

# 2012 University of Nebraska Combined Research and Extension Annual Report of Accomplishments and Results

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## I. Report Overview

### 1. Executive Summary

The Institute of Agriculture and Natural Resources (IANR) is a part of the University of Nebraska-Lincoln and includes the divisions of teaching, research, and extension. Strategic planning is integral to IANR's function as a land grant institution and it prides itself on working as an integrated system across the three mission areas. To insure that IANR's priorities reflect the needs of the state's residents there is on-going two-way dialogue between the IANR and the residents of the state. Within the past year this strategic two-way dialogue moved to a new, higher plain as Vision for 2025 was rolled out. This visioning process was created because of the need to: determine how IANR will contribute to the critical need to double the world's food supply to feed nine billion people address the shifting climate and environmental conditions, respond to the increasing need for energy sources, and consider how to help increase economic income opportunities for communities. In Nebraska one in three jobs is directly tied to agriculture or agribusiness. The state strives to increase build job opportunities. As a result of the visioning process, the priorities of IANR became food, fuel, water, landscapes and people. Entrepreneurship is a cross cutting thread of these five issue areas.

The Vision for 2025 engaged key Nebraska government leaders, stakeholders, representatives of organizations, faculty and students/youth. The process began with community listening sessions dotting the Nebraska map, involved faculty/administrative leaders in discussions with representatives of civic and community organizations and the agricultural industry; resulted in focus group discussions about specific topics such as the future of rural communities, and led to teams of faculty writing planning documents that were debated at round table discussions throughout the year. A given throughout the process was critical public input/dialogue. The next step is for administrative units of IANR to write their long term goals to support these priorities of food, fuel, water, landscapes and people.

These priority outcomes of food, fuel, water, landscapes, and people are representative of the societal challenge areas of NIFA. For example, in the Nebraska planning process 'food' represents the continuum of food to fork which includes production, food security and hunger, childhood obesity, nutrition and food safety. Landscapes represent the productivity and sustainability of climate, water, soil, and all of our natural resources. People represents the wellbeing of children, youth and families at they interact with their environments.

The Institute of Agriculture and Natural Resources strives to meet the needs of its Nebraska citizens through engagement in internationally-recognized science and education. This mission is met by: advancing knowledge along a continuum from fundamental research to application; delivering education that addresses the current and emerging needs of the state residents; and teaching tomorrow's professionals through formal and non-formal learning settings. The on-going cultivation of public-private partnerships helps make this mission more achievable.

The importance of integration of missions is most evident in the upward trajectory of grant/contract dollars received, the rigor of educational programs delivered in both formal and non-formal settings, and in the placement of graduates in careers.

**Total Actual Amount of professional FTEs/SYs for this State**

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	186.0	0.0	183.0	0.0
Actual	220.0	0.0	180.0	0.0

**II. Merit Review Process**

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

- Internal University Panel
- External Non-University Panel
- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel

**2. Brief Explanation**

During 2012 multiple approaches were used to engage both internal and external audiences of research and extension in the review of programmatic goals. External advocacy groups with Broad statewide membership, such as Agriculture Builders of Nebraska and Family and Community Partners (FCP), reviewed the strategic objectives that address food, fuel, water, landscapes, and people. These groups provided suggestions as refinements were made to these long term goals and particularly the FCP focused on the intersection of the needs of children, youth, families, and entrepreneurship with these goals. Each external advocacy group met at least three times during the year.

Research and extension continued their annual review of extension plans of work and hatch projects. Faculty teams for each of the Extension action plans (Animal Agriculture, Crops for the Future, Child and Youth, Entrepreneurship, Food-Nutrition-Health, Water and Environment). These teams were composed of Educators and Specialists working in these subject matter areas. Based upon the issues impacting the state and region, teams refined the educational programs delivered. They reviewed the evaluation tools developed to aggregate impact data for programs taught. Additionally each of the action teams periodically interact with external stakeholders. These are stakeholders who are intimately involved in the subject matter areas included in content area of that action team. For example, action team members associated with food-nutrition-health met one-on-one and in small groups with industry representatives, dieticians, staff of the Department of Agriculture and the Department of Health and Human Services. Additionally, faculty members of the Agricultural Research Division had their hatch projects reviewed by a team of faculty and administrators as the projects came up for review. Internally funded competitive grant projects were reviewed by both internal and external peers before being selected. State commodity check-off boards provided input as they assessed over 100 research and extension proposals. In Nebraska many of the IANR tenured faculty have joint research/extension appointment hence the research and the extension content areas in which they work are aligned and their work between research and extension becomes more seamless.

Two subject matter departments and two research and extension center completed their five year reviews in 2012. Teams comprised of external panel members and faculty members from within the University of Nebraska-Lincoln reviewed the self-study documents, interviewed and asked questions of faculty,

administrators and recipient stakeholders of the units. The goal being to help insure that direction of the units is future focused and programs are relevant and of high quality.

### **III. Stakeholder Input**

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

- Other (Development of public value statements for use by stakeholders to promote IANR programs)

#### **Brief explanation.**

Extension developed public value statements used by stakeholders to tell others of the impact/public value of Extension and then seek input for programmatic direction. ([Go to extension.unl.edu](http://extension.unl.edu) and scroll to the bottom left hand side of the homepage to see MAKING a DIFFERENCE.) Impact reports are printed annually for each action plan (and some related areas) and each includes public value statements. Begun in 2009 the public value statements were written to help stakeholders understand the value of and differences being made by today's Extension programs. These impact reports and public value statements are given to decision makers and extension board members to help guide their advocacy efforts on behalf of IANR at the local, regional, and national levels.

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

##### **1. Method to identify individuals and groups**

- Use Advisory Committees
- Use External Focus Groups

#### **Brief explanation.**

Nebraska is a state in which the public is very engaged with its university. The number of individuals who each year step forward to engage with IANR is commendable. Research and Extension's strategic relationships with local, state, and federal decision makers is valued. Advocacy groups, advisory groups for subject matter departments and research and extension centers, and Extension Boards are utilized to gather input. Farm organizations and industries related to agriculture routinely are at the planning table. The addition of a staff member by Extension in 2010 to identify and encourage private/public partner engagement in developing educational endeavors has yielded working relationships with the transportation industry, companies seeking to work with local communities, plant sciences, and telecommunications. The Agricultural Research Division has multiple advisory committees that speak to the long term goals for bench and translational science.

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

##### **1. Methods for collecting Stakeholder Input**

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

### **Brief explanation.**

One method of collecting input from stakeholder groups was through face to face meetings. Additionally there was an ongoing effort on the part of Extension Boards to talk one-on-one with their neighbors and colleagues about needs within their geographic regions. Specific 'listening' sessions with traditional and non-traditional groups included thirty-nine meetings by Vice President and Harlan Vice Chancellor Ronnie Green and other IANR administrators. 4-H continued its efforts to survey both youth and adults to identify the high priority needs for programming.

Extension is a partner with the 1994 land grant institutions in our state. Extension and the Nebraska Indian Community College (NICC) have had an eight year partnership to support the implementation and management of Tribal College Extension programs in 3 different NICC communities. IANR Extension faculty who work routinely with the Tribal colleges serve as a conduit moving content and planning information between these entities.

