V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Sustainable and Economically Viable Food and Biomass Systems

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	4%		9%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	4%		8%	
205	Plant Management Systems	11%		8%	
206	Basic Plant Biology	6%		8%	
211	Insects, Mites, and Other Arthropods Affecting Plants	3%		10%	
212	Pathogens and Nematodes Affecting Plants	3%		7%	
213	Weeds Affecting Plants	3%		4%	
215	Biological Control of Pests Affecting Plants	2%		2%	
216	Integrated Pest Management Systems	9%		4%	
301	Reproductive Performance of Animals	8%		5%	
302	Nutrient Utilization in Animals	5%		8%	
305	Animal Physiological Processes	2%		4%	
307	Animal Management Systems	8%		4%	
315	Animal Welfare/Well-Being and Protection	7%		2%	
402	Engineering Systems and Equipment	6%		4%	
501	New and Improved Food Processing Technologies	5%		5%	
511	New and Improved Non-Food Products and Processes	3%		5%	
601	Economics of Agricultural Production and Farm Management	8%		2%	
603	Market Economics	2%		1%	
901	Program and Project Design, and Statistics	1%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	78.0	0.0	86.0	0.0
Actual	66.0	0.0	85.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1807873	0	2760079	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2126067	0	2723879	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

•Conduct research and extension programs to develop/deliver new and improved crop and livestock integrated management programs.
•Conduct research and extension programs to develop/deliver new and improved information to help producers create sustainable crop and livestock production programs.
•Conduct research and extension programs to develop/deliver new and improved information to identify new and emerging markets and marketing strategies for agricultural products and agribusiness.
•Conduct research and extension programs to develop/deliver information on new or improved food products and technologies and emerging efficiencies of production to Nebraska's ag-based industries.

2. Brief description of the target audience

Targeted audiences will include a broad range of small and large agricultural producers and processors.Nebraska-based processors, especially start-up companies, will receive high priority. Specific groups that will use the research and education programs include:

•Crop and livestock producers •State agribusiness •Food processing facilities •Natural Resource Districts •Research and extension specialists •Extension educators •Commodity groups
•Nebraska independent crop consultants •Seed fertilizer and pesticide suppliers •Commercial pesticide applicators •Certified crop advisors •Neighboring state institutions •Scientists and engineers developing new knowledge

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	37100	300000	750	2000
Actual	93897	354898	88029	117079

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

Patent Applications Submitted

Year: 2010
Plan: 2
Actual: 12

Patents listed

IL-1beta-releasing agents as novel adjuvants

Water Stable and Biocompatible Electrospun Protein Fibers

Improved Production and Yield Capacity of Transgenic Plants Expressing a Genetically Engineered Version of the Dicamba Monooxygenase Gene (aka, oxygenaseDIC)

Methods and Device for Non-Destructive Measurement of Relative Water Content in Plants

Development of Crops Tolerant to Treatment with Dicamba

Thermoplastics from distillers dried grains by esterification

Marigold Meal Extracts as a Natural Parasite Control Substance in Poultry

Alkaline active xylanases

New Gene Which Intensifies Purple Plant Color in Pearl Millet (Temporarily designated PP3)

Mask Scentometer

RNA Interference as a tool to control western corn rootworm adults and screening of gene function

Self-powered smart wireless identification sensor system for production agriculture applications

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Plan	45	175	
Actual	48	206	254

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of scholarly publications and ouputs related to economically viable and sustainable food and biomass systems.

Year	Target	Actual
2010	220	254

Output #2

Output Measure

- Number of workshops, continuing education programs, web-based curricula and field days/tours related to economically viable and sustainable food and biomass systems.

Year	Target	Actual
2010	445	693

Output #3

Output Measure

- Number of Agricultural Research Division projects related to economically viable and sustainable food and biomass systems.

Year	Target	Actual
2010	190	102

Output #4

Output Measure

- Number of new extension publications and other education resources related to economically viable and sustainable food and biomass systems.

Year	Target	Actual
2010	35	43

Output #5

Output Measure

- Number of new or improved plant and animal genetic materials or resources related to economically viable and sustainable food and biomass systems.

Year	Target	Actual
2010	15	6

Output #6

Output Measure

- Number of new products and decsion tools developed and made available to clientele related to economically viable and sustainable food and biomass systems.

Year	Target	Actual
2010	10	8

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Nebraska farmers will increase profitability through adoption of research and extension information provided by IANR programs (measured by value placed on the information by clientele).
2	Nebraska ranchers and feeders will increase profitability through adoption of research and extension information provided by IANR programs (measured by value placed on the information by clientele).
3	Nebraska farmers and ranchers will have sustainable food and biomass systems through adoption of best management practices (measured by percent of clientele adopting best management practices).
4	Nebraska will have access to a highly trained and educated workforce for economically viable and sustainable food and biomass systems (indirectly measured by number of undergraduate and graduate students receiving degrees).
5	Nebraska farmers and ranchers will rely on IANR research and extention programs to assure an economically viable and sustainable food and biomass system (measured by percent of state acreage and livestock represented at education programs).

