterinary Diagnostic Lab is critical for our livestock industries to thrive, yet this facility is in jeopardy of losing accreditation due to its deteriorating condition. Similarly, our plant pathology labs need enhancement/

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renovation in order to better utilize the modern tools and technology available. New facilities, specifically the new greenhouse (Phases I and II) and the new animal research complex have had strong positive impacts on the ability of NDAES scientists to carry out high quality research in these state-of-the-art facilities. New technologies in crop development will provide novel methodology to incorporate disease, insect, and environmental stress resistance, thereby improving the overall adaptation of our many crops grown in the state. Our scientists travel farther each year in the state to conduct site-specific research to control wheat and barley scab (an ongoing problem) and other important yield-limiting diseases of crop commodities grown in the state. Addressing new issues, such as wheat stem sawfly, new races of existing diseases for which there is little resistance, and identifying and responding to livestock producer concerns over outbreaks of zoonotic diseases are fundamental to the mission of the NDAES. Major problems occur in acquisition of costly field and laboratory equipment that cannot be obtained through grants. NDAES has insufficient laboratory space to meet the needs of 21st Century agriculture. North Dakota is becoming increasingly urban, and urban populations require some products and services that are different than those needed by livestock and crop producers. Continual efforts to improve horticultural research are occurring, and NDAES is actively evaluating new research and demonstration programs in this area. Enhanced efforts in areas including, but not limited to, food safety, food security, natural resources management, new bioproducts (including fuel) need to continue in order to allow NDAES to serve this segment of agriculture well. A systems approach for livestock research, literally from conception to consumption, is identifying ways to better serve this important sector of the North Dakota agriculture. Our strength is in our scientists and staff, but they are too few to cover all of the critical issues facing North Dakota agriculture, and the lack of adequate numbers precludes important scientific achievement. While we are proud to provide a high level of applied research that is readily transferred to our stakeholders, some areas of fundamental research have become important to improve the efficiencies of our plant and animal-based applied research. Genomics, bioinformatics, and epigenetics all have their basis in fundamental research, but they provide products and expertise to enhance plant breeding (through genomic selection, marker-based selection) and livestock genetics (evaluating environmental influences on genetic expression). For some units, additional technical support would significantly increase productivity of researchers. Scientists are responsible for attracting external funding, and their success during this biennium is impressive; however, the effort to write more, and larger, grants is apparent, and we have concern that significant research efforts at the Main Station and the RECs rely almost exclusively on extramural funding. Economic realities often place the NDAES in a position of responding rather than being proactive in affecting positive change. Our efforts to develop close collaborative relationships with industry and other scientific organizations will help allow the NDAES to become more proactive in solving problems critical to the state's largest industry.

**REQUEST SUMMARY**

640 NDSU Main Research Center  
Biennium: 2013-2015

Bill#: SB2020

Date: 12/07/2012

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Description	Expenditures 2009-2011 Biennium	Present Budget 2011-2013	Budget Request Change	Requested Budget 2013-2015 Biennium	Optional Budget Request
<b>By Major Program</b>					
Agricultural Research	105,050,273	103,407,933	12,367,780	115,775,713	0
<b>Total Major Program</b>	<b>105,050,273</b>	<b>103,407,933</b>	<b>12,367,780</b>	<b>115,775,713</b>	<b>0</b>
<b>By Line Item</b>					
Deferred Maintenance	450,000		0	0	0
Main Research Center	104,350,273	103,407,933	12,367,780	115,775,713	0
Grape & Wine Prog Comm	250,000	0	0	0	0
<b>Total Line Items</b>	<b>105,050,273</b>	<b>103,407,933</b>	<b>12,367,780</b>	<b>115,775,713</b>	<b>0</b>
<b>By Funding Source</b>					
General Fund	63,828,496	56,605,041	6,438,585	63,043,626	0
Federal Funds	5,760,728	5,346,416	1,035,202	6,381,618	0
Special Funds	35,461,049	41,456,476	4,893,993	46,350,469	0
<b>Total Funding Source</b>	<b>105,050,273</b>	<b>103,407,933</b>	<b>12,367,780</b>	<b>115,775,713</b>	<b>0</b>
<b>Total FTE</b>	<b>329.26</b>	<b>349.01</b>	<b>12.00</b>	<b>361.01</b>	<b>0.00</b>