The Panhandle of the state has both shortterm and long Hispanic residents. An Extension Educator in the Scottsbluff area works with audiences and local planning groups to insure a cross cultural understanding. The program is in three parts: history of Mexican people in the panhandle, cross cultural communications, and the third for formal education audiences is working with English Language learners. This workshop is presented for public school educators, health professionals, students in education, health and human services employees, community leaders, Chambers of Commerce members, and companies. In each case these entities wanting to reach a specific audience. While not typical of all communities with Hispanic residents, this is an excellent example of Extension's engagement as a teacher for other organizations who seek increased understanding and involvement with all of our state's residents. In other communities with Hispanic residents, educational programs are more typically directed to Hispanic youth and families involved in EFNEP/SNAPED.

### **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.**

Input from stakeholders is used in identifying emerging issues for both research and extension and in helping set priorities. Stakeholders are also invited for input when the selection of an administrator is required. For example, stakeholders are invited by personal invitation and media releases to participate in receptions and seminars as individuals are invited to interview. Selected stakeholders serve as members of search committees for unit administrators (department heads, Deans, vice Chancellors, etc). Local stakeholders are invited to interview Extension Educators for positions located in their geographic regions.

### **Brief Explanation of what you learned from your Stakeholders**

Stakeholders expect the Institute of Agriculture and Natural Resources and its divisions of research, extension, and teaching to keep its focus on critical issues facing Nebraska. They expect

this land grant institution to do cutting edge work that is well regarded by the academy and is of value to Nebraska's residents and economy. Stakeholders recognize that priorities for programming must be established.

IV. Expenditure Summary

<b>1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)</b>			
<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
4967074	0	4232056	0

<b>2. Totaled Actual dollars from Planned Programs Inputs</b>				
<b>Extension</b>			<b>Research</b>	
	<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
<b>Actual Formula</b>	4502352	0	3926827	0
<b>Actual Matching</b>	4967074	0	4321519	0
<b>Actual All Other</b>	0	0	0	0
<b>Total Actual Expended</b>	9469426	0	8248346	0

<b>3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous</b>				
<b>Carryover</b>	620534	0	1420393	0

**V. Planned Program Table of Content**

S. No.	PROGRAM NAME
1	Global Food Security and Hunger
2	Climate Change
3	Sustainable Energy
4	Childhood Obesity
5	Food Safety

**V(A). Planned Program (Summary)**

**Program # 1**

**1. Name of the Planned Program**

Global Food Security and Hunger

Reporting on this Program

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
121	Management of Range Resources	10%		2%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		12%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	2%		8%	
205	Plant Management Systems	28%		6%	
206	Basic Plant Biology	0%		7%	
211	Insects, Mites, and Other Arthropods Affecting Plants	4%		8%	
212	Pathogens and Nematodes Affecting Plants	4%		12%	
213	Weeds Affecting Plants	4%		7%	
215	Biological Control of Pests Affecting Plants	0%		1%	
216	Integrated Pest Management Systems	4%		5%	
301	Reproductive Performance of Animals	1%		5%	
302	Nutrient Utilization in Animals	4%		9%	
303	Genetic Improvement of Animals	1%		1%	
305	Animal Physiological Processes	1%		7%	
307	Animal Management Systems	20%		4%	
402	Engineering Systems and Equipment	1%		2%	
601	Economics of Agricultural Production and Farm Management	6%		1%	
806	Youth Development	10%		3%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890

Plan	65.0	0.0	73.0	0.0
Actual Paid Professional	112.0	0.0	117.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
2264740	0	2548483	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2482695	0	2866566	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 foundational research in the basic sciences that underpin and will support future productivity and sustainability advances in agriculture.
- Conduct research and extension programs to develop/deliver new and improved crop and livestock integrated management programs that increase the potential for improved agricultural productivity.
- Conduct research and extension programs to develop/deliver new and improved information to help producers create sustainable crop and livestock production programs.

### 2. Brief description of the target audience

Nebraska farmers and ranchers, along with landowners, are the primary target audience for this work. In addition, target audiences will include land managers, bankers, agricultural consultants and agribusiness professionals who provide products and services to farmers and ranchers. The program's research and education efforts will provide valuable information for state and local policy makers (especially Natural Resource District Boards of Directors) as they make decisions regarding natural resources and climate issues. The program will provide agency staff with the knowledge they need to carry out the agency responsibilities and mandates.

### 3. How was eXtension used?

eXtension continues to serve as a valuable resource for clients and faculty. For subject areas outside of our eight Action Teams, it provides a primary web resource used by faculty and clientele for land grant university information. For example, eXtension is our primary land grant web resource for subject areas such as dairy, farm safety, freshwater aquaculture, goats, and grapes, all topic areas for which UNL Extension provides little or no web content. In addition, all UNL Extension websites link to eXtension and eXtension serves as a resource for faculty in answering questions and providing supplemental resources for face-to-face training sessions.

In 2011, 21,000 visits to eXtension originated from Nebraska resulting in 67,000 eXtension web page viewings. In addition, 325 Ask an Expert questions originated from Nebraska and 523 responses were supplied by UNL Extension faculty. We have 147 faculty and staff that are members of 45 of 59 CoPs and



17 who provide leadership for CoPs.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	15300	265600	30100	29500

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

**Patent Applications Submitted**

Year: 2012  
 Actual: 3

**Patents listed**

Methods and Materials for Making and Using Transgenic Dicamba-Degrading Organisms.  
 Plants With Useful Traits and Related Methods.  
 Thermoplastics from Distillers Dried Grains and Feathers.

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
<b>Actual</b>	25	259	284

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Percentage of Agricultural Research Division HATCH projects in global food security and hunger.

Year	Actual
2012	64

**Output #2**

**Output Measure**

- Number of workshops, continuing education programs, web-based curricula and field days/tours related to global food security and hunger.

<b>Year</b>	<b>Actual</b>
2012	500

**Output #3**

**Output Measure**

- Number of new extension publications and other education resources related to global food security and hunger.

<b>Year</b>	<b>Actual</b>
2012	25

**Output #4**

**Output Measure**

- Number of new products and decision tools developed and made available to clientele related to global food security and hunger.

<b>Year</b>	<b>Actual</b>
2012	17

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Nebraska farmers and ranchers will increase productivity and profitability through adoption of research and extension information provided by IANR programs (measured by value placed on the information by clientele)
2	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).
3	Nebraska farmers and ranchers will increase their knowledge and awareness of how integrated pest management and pesticide best management practices can help protect water quality and human health while providing acceptable crop pest protection (measured by the number of farmers and commercial applicators certified in pesticide safety).
4	Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in global food security and hunger.

## **Outcome #1**

### **1. Outcome Measures**

Nebraska farmers and ranchers will increase productivity and 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**

<b>Year</b>	<b>Actual</b>
2012	261000000

### **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**

We estimate that in 2012, Extension faculty hosted educational workshops that produced about 71,000 learner-hours attended by approximately 16,000 youth and adults of education in Beef Systems and 87,000 learner-hours attended by 18,000 youth and adults in cropping systems. In addition, the web is an increasingly important part of our educational program delivery. UNL Extension hosts 7 umbrella websites for combining content from a faculty team under a common theme. These umbrella websites target the work of UNL Extension's eight action teams. Our CropWatch web site hosted 160,000 unique visitors viewing 563,000 pages annually. Our Extension Beef web site was accessed by 77,000 unique visitors in 2012 who viewed 186,000 pages. Our Food web site addressing consumer issues as well as local foods production topics received 511,000 unique visitors and 1,085,000 page views. Overall, Extension state, county, umbrella content, and publications web sites hosted 3.9 million visitors in 2012 with 7.3 million pages being viewed.