Outcome #1

1. Outcome Measures

Nebraska farmers will increase profitability through adoption of research and extension information provided by IANR programs (measured by value placed on the information by clientele).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	133400000	146690000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To remain economically viable and environmentally sustainable in a rapidly changing world, Nebraska farmers and related agribusiness representatives must obtain and incorporate new research-based knowledge as quickly as possible in order to gain efficiencies, be better stewards of our natural resources, and take advantage of new opportunities.

What has been done
In 2010, IANR program impact reports indicated participation by about 17,000 farmers, agricultural consultants, and other agribusiness professionals who over see directly or indirectly one-third of Nebraska's crop land acres. UNL Extension taught 693 educational workshops, fields, days, professional develop sessions, and web delivered seminars to share new research based information and recommendations. In addition, many additional individuals were contacted through our statewide websites such as Crop Watch (http://cropwatch.unl.edu) and water (http://water.unl.edu). Shaping the Future of Food was the university display at Husker Harvest days and at other awareness building initiatives.

Results
Extension hosted educational workshops and classes to increase profitability. These educational experiences were taught through face to face classes, field day, and through on-line learning. These classes were evaluated for economic and behavioral changes. Examples of the impact of these educational classes is evidenced by the following reports. Fifty-eight soybean growers and agronomic industry representatives significantly increased their knowledge on identification, biology and management of soybean cyst nematodes. Participants estimated the value of information presented was $20.73/acre. This makes the value of the programs $2,108,687 on the 101,711 acres reported by participants.

Attendees at the Farmers and Ranchers college showed participants managed nearly 227,000 acres and valued information learned from the programs was $5.A, with a potential program impact of $1.1 million.

A UNL Extension led Center Pivot Water Conservation Project survey indicated center pivot irrigators attending project workshops were able to reduce pumping by 360,000 acre inches. This translated into less water used and a savings of $1.5 million annually.

Two Nebraska No-till conferences, total number of acres of no-till increased by 981,438 acres, saved or made an additional $14/A or $13.7 million.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management
603	Market Economics
901	Program and Project Design, and Statistics

Outcome #2

1. Outcome Measures

Nebraska ranchers and feeders will increase profitability through adoption of research and extension information provided by IANR programs (measured by value placed on the information by clientele).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	81262000	53953195

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To remain economically viable and environmentally compatible in a rapidly changing world, Nebraska ranchers and feeders and related agribusiness representatives must obtain and incorporated new research based knowledge as quickly as possible in order to gain efficiencies, be better stewards of our natural resources, and take advantage of new opportunities. One of UNL Extensions five spires of excellence targets beef cattle systems.

What has been done
In 2010, IANR programs impacted over 4000 ranchers, feeders, and related agribusiness professionals, representing about 4.7 million head of cattle. Nebraska Extension hosts the #1 web site on beef from a search engine perspective and also leads the national eXtension beef web initiative. In 2010 Extension education focused on making profitable management decisions.

Results
The Beef Ranch Practicum series which is in its eleventh year 'sells out' each year. The small annual enrollment of about 35 allows for individual teaching on an intense basis. The course is taught be a team of animal science research and extension faculty over an eight month period. The management system decision making tools learned influenced decisions on 273,858 acres and 26,430 head of cattle in 2010. The benefit to the ranches for this 'one year of participation' was approximately $11,168/operation, or about $390,705.

The beef satellite series was taught to 215 producers at fifteen sites with nearly 50,000 acres of pasture supporting 13,576 beef cattle. The value indicated by producers for their attendance was $10-$30/head for a median impact of $271,000.

Educational programs taught in 2010 included in-depth workshops, on-line classes, multi-state meetings and monthly classes. Evaluation data aggregated from these 100 plus education programs evidences that economic and management changes were made by the class attendees. The changes most reported were reproduction management (46% of the class participants), beef quality improvement (36%), reduced stress at weaning (31%), and improved cattle handling (35%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management
603	Market Economics
901	Program and Project Design, and Statistics

Outcome #3

1. Outcome Measures

Nebraska farmers and ranchers will have sustainable food and biomass systems through adoption of best management practices (measured by percent of clientele adopting best management practices).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	70	61

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To remain economically viable and environmentally compatible in a rapidly changing world, Nebraska farmers, ranchers, and related agribusiness representatives must obtain and incorporated new research based knowledge as quickly as possible. Clientele expressed intent to implement changes based on the new information presented at UNL sponsored events is a strong indication that the information presented was timely and of value to the agricultural industry.