**REQUEST DETAIL**640 NDSU Main Research Center  
Biennium: 2013-2015

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Description	Expenditures 2009-2011 Biennium	Present Budget 2011-2013	Budget Request Change	Requested Budget 2013-2015 Biennium	Optional Budget Request
<b>Deferred Maintenance</b>					
Land and Buildings	450,000	0	0	0	0
<b>Total</b>	<b>450,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Deferred Maintenance</b>					
General Fund	450,000	0	0	0	0
Federal Funds	0	0	0	0	0
Special Funds	0	0	0	0	0
<b>Total</b>	<b>450,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Main Research Center</b>					
Salaries - Permanent	38,488,167	42,614,576	1,986,571	44,601,147	0
Salaries - Other	4,327,097	5,598,167	(5,598,167)	0	0
Temporary Salaries	3,889,697	4,475,796	3,428,686	7,904,482	0
Overtime	335,678	446,094	1,543,906	1,990,000	0
Fringe Benefits	12,971,944	15,024,146	2,766,398	17,790,544	0
Travel	3,322,514	3,953,024	120,000	4,073,024	0
Supplies - IT Software	257,797	261,975	0	261,975	0
Supply/Material-Professional	3,154,856	3,143,657	433,043	3,576,700	0
Food and Clothing	121,614	202,262	0	202,262	0
Bldg, Ground, Maintenance	304,950	373,856	0	373,856	0
Miscellaneous Supplies	2,682,602	1,400,804	3,923,997	5,324,801	0
Office Supplies	109,289	100,722	0	100,722	0
Postage	62,976	47,889	24,000	71,889	0
Printing	247,516	191,066	36,000	227,066	0
IT Equip Under \$5,000	368,178	220,506	0	220,506	0
Other Equip Under \$5,000	649,647	382,924	146,000	528,924	0
Utilities	230,595	965,000	(186,296)	778,704	0
Insurance	105,436	130,726	0	130,726	0
Rentals/Leases-Equip & Other	337,412	594,029	0	594,029	0
Rentals/Leases - Bldg/Land	419,841	182,791	0	182,791	0
Repairs	1,111,924	1,438,987	0	1,438,987	0
Salary Increase	0	0	0	0	0
Benefit Increase	0	0	0	0	0
IT - Communications	379,870	396,004	0	396,004	0
Professional Development	60,265	74,499	0	74,499	0
Operating Fees and Services	1,654,785	1,265,902	3,835,945	5,101,847	0
Fees - Professional Services	866,461	1,200,000	36,000	1,236,000	0
Miscellaneous Expenses	2,098,054	233,428	0	233,428	0
Cost of Good Sold	104,634	141,387	0	141,387	0

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Description	Expenditures 2009-2011 Biennium	Present Budget 2011-2013	Budget Request Change	Requested Budget 2013-2015 Biennium	Optional Budget Request
Waivers/Scholarships/Fellowshi	5,272	9,917	0	9,917	0
Land and Buildings	21,136,434	13,968,242	(2,923,242)	11,045,000	0
Other Capital Payments	421,789	504,092	(82,320)	421,772	0
Extraordinary Repairs	1,340,465	1,340,465	0	1,340,465	0
Equipment Over \$5000	2,782,514	2,525,000	2,877,259	5,402,259	0
<b>Total</b>	<b>104,350,273</b>	<b>103,407,933</b>	<b>12,367,780</b>	<b>115,775,713</b>	<b>0</b>
<b>Main Research Center</b>					
General Fund	63,128,496	56,605,041	6,438,585	63,043,626	0
Federal Funds	5,760,728	5,346,416	1,035,202	6,381,618	0
Special Funds	35,461,049	41,456,476	4,893,993	46,350,469	0
<b>Total</b>	<b>104,350,273</b>	<b>103,407,933</b>	<b>12,367,780</b>	<b>115,775,713</b>	<b>0</b>
<b>Grape &amp; Wine Prog Comm</b>					
Operating Fees and Services	250,000	0	0	0	0
<b>Total</b>	<b>250,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Grape &amp; Wine Prog Comm</b>					
General Fund	250,000	0	0	0	0
Federal Funds	0	0	0	0	0
Special Funds	0	0	0	0	0
<b>Total</b>	<b>250,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Funding Sources</b>					
General Fund	63,828,496	56,605,041	6,438,585	63,043,626	0
Federal Funds	5,760,728	5,346,416	1,035,202	6,381,618	0
Special Funds	35,461,049	41,456,476	4,893,993	46,350,469	0
<b>Total Funding Sources</b>	<b>105,050,273</b>	<b>103,407,933</b>	<b>12,367,780</b>	<b>115,775,713</b>	<b>0</b>