Nebraska's beef industry is facing significant challenges due to widespread severe drought across the state. UNL extension faculty in the beef spire has targeted drought as primary focus of educational programming in 2012. Our beef extension faculty have answered more than 780 individual clientele requests, authored or prepared over 114 written articles, 7 extension peer-reviewed publications, and 36 web pages; created 93 radio or television presentations; produced

an additional 121 video or audio recordings for posting in social media or a website; and taught 68 workshops attended by 3221 total participants.

In addition to addressing drought, UNL Extension's Beef Systems programs have focused on 1) Improving the competitiveness, diversity, sustainability and profitability of Nebraska's beef producers, 2) Adoption of approaches to animal care that improve health, well-being, quality and wholesomeness, 3) Improving business and management skills, 4) Increasing consumer education about beef systems. Example programs include ranching practicums (targeting ranchers) that deliver in-depth educational programming, locally delivered Ranching for Profitability educational programs (targeting ranchers); Feedlot Roundtables (targeting feedlot managers and consultants) and Feedlot Schools (targeted feedlot employees); Husker Ag SMARTS for business and entrepreneurship (targeting integrated cow calf and crop farmers); Beef Systems Home Study Course emphasizing nutrition and health, satellite delivery of the latest research through Beef Satellite Short Course, national leadership for web delivery including Ask an Expert through eXtension; and workshops and field days for small animal feeding operations on application of vegetative treatment systems.

UNL Extension's Cropping Systems focus on 1) improving yield, competitiveness and profitability, 2) crop protection and fertility best practice adoption, 3) farm business and risk management, and 4) efficiency of input utilization. Examples of program delivery models implemented include Nebraska On-Farm Research pilot program with 27 growers completing 33 conventional studies and 7 growers completed 7 organic studies (<http://cropwatch.unl.edu/web/farmresearch>); Soybean Management Field Days that combines on-farm research plots with in-field summer workshop and winter review of research results at four locations; Crop production clinics at eight locations addressing crop protection and other agronomic and business management topics; No Till conference and supporting field days; and crop management diagnostic clinics in eastern Nebraska and Panhandle of Nebraska targeting crop consultants and agribusiness professionals; and Soybean Cyst Nematode field days.

The Nebraska Women in Agriculture Conference covers issues related to livestock, crops, and farm management topics. The 2012 conference was attended by 398 participants.

### **Results**

In 2012, 47 beef programs totaling 223 contact hours were evaluated across the state. Eleven-hundred and thirty producers and other agribusiness specialists representing over 11 million head of livestock and 8.6 million acres attended one or more of these programs. Almost 800 participants responded about the impact of attending one of these programs suggesting that participants of UNL Extension Beef programs reported an estimated average value in profitability of \$17.00 per head.

Cow Calf workshop participants reported changes made as having a value of \$12.5 million. Evaluation of feedlot participants in the Feedlot Roundtables suggested that changes were estimated to have an approximate value of \$81.3 million. Evaluation of the beef business programs was estimated by participants to have a value of approximately \$1.8 million. Education on Vegetative Treatment System design for managing open lot runoff was shared with 100 consultants who reported that they influence environmental decisions on about 1.3 million head annually.

Examples of results from cropping systems related programs include:

\* Participants in Nebraska's No-Till Conferences adopted no-till practices, maintained current profit, or increased profit \$13/acre equating to about \$3.3 million.

\* Participants (1501) in Crop Production Clinics reported directly managing or influencing

management decisions on 21.3 million acres of cropland including 8.6 million acres of irrigated land and a value of the likely practice changes returning \$17.5 to \$34.6 million to their businesses.

\* Participants (402) in 2012 Soybean management Field Days reported directly managing or influencing producer decisions on 300,000 acres and estimated the value of the anticipated changes in practice of \$7.50 per acre or \$30.2 million in total.

\* Participants (307) in the one-day Crop Management Diagnostic Clinics reported directly managing 251,000 acres and or influencing decisions on 7 million acres with an estimated economic value of anticipated changes of \$7.40 per acre or \$53 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
806	Youth Development

#### Outcome #2

##### 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	Actual
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### 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 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. Our UNL Extension's five spires of excellence targets Beef Cattle Systems and Crops for the Future around which teams of faculty assemble to plan and deliver educational programs statewide.

#### What has been done

We estimate that in 2012, Extension faculty hosted educational workshops that produced about 71,000 learner-hours attended by approximately 16,000 youth and adults of education in Beef Systems and 87,000 learner-hours attended by 18,000 youth and adults in cropping systems. In addition, the web is an increasingly important part of our educational program delivery. UNL Extension hosts 7 umbrella websites for combining content from a faculty team under a common theme. These umbrella websites target the work of UNL Extension's eight action teams. Our CropWatch web site hosted 160,000 unique visitors viewing 563,000 pages annually. Our Extension Beef web site was accessed by 77,000 unique visitors in 2012 who viewed 186,000 pages. Our Food web site addressing consumer issues as well as local foods production topics received 511,000 unique visitors and 1,085,000 page views. Overall, Extension state, county, umbrella content, and publications web sites hosted 3.9 million visitors in 2012 with 7.3 million pages being viewed.

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In addition to addressing drought, UNL Extension's Beef Systems programs have focused on 1) Improving the competitiveness, diversity, sustainability and profitability of Nebraska's beef producers, 2) Adoption of approaches to animal care that improve health, well-being, quality and wholesomeness, 3) Improving business and management skills, 4) Increasing consumer education about beef systems. Example programs include ranching practicums (targeting ranchers) that deliver in-depth educational programming, locally delivered Ranching for Profitability educational programs (targeting ranchers); Feedlot Roundtables (targeting feedlot managers and consultants) and Feedlot Schools (targeted feedlot employees); Husker Ag SMARTS for business and entrepreneurship (targeting integrated cow calf and crop farmers); Beef Systems Home Study Course emphasizing nutrition and health, satellite delivery of the latest research through Beef Satellite Short Course, national leadership for web delivery including Ask an Expert through eXtension; and workshops and field days for small animal feeding operations on application of vegetative treatment systems.

UNL Extension's Cropping Systems focus on 1) improving yield, competitiveness and profitability, 2) crop protection and fertility best practice adoption, 3) farm business and risk management, and 4) efficiency of input utilization. Examples of program delivery models implemented include

Nebraska On-Farm Research pilot program with 27 growers completing 33 conventional studies and 7 growers completed 7 organic studies (<http://cropwatch.unl.edu/web/farmresearch>); Soybean Management Field Days that combines on-farm research plots with in-field summer workshop and winter review of research results at four locations; Crop production clinics at eight locations addressing crop protection and other agronomic and business management topics; No Till conference and supporting field days; and crop management diagnostic clinics in eastern Nebraska and Panhandle of Nebraska targeting crop consultants and agribusiness professionals; and Soybean Cyst Nematode field days.