What has been done
Extension hosted a large variety of workshops, field days, tours, clinics, on-farm research and electronically delivered offerings. Many of these events were evaluated by a variety of quantitative economic and behavioral change survey tools. In 2010, field days/workshops targeted economic sustainable practices in farming and ranching including 1) Emerging Ag Technologies reached 1,000 farmers and advisors on mapping, imagery, guidance technologies; 2) Winning the Game was attended by 550 participants on grain marketing strategies; 3) ethanol co-product utilization education was delivered to 5,700 small cattle producers; 4) Solution Days reached 500 participants on crop efficiency topics; 5) soybean management field days reached 434 participants on emerging soybean technologies; and 6) Ranching for Profitability reached 175 ranchers on cow nutrition topics. In addition, web based delivery through CropWatch (cropwatch.

unl.edu) was accessed by 165,000 visitors who viewed more than 472,000 web pages.

Results

The surveys indicated that on average 61% of clientele participating in University of Nebraska sponsored workshops, field days, tours and electronically delivered events definitely would or probably would make changes as a result of the new research based information presented. Sample impacts include 1) Winning the Game resulted in changes increased profitability by $5400 per farm; 2) ethanol co-product utilization education produced likely changes on 55% of participating farms; 3) Solution Days produced an economic return of $9.16 per acre or $45 million; 4) soybean management field days participants saved $4.9 million; and 5) Ranching for Profitability produced management changes that increased profitability on 59% of farms. Statewide aggregation of beef programs for cow/calf producers suggested that 86% of producers made documented changes as a result of UNL Extension programs, feedlot schools improved feeder profitability by $940,000.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection
402	Engineering Systems and Equipment
501	New and Improved Food Processing Technologies
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
603	Market Economics
901	Program and Project Design, and Statistics

Outcome #4

1. Outcome Measures

Nebraska will have access to a highly trained and educated workforce for economically viable and sustainable food and biomass systems (indirectly measured by number of undergraduate and graduate students receiving degrees).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	100	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To remain economically viable and environmentally compatible in a rapidly changing world, Nebraska farmers and related agribusiness representatives must have access to a highly educated and trained work force in order to take advantage of new information, incorporate new technologies, and adjust to changing economic, social, and environmental conditions.

What has been done
The University of Nebraska offers 27 undergraduate programs of study and two pre-professional programs in agriculture and natural resources, and 15 Master of Science and 12 Ph.D. programs. Our programs include agribusiness, animal science, agronomy, biochemistry, biological systems engineering, fisheries and wildlife, food science and technology, pre-veterinary medicine, professional golf management, etc.

Results
In 2010, there were 620 Baccalaureate and 230 Masters/Doctoral degrees conferred at the University of Nebraska in agricultural and natural resources related areas. Over 85% of our Baccalaureate degree students find jobs in their fields or continue with their professional education; approximately 70% take their first job in Nebraska.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection
402	Engineering Systems and Equipment
501	New and Improved Food Processing Technologies
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
603	Market Economics
901	Program and Project Design, and Statistics

Outcome #5

1. Outcome Measures

Nebraska farmers and ranchers will rely on IANR research and extention programs to assure an economically viable and sustainable food and biomass system (measured by percent of state acreage and livestock represented at education programs).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	64	82

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

To remain economically viable and environmentally compatible in a rapidly changing world, Nebraska farmers and related agribusiness representatives must have access to a highly educated and trained work force in order to take advantage of new information, incorporate new technologies, and adjust to changing economic, social, and environmental conditions. In 2009, our Extension Action Teams identified our "Signature Outcomes" that will involve a targeted, statewide-delivered, educational programs engaging teams of specialists and educators. The behavioral and conditional outcomes from these programs will address Beef Systems Profitability, Enhancing Beef Cattle Health/Well Being and Economic Risk Management in Cropping Systems for the next several years.

What has been done

Participant surveys from workshops, field days, tours, clinics, and electronically delivered offerings included a variety of quantitative economic and behavioral change questions. Approximately 12800 individuals (10,000 cattle producers) participated in beef production programs representing more than 13,000,000 head of cattle (210% of NE cattle inventory). In addition, approximately 15,800 participants (12,600 crop farmers) participated in crop production programs targeting profitability issues. These individuals managed about 17,700,000 acres of cropland (82% of NE crop acres). NE Extension programs attract participant from outside NE and some individuals participate in multiple educational programs in any one year. NE Extension also reaches many advisors to agricultural enterprises. For example our 6 eastern NE Crop Diagnostic Clinics reached 331 participants (primarily crop advisors) which influence conservatively 5.3 million crop acres (20% of all crop acres). Educational programs provided more than 60,000 learner-hours of Extension instruction in 2010.