**CHANGE PACKAGE SUMMARY**

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Description	Priority	FTE	General Fund	Federal Funds	Special Funds	Total Funds
<b>Base Budget Changes</b>						
<b>One Time Budget Changes</b>						
A-B 10 Vet Diagnostic Equipment		0.00	400,000	0	0	400,000
A-B 2 Major Capital Projects		0.00	11,045,000	0	0	11,045,000
A-E 1 Remove One Time Funding		0.00	(82,402)	0	0	(82,402)
A-E 2 Remove Capital Projects		0.00	(6,608,025)	0	(2,502,931)	(9,110,956)
A-E 3 Remove 2009-11 Operating Carryover		0.00	(344,299)	0	0	(344,299)
<b>Total One Time Budget Changes</b>		<b>0.00</b>	<b>4,410,274</b>	<b>0</b>	<b>(2,502,931)</b>	<b>1,907,343</b>
<b>Ongoing Budget Changes</b>						
A-A 1 SBARE Priorities		12.00	3,290,000	0	0	3,290,000
A-A 10 Capital Bond Payments		0.00	421,772	0	0	421,772
A-A 2 Base Funding Extraordinary Repairs		0.00	1,340,465	0	0	1,340,465
A-A 3 Base Funding for Equipment over \$5,000		0.00	500,000	0	4,502,259	5,002,259
A-A 4 Other Revenue Change		0.00	612,988	0	7,000,000	7,612,988
A-F 1 Remove 2009-11 Capital Carryover		0.00	(2,187,969)	0	(2,669,317)	(4,857,286)
A-F 2 Remove Base Funding Extraord Repairs		0.00	(1,340,465)	0	0	(1,340,465)
A-F 3 Remove Base Funding Equip over \$5,000		0.00	(500,000)	0	(2,025,000)	(2,525,000)
A-F 4 Remove Funding Cap Bond Pmts		0.00	(421,690)	0	0	(421,690)
Base Payroll Change		0.00	313,210	1,035,202	588,982	1,937,394
<b>Total Ongoing Budget Changes</b>		<b>12.00</b>	<b>2,028,311</b>	<b>1,035,202</b>	<b>7,396,924</b>	<b>10,460,437</b>
<b>Total Base Budget Changes</b>		<b>12.00</b>	<b>6,438,585</b>	<b>1,035,202</b>	<b>4,893,993</b>	<b>12,367,780</b>

**BUDGET CHANGES NARRATIVE**

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<b>Change Group:</b> A	<b>Change Type:</b> A	<b>Change No:</b> 1	<b>Priority:</b> 1
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SBARE Priorities

An increase of \$6,430,000 over the 2011-13 general fund base, would provide funds to address the following priorities of the State Board of Agricultural Research and Education and related needs of North Dakota agriculture. Of the total, \$3,290,000 is included in the request for the Main Station, and \$3,140,000 is included in the request for the Branch Stations.

SBARE ranked all of the projects for Main Station and Branch Stations together since a lot of the projects are joint efforts. Please refer to the ranked projects by reviewing the narrative in all of the agencies.

**SBARE Ranking: Agriculture Experiment Station**

In addition to Cost to continue FY 13 salary & retirement increases plus 2013-15 salary and health insurance increases [Main REC cost to continue FY13 salary & retirement increases = \$926,198 GF; 2013-15 salary and health insurance increases to be determined], SBARE identified the following priorities:

**1. Crops Initiative- Enhancing Crop Development and Protection Efforts [\$2,110,000 Main; 6.0 FTE; \$360,000 REC, 0.0 FTE ]**

**\$2,470,000 Total General Fund Increase**

- \$1,160,000 Increased operating support for the following programs: barley, corn, dry bean, pulse, soybean, HRS wheat, winter wheat, canola, cereal diseases, dry bean and pulse diseases (Main Station-\$800,000), crop pathology (CREC-\$120,000), variety testing (LREC-\$120,000) , and dryland crop improvement (DREC-\$120,000)
- \$355,000 salary and fringe benefits, 2.0 FTE- Main Station, one nematologist and technician
- \$300,000 Increased funding for operating(\$80,000), software and hardware (\$100,000), and technical support (1.0 FTE, Main Station- \$120,000) for NDAWN
- \$300,000 salary and fringe benefit, 1.0 FTE, Main Station -one bioinformaticist
- \$355,000 salary and fringe benefit, 2.0 FTE Main Station, one statistical genomicist and technical support

Agriculture is the leading sector of the state's economy. Cash "farm-gate" receipts of crop and livestock commodities account for 25% of the state's economy. Further, additional agricultural activities including, but not limited to, sale of products, manufacturing, transportation of commodities, professional services, and processing increases the percentage of this important component to more than 40%.

Developing improved crop varieties is fundamental to continued competitive success and profitability of farmers in the state. North Dakota has an extremely diverse crop mix; farmers grow more than 42 different crops in the state, and lead the nation in the production of more than 14 crop commodities. To accommodate the demand, the NDAES has developed over 13 plant breeding programs, with additional research programs that significantly aid in the development of improved varieties. When new varieties are released, they provide an immediate level of new wealth to farmers in the state. In general, \$1 invested in variety development generates over \$200 in return to the state.

Research to protect yield of all of the commodities is critical in reducing production costs. One area of crop protection that needs to be addressed is nematology.