The Nebraska Women in Agriculture Conference covers issues related to livestock, crops, and farm management topics. The 2012 conference was attended by 398 participants.

### **Results**

In 2012, 47 beef programs evaluated by almost 800 participants responded that participants of UNL Extension Beef programs gained moderate to significant knowledge (95% of participants) in one or more subject matter areas and developed plans to improve current practices or begin new practices in one or more subject matter areas (57%).

Cow Calf evaluations indicated common changes by respondents produced improved grazing management (64%), nutrition (69%), pasture and range management (59%), reproductive management (62%), and genetics (49%). The feedlot evaluations indicated that 48% of respondents anticipated making changes as a result of UNL Extension educational programs. Common changes indicated by respondents addressed cattle health, handling and care (62%), nutrition, rations and feeding (50%), and environmental issues (49%). Evaluation of the beef business programs indicated changes being made or likely to be made by 66% of respondents as a result of UNL Extension educational programs. Common changes indicated by respondents addressed business management and decision making (72% of participants), financial/economic decisions (73%) and risk management (59%). Education on Vegetative Treatment System design for managing open lot runoff was shared with 100 consultants who reported a significant improvement in their knowledge of this technology (91% of participants). These individuals work mostly with beef systems (78%) as technical service providers and indicated that they influence environmental decisions on about 1.3 million head annually.

Examples of results from cropping systems related programs include:

\* Participants in Sustainable agriculture programs reported 72% of program participants significantly increased knowledge in alternative agriculture production practices and 72% significantly increased knowledge in crop and livestock diversity to improve soil health.

\* Participants (1501) in Crop Production Clinics reported 54% of attendees reported moderate or greater knowledge of crop management practices that will reduce input costs and/or increase yields, likely behavior changes related to personal and employee health and safety (88% of participants), reduced environmental contamination from pesticide (61%), improved irrigation efficiency (55%), practices leading to increase yield or reduced input costs (54%) .

Participants in the 2012 Nebraska Women in Agriculture Conference reported influencing or directly making decisions on 237,000 acres and 59,000 head of livestock. Participants in the 2012 Nebraska Women in Agriculture Conference reported that past participation in the conference was influential relative to changes in marketing grain for 37% of participants, farm budgeting and records for 45% of participants, animal ID and tracking implementation for 33% of participants, and marketing of livestock for 32% of participants. In addition, past participant reported that already implemented changes have increased farm/ranch profitability for 45% of participants and improved business effectiveness for 57% of participants.



**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
121	Management of Range Resources
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
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management
806	Youth Development

**Outcome #3**

**1. Outcome Measures**

Nebraska farmers and ranchers will increase their knowledge and awareness of how integrated pest management and pesticide best management practices can help protect water quality and human health while providing acceptable crop pest protection (measured by the number of farmers and commercial applicators certified in pesticide safety).

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	6540

**3c. Qualitative Outcome or Impact Statement**

### **Issue (Who cares and Why)**

The 2012 Nebraska Groundwater Quality Monitoring Report states "The data does indicate that overall, since the 2005 report the number of analyses for nitrate greater than 10 mg/l has decreased. As discussed previously in this report, data from 1994 to 2012 is more representative of the "statewide" concentration of nitrogen and indicates a slight upward trend. Utilizing the data from the NRDs' Statewide Groundwater Monitoring Network, for both short term and long term analysis, there are a greater number of wells that show an increase than show a decrease. There is not enough recent data for atrazine, alachlor, metolachlor, or simazine to conduct any trend analyses." The 2012 Water Quality Integrated Report defines long term trends for atrazine in 10 lakes and 26 streams. The analysis suggests that atrazine levels are declining in 4 lakes and 6 streams, remaining stable in 2 lakes and 18 streams, and increasing in 1 lake and 2 streams.

### **What has been done**

The Commercial/Noncommercial Pesticide Safety Education Program currently licenses over 9,518 people as commercial and noncommercial pesticide applicators in Nebraska with approximately 2,978 pesticide applicators trained in 2012. The 2012 Private Pesticide Safety Education Program trained an additional 3,562 participants with a total of 21,459 private applicators certified in Nebraska.

In 2011, UNL Extension deployed iPads and mobile internet service to all Extension Educators in Nebraska. In 2012 two new Apps were developed by UNL Extension addressing Western Bean Cutworm Speed Scout and Aphid Speed Scout. In addition, a new online self-paced private applicator certification training option was pilot tested and then released this past year with 92 individuals completing registration on line. To support both the on-line and face-to-face certification processes, 10 new (or substantially revised) publications and 10 new (or substantially revised) videos were published.

Primary delivery mechanisms for 2012 programs included an Educator Forum (train the trainer workshop), eight crop production clinics, multiple IPM School targeted clinics, pesticide container recycling program, and 26 private applicator workshops and multiple additional commercial. In addition innovative application of web tools has been applied through a Pest Private Eye Video game and pesticide safety staff connecting with clientele through Facebook, Twitter, You Tube, and blogging to connect with clientele.

### **Results**

Private Pesticide Safety Education Program: Participants in the 2012 indicated that their past participation in pesticide safety education has produced reductions in pesticide use (23%) of participants, regular monitoring to correctly identify pest problems (72%), safe pesticide storage, handling and application practices (93%), application of BMS to reduce contamination (89%), and use of IPM control strategies (76%).

Commercial/Noncommercial Pesticide Safety Education Program: Participants in 2012 indicated that their past participation in pesticide safety education has produced reductions in pesticide use (28%) of participants, regular monitoring to correctly identify pest problems (81%), safe pesticide storage, handling and application practices (95%), application of BMS to reduce contamination (94%), and use of IPM control strategies (82%).

Crop Production Clinics: 54% of attendees reported improved knowledge of crop management practices that will reduce input costs and/or increase yields. 61% reported that they are already using best management practices to reduce pesticide contamination of the environment, and 26% intended to change their behavior based on what they learned. 2012 Clinic attendees influence

ca. half of Nebraska crop production acres or about 10-11 million acres.

Crop Management & Diagnostic Clinics: About 50% of participants learned new knowledge about soybean aphid scouting and management; 70% of the participants learned new knowledge on corn and soybean disease identification; 67% learned new knowledge on more effective use of fungicides for disease management; 63% learned new knowledge of management of herbicide resistant weeds.

UNL Extension yard and garden programs: In 2012, it is estimated that the show reached 4,500 listeners, 43% "identified pest problems before applying chemicals" as opposed to just spraying "Sevin" on the tree, shrub, vegetable, annual or perennial and 36% "changed plant choices to utilize more diversity in the landscape" to allow for less problems if a new plant disease or insect comes along.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
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
806	Youth Development

#### Outcome #4

##### 1. Outcome Measures

Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in global food security and hunger.