Results

Example impacts of these programs include 1) 2010 Crop Production Clinics which observed that 80% of participants reported that knowledge gained at the clinic would help increase the profitability or success of their operation; they valued this knowledge at $3.12 per acre; 2) 2010 Crop Management & Diagnostic Clinics valued knowledge gained at $6.44 per acre with 51% improving their ability to id agronomic crop weeds, 52% intending to make increased use of insect resistant alfalfa varieties, and 43% intending to do better job managing soybean cyst nematode; 3) participants at the 2010 Nebraska No Till Conferences reporting that they added no-till practices to 981,000 acres at a savings of $14 per acre based in part on past knowledge from Nebraska No-Till conferences.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management
603	Market Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Natural disasters: Drought conditions continue to moderate in 2010. Only parts of the Panhandle and much of the southern tier of Nebraska counties were listed as abnormally dry during the start of the 2011 growing season. During 2010, 20% to 40% of the state were listed as abnormally dry or moderate drought, significantly less than the first half of the decade.

Economy: 2010 was a year of high crop costs and prices for crops and generally positive economic conditions for crop producers. The recession and trade protection policies of key trading partners have moderated and demand for meat products is holding steady or growing within all animal production sectors. Animal industry is enjoying stronger product prices but balancing that against very high feed costs.

The continued strength of the corn-based ethanol industry has brought significant economic development and income potential to many rural areas. There are currently 24 active ethanol production plants in Nebraska, with a combined production capacity of over 2 billion gallons of ethanol each year-and requiring 769 million bushels of grain in the process. These ethanol plants represent more than $5 billion in capital investment in the state and provide direct employment for some 1,200 Nebraskans.

Public policy and Government Regulations: Public pressure by the Human Society of the US is causing significant concerns among all agricultural organizations. Policy implementation in California and other states sponsored by HSUS is seen as promoting economically unsustainable animal agricultural practices in the US by agricultural organizations. HSUS has established an office in Nebraska and is hosting public meetings.

Appropriation Changes: Reduced state tax collection and soaring federal deficits has led to static state and federal budget support in 2010 with significant federal reductions possible in 2011. Additional elimination of some research and extension program areas is anticipated.

Competing public priorities: A customer base that has little connection and no understanding of modern agricultural production systems and values of the farming community and a desire to use public policy to design agricultural systems is very frustrating to the agricultural community. Some aspects of this public oversight of food production is seen as beneficial such as local foods production and organic systems because of potential for premium prices. However, the lack of acceptance by some groups

of many production technologies for reducing inputs (e.g. genetically modified seeds) or increasing production efficiencies and yields (e.g. use of antibiotics and growth promotants in animal production) comes at the same time that society is asking for greater production to meet a growing food and energy feedstock need. These competing public priorities are leaving farmers frustrated with meddling by their customers and policy makers that the agricultural community believes to be poorly informed.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)
- During (during program)

Evaluation Results

UNL Extension has divided into five spires of excellence with two specifically targeting agriculture and natural resource issues: 1) Beef Systems, 2) Crops of the Future. The Action Team supporting each spire has identified one or more "Signature Outcomes" that first became active at the start of 2010. The "Signature Outcomes" were delivered statewide for the first time in 2010 and establish methodologies for measuring statewide impact allowed capture of a significant part of our 2010 impact (see Making a Difference at http://extension.unl.edu). The faculty team supporting each spire is in the process of planning 2011 statewide delivery and evaluation procedures identified in the statewide action plans. These tools have produced our first statewide snapshots of educational program impacts including knowledge gain, intended practice change, and likely conditional changes.

Key Items of Evaluation

Impact indicators and supporting statewide survey are being completed for one to three Signature Programs (initiated for 2010) associated with each Action Team. The preliminary statewide measures of impact that will be utilized for the next several years are as follows:

Beef Systems (Cow-Calf) Profitability:

1. Changes in production practices
2. Changes in business skills
3. Savings per animal

Beef Systems (Feedlot) Profitability:

1. Changes in production practices
2. Reduced environmental challenges
3. Savings per animal

Enhancing Beef Cattle Health, Quality, and Wholesomeness

1. Reduced cattle disease incidence and improved cattle performance

2. Greater use of health records
3. Increased adoption of pre-harvest methods for beef quality and safety

Integrated Pest Management

1. Farmers etc. learn principles of IPM
2. IPM tool and resources are readily available to clientele
3. IPM is implemented
4. Consultants, other Ag Professionals and Ag service providers use science based IPM management recommendations

Economic Risk Management

1. Federal, state, and local food policy
2. Land, machinery, other ag assets, and input and production costs
3. Crop insurance products, crop marketing, and exposure to emerging markets
4. Enterprise and whole farm financial analysis
5. Transition planning and employee / business management