Several species of nematodes infest the roots of many of our important commodities; of these, the Soybean Cyst Nematode (SCN) perhaps causes the greatest economic impact. While the organism does not travel far on its own, mechanical transportation by humans enhance its movement within a region. This organism has recently been identified in 12 counties in the state, as far north as the Canadian border and west to the Missouri River.

The population is expected to increase rapidly. Yield losses in soybean and in other susceptible hosts of the pathogen, such as dry bean, are expected to increase as the population increases. In addition to SCN, other nematode species likely or confirmed in NO can infect sugarbeet, canola, potato, wheat, corn, and others.

Efforts to monitor disease development using NDAWN saved more than \$30 million annually (either protecting the crop using timely application or not needing to spray). However, the NDAWN network is in need of upgrades, both in software and hardware. Of the 73 sites operated by NDAWN, only eight stations are capable of near-real-time data delivery using Wireless Data communication. Also, large spatial gaps exist, with 15 western NO counties not having an NDAWN station.

Fundamental research is research that creates new knowledge of science. Also described as basic research, it is the basis of all applied research that is carried out. Unlike applied research, where we can typically identify an immediate "payback", basic research generally has a more long-term payback. Having a combination of

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basic and applied research in agriculture allows our scientists to be at the forefront of identifying new knowledge, new technology, and new products. It also enhances our ability

as an experiment station to partner with industry, to increase our success in garnering competitive grants

from a number of organizations and solving tomorrow's problems today.

Research in areas, such as bioinformatics and statistical genomics, has future payoff, but also will provide our scientists with cutting edge tools with which to work more efficiently. Modern genetic and genomic technologies are providing a wealth of new data that are rapidly accelerating the pace of new applied discoveries.

Understanding these data and interpreting them in a manner that supports breeding and other investigative research areas is essential for rapid advancement and the efficient development of new crop cultivars. Statistical genetics defines the new experimental approaches necessary to take advantage of large genomics data sets.

Bioinformatics is the analytical tool necessary to analyze these data. Together, researchers in these fields analyze the data and provide applied researchers with interpretations that allow for timely and efficient decisions.

Crop development efforts can be enhanced by additional support to a number of breeding and affiliated research programs in quality evaluation, disease reaction, and agronomics.

**2. Enhancing Research Capacity at the REC's [\$0 Main; \$1,860,000 REC, 8.0 FTE]****\$1,860,000 Total General Fund Increase**

- \$400,000 salary and fringe benefits, 2.0 FTE (HREC and WREC at \$200,000 each) are needed to focus on chemical and cultural control of weeds and plant pathogens in farming and grazing enterprises in western North Dakota.
- \$900,000 salary and fringe benefit (1.0 FTE, LREC; 1.0 FTE, CGREC; 1.0 FTE, NCREC; 1.0FTE, DREC; 1.0 FTE, WREC; and 1.0 FTE, CREC), technical support (\$150,000 each)
  - \$560,000 Operating support - \$80,000 each (LREC, CGREC, NCREC, WREC, HREC, CREC, DREC)

The Research Extension Centers play a very important role in carrying out applied research in the Agricultural Experiment Station. Since evolving from branch stations/research farms, their involvement in important regional and state research activities has expanded, and there is strong support for these activities from farmers and ranchers in the state. Each REC has a unique mission to serve their respective region of the state; therefore, their needs also are unique. The ability of the scientists stationed at the RECs to address important and emerging problems will increase as the technical sophistication of farming and ranching practices continues to occur. Additional technical support staff to assist scientists on their research efforts and operating funds to help carry out the research are needed. Approximately 50% of each REC total budget is from gifts, grants (to support research), and sale of product.

A few scientists throughout the state carry out weed control research. Often, the mix of weed species affecting crop production in western North Dakota, and the cost of herbicides relative to potential productivity in the western part of the state, requires identifying different options better suited to this unique environment. A number of factors differentiate this region from other regions of the state, including extensive grazing lands, widespread adoption of no-till for moisture conservation, and the crops mix used in the region. Additionally, soil fertility, C-N ratios that exist in the region, and the identification of invasive species into this region all indicate that more expansive weed control activities be carried out in the region. Environmental conditions, including extended growing seasons and frequent drought create unique populations of tough-to-control weeds like downy brome, Persian darnel, and cleavers. Many weeds are directly responsible for reduced productivity of grazing lands, reduced palatability of livestock feeds, and some can be toxic to livestock.

There is an increasing level of crop disease problems occurring in western North Dakota due to the switch from a strict wheat-fallow rotation to intensive no-till cropping systems and irrigation development. Wheat and barley fields infected with leaf diseases, viruses, and even Fusarium head blight have been observed, while fields of pulse crops and other alternate crops have been infected with a number of diseases. A plant pathologist is needed to conduct timely disease surveys on the incidence and severity of crop diseases and to develop and recommend disease management control measures to no-till and irrigated producers. The plant pathologist will work with NDSU plant breeders on screening and identifying germplasm having resistance to the prevalent diseases occurring under no-till and irrigated production in western North Dakota.