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2012	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**

Extension: Extension provides in-depth education leading to certification for crop consultants (Crop Management Diagnostic Clinics discussed previously), Commercial Pesticide Applicators (discussed previously), well drillers, and rural septic system installers. In addition, Extension faculty deliver in-depth education to agricultural producers and other clientele in the area of DNA Technology and marker assisted selection for beef systems (120 workshop participants), Ranch Practicum for cattle producers using curriculum derived from the systems based research of the University of Nebraska through (2 8-day course worth 4 hours of undergraduate credit delivered to 70 ranchers), and the Nebraska Agricultural Technologies Conference which engages farmers and agribusiness (175 participants in 2012) in emerging GPS related technologies, site specific management and on-farm research. UNL Extension in cooperation with the Nebraska Corn Board has initiated a transformational education program for engaging top crop farmers and 4-H and FFA youth in on-farm research programs to gather production performance for common management and technology use decisions.

### **Results**

Extension: 348 Nebraska onsite wastewater treatment professionals participated in one of 15 6-hour training opportunities. These individuals work with just under 4,000 systems treating 250 million gallons of wastewater annually. Impacts include changes in conducting soil percolation tests (32% of participants), changes in design of treatments systems (34%) and their installation (32%), and changes in discussion of system management with owners (54%).

The pilot year of the Nebraska On-Farm Research program include 27 growers who participated in 33 on-farm comparisons and an addition 11 youth in 7 teams as part of the Innovative Youth Corn Challenge. More information is available at:

<http://cropwatch.unl.edu/web/farmresearch/home> . The results (<http://ardc.unl.edu/2012-FINAL%20NOFRN-FebResearchUpdateReport.pdf>) from the growers were shared with 100+ producers the following winter. The intent is to expand to 75 on-farm research comparisons in

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
121	Management of Range Resources
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
303	Genetic Improvement of Animals
305	Animal Physiological Processes
307	Animal Management Systems
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management
806	Youth Development

#### **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: Extreme drought conditions arrive in Nebraska during the spring of 2012 and persisted through the remainder of the year. The drought dramatically reduced forage produced, forced many dryland crops to be harvested as forage or hay, and created higher than normal levels of aflatoxin in corn. Weather service outlooks indicate that these conditions will persist into 2013. Federally subsidized crop insurance covered an estimated \$1.5 billion in crop losses in Nebraska from the 2012 drought.

Economy: 2012 was a year of record setting crop prices for crops and solid year for farm income levels for crop producers. Because of the high grain and forage costs and lack of range and pasture grass production, livestock farmers experience unparalleled feed costs. For ranchers, their ability to secure sufficient forage has forced many to move cows into dry lot production space or significantly down size cow herds. The historical trend of downsizing the beef cow herd as well as cattle placement on feed continued in 2012 and is expected to accelerate in Nebraska in 2013 due to drought conditions. Despite the challenges faced by Nebraska cattle producers, U.S. poultry, egg and pork shipments exceeded previous highs for value and volume set in 2011. International beef sales dipped slightly in volume but broke the previous value record.

According to Bruce Johnson (published in Cornhusker Economics, March 20, 2013, [http://agecon.unl.edu/c/document\\_library/get\\_file?uuid=7fcaa994-3cda-4041-85e2-9e701058cb1b&groupId=2369805&.pdf](http://agecon.unl.edu/c/document_library/get_file?uuid=7fcaa994-3cda-4041-85e2-9e701058cb1b&groupId=2369805&.pdf) ) "Despite an extreme drought and indicators of weaker agricultural earnings on the horizon, the markets for agricultural land in Nebraska have remained strong into early 2013. Preliminary findings from the 2013 University of Nebraska-Lincoln Nebraska Farm Real Estate Market Developments Survey show the state's all-land average value rose **25 percent** over the 12-month period ending February 1, 2013 (Figure 1 on next page and Table 1 on page 3). Following on the advances for each of the previous two years of 22 percent and 32 percent, respectively, the 2013 all-land value of

\$3,040 per acre is more than double the value of just three years previously, in early 2010."

**Nebraska Energy Production:** According to a recent Associated Press story by Brandon Nelson, "With corn becoming an increasingly scarce commodity, the ethanol business is feeling the pinch. The persistent drought is taking its toll on the industry and has forced about 20 ethanol plants nationwide to halt production on the corn-based fuel. Data recently provided to the Associated Press by The Renewable Fuels Association shows nearly two-dozen of the nation's 211 ethanol plants have stopped production during the past year. Production is unlikely to resume before the 2013 corn harvest in late August or September and the down time affects the state's production as six of the stalled plants are in Nebraska." At the beginning of 2013, seven of Nebraska plants were either shutdown or idled representing about 30% of the capacity in this state.

**Public policy and Government Regulations:** Lack of a five-year farm bill was the primary public policy discussion in 2012. Disappearance of all USDA safety net for ranchers experiencing extreme drought is likely to speed downsizing by many ranches and loss of some ranch businesses in 2013.

**Appropriation Changes:** Steady state tax collection and soaring federal deficits has led to static state and declining federal budget support in 2012. Sequestration is likely to cause reductions within Extension programs possibly starting in 2013. However, the growth in student enrollment has resulted in UNL adding 36 new positions in 2013, with approximately 6 having Extension responsibility.

**Competing public priorities:** A customer base that has little connection and no understanding of modern agricultural production systems and a desire to use public policy to design agricultural systems continues as a frustration among 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. In spite of one of the worst droughts on record, better seed genetics has contributed to 2012 corn yields exceeding almost all previous yields prior to 1992. These competing public priorities are leaving farmers frustrated with consumer and policy maker scrutiny.

## **V(I). Planned Program (Evaluation Studies)**

### **Evaluation Results**

UNL Extension has divided into five spires of excellence with two action teams specifically targeting global food security issues: 1) Beef Systems and 2) Crops for the Future. The Action Team supporting each spire has identified one or more "Signature Outcomes" that first became active at the start of 2010. These "Signature Outcomes" continue to be delivered statewide in 2012 and establish methodologies for measuring statewide impact allowed capture of a significant part of our 2012 impact (see "Making a Difference" at <http://extension.unl.edu>). The faculty team supporting each spire is in the process of planning 2013 statewide delivery and evaluation procedures identified in the statewide action plans. These teams are also learning about the issues surrounding the Challenge of Feeding 9 Billion People and the implications of these issues for future

Extension Signature Outcomes. These methods developed by our Action Teams provided our second statewide snapshots of educational program impacts including knowledge gain, intended and actual practice change, and likely conditional changes.

The Nebraska Agricultural Experiment Station measures its success in our ability to provide Extension with cutting edge research results that impact Nebraska. In addition, we have begun to use a commercial product (Academic Analytics) to assess faculty productivity measures. We are still in the process of determining the robustness of their dataset.