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**3. Livestock Initiative - Improving Livestock Productivity and Protection [\$1,180,000 Main REC, 6.0 FTE; \$920,000 REC, 4.0 FTE]****\$2,100,000 Total General Fund Increase**

- \$700,000 salary and fringe benefit, 5.0 FTE at HREC, CREC, CGREC, DREC, and Main Station), technical support. (\$140,000 each).
- \$480,000 Operating support (\$120,000 at Main Station, and \$90,000 each at HREC, CGREC, CREC and DREC)
- \$225,000 salary and fringe benefit, 1.0 FTE, Main Station, one scientist in forage nutrition and management
- \$340,000 salary and fringe benefit 2.0 FTE, Main Station, support staff
- \$355,000 salary and fringe benefit, 2.0 FTE, Main Station, one scientist in epigenetics and one technician

North Dakota livestock producers are committed to producing the safest, highest quality food products. Increasing demand for our meat products nationally and internationally will require additional emphasis on productivity and also will present additional opportunities for specialty markets and improved profitability. Through research, we can identify sustainable, profitable opportunities to improve livestock productivity in North Dakota.

*Forage and Forage Nutrition Research.* Forages are the backbone of North Dakota's livestock industry. The cow-calf, sheep, and dairy industries in the state rely on forages (grazed and harvested) for profitable and sustainable production. Additional investments in forage and forage nutrition research will pay dividends for North Dakota's livestock industry by enhancing productivity through a systems approach.

*Expanded Beef Cattle Finishing Research.* The resources are in place to grow beef feedlot enterprises in North Dakota. Opportunities for new market outlets and international trade, as well as the large variety of available feedstuffs, should enhance the opportunity for expansion. Systems that provide a stable, year-round finished cattle supply for processors and enhanced carcass quality for specialty markets, along with mitigating environmental stress, improving environmental sustainability, and improved animal care and husbandry are priorities for research.

*Bison research.* North Dakota is the third largest bison producer in the nation. The North Dakota bison industry identified several emerging needs areas at their recent testimony (Jan. 6, 2012), the most important of which is information on mineral nutrition of bison. Also, included in their testimony was research on feeding and nutrition of bison, grazing management, basic nutrient requirements, and animal health.

*Epigenetics.* Epigenetics is the study of factors such as diet, stress and other regulators that influence genetic expression. Our research capabilities can be enhanced by adequately funding efforts such as those made in the Advanced Imaging and Microscopy Lab and the Center for Nutrition and Pregnancy.

Identifying and preventing disease outbreaks in the animal herds in the state is the responsibility of the Veterinary Diagnostic Lab (VOL). The expanding oilfield presents challenges to livestock producers in western North Dakota. Pipeline breaks, semi-truck chemical spills, and down-hole accidents can contaminate ground and surface water sources. The proximity of livestock to drilling sites can result in poisoning from ingestion of water/feedstuffs contaminated with crude oil, condensate, salt water, heavy metals and/or caustic chemicals. Diagnosis of these cases requires sophisticated equipment.

The ability of the VOL to carry out enhanced testing of livestock feeds for mycotoxins, molds and phytoestrogens. Liquid chromatography with mass spectrometry capability (LC/MS/MS) can be used to test animal feeds for natural contamination by field and storage molds. Phytoestrogens are natural toxins commonly found in alfalfa and clover forages used for dairy and beef cattle. Elevated phytoestrogens in animal feeds create the potential for transfer to milk and milk products, and constitutes a public health risk. To identify low levels of phytoestrogens in milk, a more specific and sensitive method is required.

Currently, testing for *Listeria*, *Salmonella* and *E. coli* in ready to eat and raw meat products for the North Dakota Meat Inspection Service is being conducted at South Dakota State University. The NDSU-VDL is in the process of developing the capacity for surveillance of these bacteria. Instrumentation has been purchased to screen for the three above-mentioned bacteria with temporary laboratory space assigned to conduct the testing. Additional instrumentation is required. There are 21 federally inspected and 14 state inspected establishments in North Dakota that would immediately benefit from this testing.

**BUDGET CHANGES NARRATIVE**

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Through cooperative agreements and collections income, the laboratory has been responsible for the funding of positions considered essential by our accrediting organization, the American Association of Veterinary Laboratory Diagnosticians. Uncertainty about the year to year availability of these monies places these critical positions in jeopardy. Without accreditation, the laboratory would lose reputation, status, and clientele. Permanent funding is needed to give stability to these positions.