### **Key Items of Evaluation**

Extension action team implementation plans, evaluation indicators and tools as well as 2012 Impact reports are all found at <http://www.extension.unl.edu/web/Extension/progfocus> . A review of the specifics of these implantation and evaluation plans are found for the two most relevant action teams by going to <http://www.extension.unl.edu/web/Extension/progfocus/actionteam-beef> and <http://www.extension.unl.edu/progfocus/actionteam-crops-of-the-future>

**V(A). Planned Program (Summary)**

**Program # 2**

**1. Name of the Planned Program**

Climate Change

Reporting on this Program

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	25%		15%	
111	Conservation and Efficient Use of Water	14%		15%	
132	Weather and Climate	4%		5%	
133	Pollution Prevention and Mitigation	5%		11%	
135	Aquatic and Terrestrial Wildlife	5%		2%	
141	Air Resource Protection and Management	4%		0%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		13%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	7%		9%	
302	Nutrient Utilization in Animals	4%		9%	
303	Genetic Improvement of Animals	0%		1%	
305	Animal Physiological Processes	0%		8%	
307	Animal Management Systems	4%		4%	
403	Waste Disposal, Recycling, and Reuse	4%		3%	
405	Drainage and Irrigation Systems and Facilities	14%		1%	
605	Natural Resource and Environmental Economics	10%		4%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	37.0	0.0	68.0	0.0
Actual Paid Professional	46.0	0.0	27.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0



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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
832388	0	594112	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
989091	0	862350	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 foundational research in the basic sciences that underpin and will support future productivity and sustainability advances in agriculture.
- Collect, disseminate, and model climate change data essential for understanding the impact of climate on natural resource and agricultural systems.
- Conduct research and extension programs to develop/deliver new and improved crop and livestock integrated management programs that increase the potential for improved agricultural productivity in the face of environmental stress/climate variability.
- Conduct research and extension programs to develop/deliver new and improved information to help producers create sustainable crop and livestock production programs with improved environmental impacts.

**2. Brief description of the target audience**

Nebraska farmers and ranchers, along with landowners, are the primary target audience for this work. In addition, target audiences will include land managers, bankers, agricultural consultants and agribusiness professionals who provide products and services to farmers and ranchers. The program's research and education efforts will provide valuable information for state and local policy makers (especially Natural Resource District Boards of Directors) as their make decisions regarding natural resources and climate issues. The program will provide agency staff with the knowledge they need to carry out the agency responsibilities and mandates.

**3. How was eXtension used?**

{No Data Entered}

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	18100	83900	13100	9300

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

Year: 2012  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
<b>Actual</b>	10	138	148

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Percentage of Agricultural Research Division HATCH projects in climate change.

Year	Actual
2012	9

**Output #2**

**Output Measure**

- Number of workshops, continuing education programs, web-based curricula and field days/tours related to climate change.

Year	Actual
2012	370

**Output #3**

**Output Measure**

- Number of new extension publications and other education resources related to climate change.

<b>Year</b>	<b>Actual</b>
2012	10

**Output #4**

**Output Measure**

- Number of new products and decision tools developed and made available to clientele related to climate change.

<b>Year</b>	<b>Actual</b>
2012	6

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Nebraska ranchers will increase sustainability of range resources through adoption of research and extension information provided by IANR programs (measured by value placed on the information by clientele).
2	Consumptive water use by irrigated crops will be reduced. The outcome measure will be the percent reduction of estimated consumptive water use when the current year is compared to the estimated consumptive water use in calendar year 2006. The consumptive water use will be estimated using the irrigation water pumped in Natural Resource Districts that require the use of water measurement devices.
3	Nebraska will not exceed its allocation of water in the Republican River as allowed by the interstate compact with Kansas and Colorado. Nebraskan's allocation is 49% of the average annual water supply. The output measure will be the percent of the Republican River average annual water supply used by Nebraska.
4	Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in climate change.

## **Outcome #1**

### **1. Outcome Measures**

Nebraska ranchers will increase sustainability of range resources 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**

<b>Year</b>	<b>Actual</b>
2012	12500000

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Twenty-four million acres of range and pasture resources are a primary source of feed for 1.88 million head of beef cows in Nebraska. Half of this rangeland is in the Nebraska Sandhills, a unique ecosystem that has transitioned from rich grasslands to desert sand dunes multiple times during its history as a result of climate shifts. Future potential for climate change or increased climate variability will place this fragile ecosystem at risk. Drought conditions dramatically reduced forage production and grazing opportunities in 2012 and weaken the potential for regrowth in 2013. As of March 2013, hay reserves are at their lowest level ever. Even with normal rainfall, grass production is expected to be reduced by one-third in 2013. In addition, high price for feed grains and reduced production of ethanol and distiller's co-products have resulted in high feeding costs and risks of inadequate feed resources for maintaining Nebraska's cattle herd. Adapting to drought conditions and minimizing the loss of productivity of Nebraska range and pasture resources is essential to 20,000 businesses (beef cow operations) and to the rural infrastructure of much of Nebraska.

#### **What has been done**

UNL extension faculty in the beef spire has targeted drought as primary focus of educational programming in 2012. Our beef extension faculty have answered more than 780 individual clientele requests, authored or prepared over 114 written articles; 7 extension peer-reviewed publications; 93 radio or television presentations; 36 web pages; and 121 video or audio recordings for posting in social media or a website, and taught 68 workshops attended by 3221 total participants.

UNL Extension hosts many types of educational opportunities addressing integrated beef and range/pasture issues. Our highest dosage educational experiences are the High Plains and

Nebraska Ranch Practicums that focus on the integration of beef and range systems. These courses are the equivalent of a 4 hour undergraduate education experience taught on research and commercial ranches in the Sandhills and Panhandle of Nebraska. Medium dosage experience come in the form of one-day to multi-day regional conferences such as the Nebraska Grazing Conference, Gudmundsen Sandhills Laboratory Open House, Beef Production Conference, Range Beef Cow Symposium, Mid-Plains Beef Education Series, West Central Cattlemen Days, Ranching for Profitability regional programs, Cow/Calf College , UNL Barta Brothers Field Days, and the 4 State Beef Conference. In addition, there are many local educational opportunities for both youth and adults addressing range ecology, range and pasture management, fire recovery, pesticide safety, and grasshopper and prairie dog control, to name a few. The Beef Action Team assembled evaluation data from 800 participants in educational programs in 2012 which is summarized in the Global Food Security outcome.

Practically all educational programs targeting grazing and cow/calf production have addressed drought issues in some way in 2012 with drought dominating those educational programs delivered since June 2012. In addition, our partnership with Nebraska Public TV has been leveraged to provide timely information on many drought topics to all Nebraska ranchers. These programs have addressed a range and pasture drought related topics including strategies for reducing ranch feed demands, alkaline treatment of alternative crop residues, corn stalk residue use, grazing and baling of cornstalks for feed use, forage options for drought damaged crops, managing nitrates in feeding drought stressed crops, aflatoxin issues in drought stressed crops, feeding low test weight corn, insurance for drought risk management, economic implications of alternative herd downsizing options, considerations for renting of corns stalks for winter grazing, forage options for planting under irrigated conditions.

The web has been used extensively in 2012 for providing access to research based information on drought topics. The beef team has authored a wide range of written resources, webinars, and short videos that have been made accessible through UNL Extension Drought Resources (<http://droughtresources.unl.edu> ), UNL Extension beef (<http://beef.unl.edu>), and YouTube (<http://www.youtube.com/user/NUBeef> ).

## Results

In 2012, 31 cow calf programs totaling 139 contact hours and reaching 601 participants representing 1.1 million head of cows, 1 million head of calves, and 240,000 replacement heifers were evaluated across the state. Most of these programs targeted drought related issues that related directly or indirectly to minimizing drought impact on range and pasture systems. Cow Calf workshop participants reported changes made were estimated to have an aggregated value of \$12.5 million. Cow Calf evaluations indicated common changes by respondents addressed grazing management (64% of participants), nutrition (69%), pasture and range management (59%), and reproductive management (62%).

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
132	Weather and Climate
141	Air Resource Protection and Management
302	Nutrient Utilization in Animals
305	Animal Physiological Processes

307 Animal Management Systems  
605 Natural Resource and Environmental Economics

## **Outcome #2**

### **1. Outcome Measures**

Consumptive water use by irrigated crops will be reduced. The outcome measure will be the percent reduction of estimated consumptive water use when the current year is compared to the estimated consumptive water use in calendar year 2006. The consumptive water use will be estimated using the irrigation water pumped in Natural Resource Districts that require the use of water measurement devices.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Condition Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	208

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

According to the USDA 2007 Farm and Ranch Irrigation Survey, Nebraska irrigates approximately 8.45 million acres with more than 6.70 million acre-feet of water annually. This represents a 11% increase in acres irrigated with 21% less water. This change is likely a result of both difference in rainfall patterns and concerted efforts promoting efficient irrigation water use. In 2004, state policy established a process for defining watersheds as a fully or over-appropriated. Part or all of eleven Natural Resource Districts are currently defined as fully or over-appropriated. Over-appropriated basins are required to reduce water use to 1997 levels. Discussion continues on defining additional areas of Nebraska as over or fully appropriated. State public policy continues to emerge and change annually on a variety of topics related to water use by irrigation.

#### **What has been done**

Irrigation Management: As a result of this past year's drought, an educational emphasis has included sprinkler packages and uniformity, soil moisture monitoring and deficit irrigation. Additional Extension drought related programs are in the planning and development stages. Educational products release in 2012 include the Irrigation Management Home Study Course was released in 2012 on-line at <http://marketplace.unl.edu/extension/irrigation.html> . The intent of this Home Study Course is to increase the user's awareness and understanding of irrigation management concepts. This in turn can help producers improve irrigation efficiency and reduce deep percolation of nitrates. The target audience for this course includes: crop consultants,

agency personnel, irrigated crop producers and others interested in improving their irrigation water management skills.

Panhandle irrigation program started with the Pumpkin Creek project and has transformed into a regional effort to conduct education of producers about surviving under deficit irrigation conditions. Educational efforts from that project have been expanded in cooperation with the three Natural Resource Districts with a focus on use of no-till for soil water conservation, timing of deficit irrigation, and dividing of limited water among different crops for maximum profitability. More irrigated wheat, dry beans and sunflowers (lower water using crops) are being planted as well as a return to alfalfa and sugar beets originally abandoned as a result of lower allocations.

NAWMDM: The Nebraska Agricultural Water Management Demonstration Network continues to demonstrate technologies to improve irrigation management and water use efficiency. The Crop Water App was developed at the request of Nebraska Agricultural Water Management Network (NAWMN) participants. This app provides an easy way to estimate soil water status based on Watermark sensors installed at depths of 1, 2, and 3 feet. With these sensor readings, the Crop Water app will estimate the water used as well as what is still available for Nebraska soils. You can also see historic sensor readings and graph the data. Download the app at: <https://itunes.apple.com/us/app/crop-water/id557926049?mt=8> . 215 downloads have occurred to date.

Field Level ET: A statewide network of field level Evapotranspiration is posted on line for 339 producer sites and 60+ automatic High Plains Regional Climate Center ET data locations to provide producers with better estimates of crop water use (<http://water.unl.edu/nawmn> ). An additional initiative, the NEBFLUX project, measures evapotranspiration and other plant and soil parameters for many different vegetation surface. It is the largest and most comprehensive network of its kind that is operated by a single laboratory in the United States. The project is providing extremely valuable data to state agencies (irrigation districts, NRDs, and DNR) for their designing, planning, and management of water resources and related infrastructures.

Monsanto Partnership: A partnership with Monsanto's Water Utilization Center has resulted in 33 joint sessions and tours taught by UNL Extension faculty and Monsanto staff on water utilization related topics reaching 1,050 adults and youth. This partnership is also producing greater exchange of UNL water related research with Monsanto staff and tour participants and implementation of 3 demonstrations and 3 research projects at the Monsanto Learning Center led

## **Results**

Irrigation Management: In 2012, over 2,840 producers/consultants (representing 27.9 million acres of cropland) attended an educational program addressing irrigation issues. Previous follow up surveys have indicated that attendees have reduced water application by 2.1 inches per growing season. This reduced water application would save producers about \$20 per acre in reduced pumping costs. The NAWMDN continues to expand from 15 farmer collaborators/partners in 2005 to over 800 in 2012. NAWMDN sites have provided much of the field documentation for water application reductions of 2.1 inches.

Data collected from 7 or 8 Natural Resource Districts on irrigation water pumped since 2005 has indicated a steady decline in water use from an average of 10.5 inches per year per acre to 6.6 inches per year per acre between 2005 and 2011. The drought of 2012 has dramatically changed that trend with an average pumping rate of 15.4 inches per acre per year.

## **4. Associated Knowledge Areas**



<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

**Outcome #3**

**1. Outcome Measures**

Nebraska will not exceed its allocation of water in the Republican River as allowed by the interstate compact with Kansas and Colorado. Nebraskan's allocation is 49% of the average annual water supply. The output measure will be the percent of the Republican River average annual water supply used by Nebraska.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The Republican River Compact allocates the water supply of the Republican River, originally set at 11% to CO, 49% to NE and 40% to KS. Natural Resource Districts have developed plans that are contributing towards achieving the targeted allocation that includes retirement of irrigated acres, improvements in efficiency of irrigation water use, and limitations on irrigation development. Observed reductions in Nebraska water use (discussed later) are a result of extension education, public policy, and changes in rainfall patterns. Increases in 2012 due to drought have overshadowed water savings from recent years.

The measure for Nebraska's consumptive water use in the Republican River basin are not available for public use for 2011 or 2012 due to litigation between Nebraska and Kansas.

**What has been done**

Conservation Practice Impact on Republican River: A field research analysis lead by UNL and Kansas State University has been completed of how installation of conservation terraces and

small watershed reservoirs has impacted the stream flow in the Republican River.

Deficit Irrigation Project: A UNL project on deficit irrigation management when irrigation water supplies are limited has resulted in the development of a suite of spreadsheet models to optimize net return from irrigation water. The suite includes planning modules for single-season single-field, multiple-season single-field and multiple-season single field optimization. A UNL, Kansas State University, and Colorado State University faculty collaborated to develop a pilot deficit irrigation insurance procedure for the USDA Risk Management Agency. This is the initial deficit irrigation project in the US for RMA risk management programs and has been widely requested by clientele. RMA is currently working on implementation of the program. Following the drought, deficit irrigation education is beginning to gain traction. Project entitled Conserving Water through Informed Irrigation Management resulted in two daylong workshops with attendance of approximately 250 agricultural producers, consultants and service agency personnel.

Faculty member assisted in United States Supreme Court litigation as a consultant on apportionment of water in the Republican River Basin. Recent rulings from Special Master are generally favorable to Nebraska.