<b>Change Group:</b> A	<b>Change Type:</b> A	<b>Change No:</b> 2	<b>Priority:</b> 2
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Base Funding Extraordinary Repairs

This provides an amount equal to the 2011-13 base funding of **\$1,340,465** for extraordinary repairs, and is equivalent to the amount removed in the cost to continue **change code AF2**.

<b>Change Group:</b> A	<b>Change Type:</b> A	<b>Change No:</b> 3	<b>Priority:</b> 3
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Base Funding for Equipment over \$5,000

This provides an amount equal to the 2011-13 GF base funding of \$500,000 for equipment > \$5,000, and is equivalent to the amount removed in the cost to continue **change code AF3**. In addition, \$4,502,259 is added for equipment > \$5,000 from special funding sources.

<b>Change Group:</b> A	<b>Change Type:</b> A	<b>Change No:</b> 4	<b>Priority:</b> 4
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Other Revenue Change

Increase due to reallocation of payroll sources, as well as estimated increases in revenue from grants and other funds

<b>Change Group:</b> A	<b>Change Type:</b> A	<b>Change No:</b> 10	<b>Priority:</b> 10
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Capital Bond Payments

This **\$421,772** request is based on estimates provided by the Industrial Commission for state general fund obligation bonds issued through the Industrial Commission. The 2011-13 appropriation for bond payments was removed in change code **AF4**.

<b>Change Group:</b> A	<b>Change Type:</b> B	<b>Change No:</b> 2	<b>Priority:</b> 2
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Major Capital Projects

**1. Agronomy Labs (CREC, HREC, LREC, CGREC) - \$5,925,000****Agronomy Lab (CREC) - 10,040 square feet new construction - \$2,500,000**

The Carrington Research Extension Center agronomy program is perhaps the largest and most diverse of the out-state RECs. Yet this program must perform the duties and processes associated with this large program in an old (1962-era) potato warehouse. For example, more than 25,000 individual samples are handled in multiple processing steps in the confines of this antiquated facility. During the course of the past 30 years, the CREC agronomy staff have self-renovated the interior of this

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warehouse to create a degree of functionality, given the limitations. First and foremost, the current agronomy laboratory does not meet worker safety and protection standards. The current laboratory has limited space for experiment preparation and processing, sample cleaning, dryers and field sample storage. The current facility lacks some basic research functionality, such as dust and air exchange capability, isolated chemical handling space and controlled environment for seed storage plus it has no room for plant pathology experiments. The innovative and proactive research efforts of the CREC agronomist and plant pathologist are severely compromised by the limitations and lack of modern capabilities in the present facility.

**Agronomy Lab (HREC) - 8,000 square feet new construction - \$1,800,000**

The agronomy and range research programs at the NDSU Hettinger Research Extension Center have grown beyond the ability of our agronomy lab to house them. The current lab is a converted granary with inadequate sample storage space, inadequate drying ovens, and no Internet service or the ability to provide a modern office working environment. Additionally, the HREC has inadequate equipment storage space needed to store the agronomy research program's seed drills and combine, and the range research program's equipment. A modern agronomy and range lab of approximately 8,000 square feet is needed to provide technicians and graduate students with office space, technical facilities in line with modern research (Internet access, dust-free environments to work on computers, and lab areas for handling radio telemetry collars for wildlife and domestic livestock), new drying ovens and sampling processing areas, and storage for research samples and equipment.

**Agronomy Lab (LREC) - 5,500 square feet new construction - \$1,225,000**

The Langdon Research Extension Center has an active agronomy research program that includes all aspects of crop production, including, but not limited to, soil health, plant pathology, entomology, crop fertility, weed control and variety development. The LREC has no dedicated facility to store, process and perform an array of tests to compile research data the region's producers need to solve crop production problems and questions. A new agronomy lab would allow LREC scientists to conduct this work and, in the long run, would save resources that are expended on shipping research materials away for processing and testing.

**Agronomy Lab (CGREC) - 4,000 square feet new construction - \$400,000**

With the addition of a forage agronomist at the Central Grasslands Research Extension Center, the center is in need of a forage lab/storage building. Currently, samples collected in the field by the scientist are processed in a corner of an equipment storage building with a dirt floor. The dust from opening the overhead door and moving equipment renders this area very dusty and makes keeping scales and computers clean very difficult. The new building would house the forage drying ovens, computer, scale, etc., for sample data processing. It also would house the grinders and equipment to process the forage samples in preparation for nutrient analysis. The building would be 40 by 100 feet, with half used for the forage lab and the remainder used for sample and equipment storage. We are forced to store plot equipment outside, where the weather takes its toll on the equipment. New plot equipment such as self-propelled forage harvesters cost upwards of \$100,000 and should be maintained in a clean, dry storage environment.

**2. Seed Cleaning Plants (NCREC, CREC, WREC, LREC)- Option B- \$3,470,000.****Self Contained (portable) Conditioning Mill (CREC) \$ 905,000**

The current seed plant was constructed in 1963 and is seriously out of date. The current plant is not designed to readily accommodate air exchange and dust control mechanical features to address worker safety concerns. The present building is too small to retro-fit with larger capacity seed conditioning equipment.

A Self Contained (portable) Conditioning Mill, color sorter, steel storage building, and necessary ancillary improvements are needed. The Self Contained Mill includes an air screen cleaner, an indent mill, and a gravity mill.

**SELF CONTAINED (PORTABLE) CONDITIONING MILL (LREC) \$755,000**

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The LREC produces an average 15,000 bushels of regionally adapted foundation seed production for use by the regions producers in their cropping enterprise. The current foundation seed facility at the LREC was constructed in 1962 and utilizes the same equipment. It is outdated, inefficient, very slow, and needs to be modernized to support a foundation seed system demanded by the region's producers. In 2008, the condition of the seed cleaning plant was cited as the number one safety hazard on the grounds of the LREC. There is no room for a renovation, such as adding another leg.

A Self Contained (portable) Conditioning Mill, steel storage building, and necessary ancillary improvements are needed. The Self Contained Mill includes an air screen cleaner, an indent mill, and a gravity mill.

**SELF CONTAINED (PORTABLE) CONDITIONING MILL (NCREC) \$905,000**

The current seed conditioning facility was built in 1949 and added on to in 1982. It is too small, inefficient, and is a health and safety problem due to inadequate dust handling. It is not equipped to gently handle pulse crops, oil seeds, and other crops. A Self Contained (portable) Conditioning Mill, color sorter, steel storage building, and necessary ancillary improvements are needed. The Self Contained Mill includes an air screen cleaner, an indent mill, and a gravity mill.

**SELF CONTAINED (PORTABLE) CONDITIONING MILL (WREC) \$ 905,000**

The current building used to house the foundation seed conditioning equipment was built in the mid 1950's. The area designated to unload trucks can only accommodate a small single axle truck and does not have sufficient unloading capacity. Grain legs that move the dirty and clean grain are all too small for efficient movement of grain. We are limited to cleaning a maximum of 45 bushels per hour by the current grain leg size. Upgrading the grain legs is difficult to near impossible in this building because of space limitations. Equipment for the distribution and conditioning of grain is currently located on five different floor levels in the building, creating potential worker safety issues and problems associated with constant stair climbing. The conditioning plant is cleaned thoroughly at every level between each crop variety that is conditioned in order to insure seed purity for Foundation Seed production. This means that in 2011-2012 the conditioning plant will need to be hand cleaned about 18 times, a task that now takes two people approximately ten hours to complete.

A Self Contained (portable) Conditioning Mill, color sorter, steel storage building, and necessary ancillary improvements are needed. The Self Contained Mill includes an air screen cleaner, an indent mill, and a gravity mill.

**3. Livestock Facilities (CREC - \$1,150,000, HREC - \$500,000)- \$1,650,000**

Construction of a multi-use Feedlot Research Support Facility will improve feedlot research operational capability, assist in sustaining IACUC compliance, attain worker protection standards, and reduce maintenance costs for equipment. The CREC has a critical need for a facility that would combine the functions of storing and dispensing pharmaceuticals and animal health supplies, allow for the efficient processing of feeds, blood, and tissue, provide office space for technical staff with computer support and records storage, indoor storage for feeding equipment used on a daily basis, and a general shop area for equipment maintenance and minor repairs.

Meeting the expanding demands for feedlot research is partially limited by available pens. Current pens are fully utilized. The CREC is continually challenged to do more research, however feedlot pen availability is a clear limitation. The addition of a minimum of sixteen pens that would hold 160 head of cattle would allow the CREC to conduct one additional experiment per feedout period. Further additional pens will allow more treatments and replications in feedlot research studies which would improve statistical confidence and precision. Any feedlot pen expansion must include the associated waste containment facilities to remain compliant with state law.

HREC has provided educational events to veterinarians, extension specialists, and producers from 14 states and three countries. These events include various demonstrations, including, but not limited to, carcass ultrasound evaluation, shearing and wool grading schools, and technical cattle feedlot schools and trainings. All of these events are held in the former dairy barn, originally built in 1909, or outdoors. This facility is inadequate to provide state-of-the-art training and educational events. A multi-purpose livestock facility is needed to address the research and outreach needs of the Center and the stakeholders in the region.

<b>Change Group:</b> A	<b>Change Type:</b> B	<b>Change No:</b> 10	<b>Priority:</b> 10
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Vet Diagnostic Equipment

Adds a one-time request for \$400,000.

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Identifying and preventing disease outbreaks in the animal herds in the state is the responsibility of the Veterinary Diagnostic Lab (VDL). Livestock feeds can be tested for mycotoxins, molds, and phytoestrogens. Liquid chromatography with mass spectrometry capability (LC/MS/MS) can be used to test animal feeds for natural contamination by field and storage molds. In addition, the expanding oilfield presents challenges to livestock producers in western North Dakota. Pipeline breaks, semi-truck chemical spills, and down-hole accidents can contaminate ground and surface water sources. The proximity of livestock to drilling sites can result in poisoning from ingestion of water/feedstuffs contaminated with crude oil, condensate, salt water, heavy metals and/or caustic chemicals. Diagnosis of these cases requires sophisticated equipment. - \$400,000 equipment

<b>Change Group:</b> A	<b>Change Type:</b> E	<b>Change No:</b> 1	<b>Priority:</b> 1
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Remove One Time Funding

To remove \$82,402 (GF) one-time special assessments.

<b>Change Group:</b> A	<b>Change Type:</b> E	<b>Change No:</b> 2	<b>Priority:</b> 2
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Remove Capital Projects

To remove 2011-13 adjusted appropriation authority for the following capital projects. We will report on the status of the individual projects to the appropriations committees of the sixty-third legislative assembly, as required. Main Research Center Greenhouse Project - **\$6,608,025 GF (\$383,625 has been reduced from original appropriation for the amount utilized in 2009-11, per emergency clause (HB1020 Section 11) and \$2,502,931 OF**

<b>Change Group:</b> A	<b>Change Type:</b> E	<b>Change No:</b> 3	<b>Priority:</b> 3
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Remove 2009-11 Operating Carryover

To remove the 2009-11 carryover for greenhouse utilities \$344,299 GF.

<b>Change Group:</b> A	<b>Change Type:</b> F	<b>Change No:</b> 1	<b>Priority:</b> 1
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Remove 2009-11 Capital Carryover

To remove the 2009-11 carryover, totaling \$5,201,585 (**\$2,187,969 GF; \$2,669,317 OF**):

- Greenhouse capital project \$1,342,812 GF; \$2,669,317 OF
- REC renovations \$845,157 GF

<b>Change Group:</b> A	<b>Change Type:</b> F	<b>Change No:</b> 2	<b>Priority:</b> 2
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Remove Base Funding Extraord Repairs

To remove \$1,340,465 base funding for extraordinary repairs. The same amount is being requested for 2013-15, and is reflected in change code AA2. To date, funding has been used for a fencing project, dairy lagoon upgrade, roof repairs, and feed bunk upgrades.

<b>Change Group:</b> A	<b>Change Type:</b> F	<b>Change No:</b> 3	<b>Priority:</b> 3
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Remove Base Funding Equip over \$5,000

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To remove \$500,000 GF base funding, and \$2,025,000 SF for equipment > \$5,000. The same amount of GF is being requested for 2013-15, and is reflected in **change code AA3**.

<b>Change Group:</b> A	<b>Change Type:</b> F	<b>Change No:</b> 4	<b>Priority:</b> 4
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Remove Funding Cap Bond Pmts

To remove for bond payments for state general fund obligation bonds issued through the Industrial Commission at the Main REC **\$421,690**.

<b>Change Group:</b> R	<b>Change Type:</b> A	<b>Change No:</b> 1	<b>Priority:</b>
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Adjust SBARE Initiatives to Recommendation

This change package adjusts funding for SBARE initiatives in change package AA1 to the Executive Recommendation:

**Enhancing Crop Development and Protection Efforts**

- \$800,000 for increased operating support.
- \$355,000 and 2.00 FTE for a nematologist and a technician.
- \$300,000 and 1.00 FTE for technical support, increased operating costs, and software & hardware purchases for the North Dakota Agricultural Weather Network (NDAWN).

**Livestock Initiative**

- Did not fund \$1,180,000 and 6.0 FTE requested for this initiative.

<b>Change Group:</b> R	<b>Change Type:</b> A	<b>Change No:</b> 2	<b>Priority:</b>
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Agricultural Research Fund - Adjust to Actual

This change package adjusts expenditures from the agricultural research fund to the expected actual level.

<b>Change Group:</b> R	<b>Change Type:</b> A	<b>Change No:</b> 100	<b>Priority:</b>
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Executive Compensation Adjustment

This budget change provides funding for recommended 2013-15 compensation adjustments.

<b>Change Group:</b> R	<b>Change Type:</b> B	<b>Change No:</b> 1	<b>Priority:</b>
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Adjust Capital Projects to Recommendation

This change package adjusts the capital projects in change package AB2 to the Executive Recommendation:

- Provides \$4.3 million to construct agronomy laboratories at the Carrington and Hettinger Research Extension Centers.
- Does not include funding of \$1,625,000 requested for agronomy laboratories at Central Grasslands or Langdon.

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- Does not include funding of \$3,470,000 requested for seed conditioning plants
- Does not include funding of \$1,650,000 requested for livestock facilities.