### **Results**

Conservation Practice Impact on Republican River: A field research analysis suggests that terraces and small reservoirs have a) Increased evapotranspiration by approximately 36,000 acre-feet/year; b) Increased groundwater recharge by approximately 88,000 acre-feet/year; and c) Decreased stream flow by approximately 63,000 acre-feet/year. Results were presented to the State Engineers for Colorado, Kansas and Nebraska. Results will be considered in conjunctive water management of the Republican Basin.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

## **Outcome #4**

### **1. Outcome Measures**

Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in climate change.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2012	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**

**Results**

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
141	Air Resource Protection and Management
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

## V(H). Planned Program (External Factors)

### External factors which affected outcomes

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

### Brief Explanation

Natural disasters: Extreme drought conditions arrive in Nebraska during the spring of 2012 and persisted through the remainder of the year. The drought dramatically reduced forage produced, forced many dryland crops to be harvested as forage or hay, and created higher than normal levels of aflatoxin in corn. Weather service outlooks indicates that these conditions will persist into 2013. Federally subsidized crop insurance covered an estimated \$1.5 billion in crop losses in Nebraska from the 2012 drought.

Economy: 2012 was a year of record setting crop prices for crops and solid year for farm income levels for crop producers. Because of the high grain and forage costs and lack of range and pasture grass production, livestock farmers experience unparalleled feed costs. For ranchers, their ability to secure sufficient forage has forced many to move cows into dry lot production space or significantly down size cow herds. The historical trend of downsizing the beef cow herd as well as cattle placement on feed continued in 2012 and is expected to accelerate in Nebraska in 2013 due to drought conditions. Despite the challenges faced by Nebraska cattle producers, U.S. poultry, egg and pork shipments exceeded previous highs for value and volume set in 2011. International beef sales dipped slightly in volume but broke the previous value record.

According to Bruce Johnson (published in Cornhusker Economics, March 20, 2013, [http://agecon.unl.edu/c/document\\_library/get\\_file?uuid=7fcaa994-3cda-4041-85e2-9e701058cb1b&groupId=2369805&.pdf](http://agecon.unl.edu/c/document_library/get_file?uuid=7fcaa994-3cda-4041-85e2-9e701058cb1b&groupId=2369805&.pdf) ) "Despite an extreme drought and indicators of weaker agricultural earnings on the horizon, the markets for agricultural land in Nebraska have remained strong into early 2013. Preliminary findings from the 2013 University of Nebraska-Lincoln Nebraska Farm Real Estate Market Developments Survey show the state's all-land average value rose **25 percent** over the 12-month period ending February 1, 2013 (Figure 1 on next page and Table 1 on page 3). Following on the advances for each of the previous two years of 22 percent and 32 percent, respectively, the 2013 all-land value of \$3,040 per acre is more than double the value of just three years previously, in early 2010."

Public policy and Government Regulations: Lack of a five-year farm bill was the primary public policy discussion in 2012. Disappearance of all USDA safety net for ranchers experiencing extreme drought is likely to speed downsizing by many ranches and loss of some ranch businesses in 2013.

Appropriation Changes: Steady state tax collection and soaring federal deficits has led to static state and declining federal budget support in 2012. Sequestration is likely to cause reductions within Extension programs possibly starting in 2013. However, the growth in student enrollment has resulted in UNL adding 36 new positions in 2013, with

approximately 6 having Extension responsibility.

## **V(I). Planned Program (Evaluation Studies)**

### **Evaluation Results**

UNL Extension has divided into five spires of excellence with one specifically targeting climate change issues: 1) Water Climate and the Environment for Agriculture and 2) Water Climate and the Environment for Communities. The Action Team supporting each spire has identified one or more "Signature Outcomes" that first became active at the start of 2010. These "Signature Outcomes" continue to be delivered statewide in 2012 and establish methodologies for measuring statewide impact allowed capture of a significant part of our 2012 impact (see 'Making a Difference' in left hand column at <http://extension.unl.edu>). The faculty team supporting each spire is in the process of planning 2013 statewide delivery and evaluation procedures identified in the statewide action plans. These methods developed by our Action Teams provided our third statewide snapshots of educational program impacts including knowledge gain, intended and actual practice change, and likely conditional changes.

### **Key Items of Evaluation**

Extension action team implementation plans, evaluation indicators and tools as well as 2012 Impact reports are all found at <http://www.extension.unl.edu/web/Extension/progfocus>. A review of the specifics of these implantation and evaluation plans are found for the two most relevant action teams by going to <http://www.extension.unl.edu/progfocus/actionteam-water-climate-and-environment>

**V(A). Planned Program (Summary)**

**Program # 3**

**1. Name of the Planned Program**

Sustainable Energy

Reporting on this Program

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		42%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		29%	
205	Plant Management Systems	30%		23%	
511	New and Improved Non-Food Products and Processes	70%		6%	
<b>Total</b>		100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	19.0	0.0	7.0	0.0
Actual Paid Professional	11.0	0.0	13.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
267253	0	274775	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
290983	0	224912	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 information on new or improved energy products and technologies and emerging efficiencies of production to Nebraska's ag-based industries.

**2. Brief description of the target audience**

Land owners, agricultural producers, youth, and graduate and undergraduate students.

**3. How was eXtension used?**

{No Data Entered}

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	660	1000	1270	0

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

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
<b>Actual</b>	5	16	21

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of refereed journal publications related to sustainable energy.

<b>Year</b>	<b>Actual</b>
2012	21

**Output #2**

**Output Measure**

- Percentage of Agricultural Research Division HATCH projects in sustainable energy.

<b>Year</b>	<b>Actual</b>
2012	14

**Output #3**

**Output Measure**

- Number of workshops, continuing education programs, web-based curricula and field days/tours related to sustainable energy.

<b>Year</b>	<b>Actual</b>
2012	20

**Output #4**

**Output Measure**

- Number of new extension publications and other educational resources related to sustainable energy.

<b>Year</b>	<b>Actual</b>
2012	1

**Output #5**

**Output Measure**

- Number of new products and decision tools developed and made available to clientele related to sustainable energy.

<b>Year</b>	<b>Actual</b>
2012	1



**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in sustainable energy.
2	Extension will assist land owners involved in negotiating land use contracts with wind energy developers (measured by number of land owners participating in educational programs).

## **Outcome #1**

### **1. Outcome Measures**

Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in sustainable energy.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	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**

On September 15, 2012 nearly 85,000 Nebraska football fans witnessed Astronaut Clayton Anderson, 4-Hers, teachers and middle school students launch science experiments 20 miles into the atmosphere using high altitude balloons. The balloons were launched during half time of a Nebraska football game in front of 80,000+ fans. This is part of a pilot program initiative to develop Science, Technology, Engineering, and Mathematics curriculum and experiences for high school youth addressing climate science and engineering awareness.

#### **Results**

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
511	New and Improved Non-Food Products and Processes

## **Outcome #2**

### **1. Outcome Measures**

Extension will assist land owners involved in negotiating land use contracts with wind energy developers (measured by number of land owners participating in educational programs).

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

In 2012, 1.3 billion kilowatt-hours were generated by utility-scale wind energy in Nebraska from 260 operational wind turbines with a total capacity of 459 megawatts. The average annual output could power about 165,880 homes. In 2012, Nebraska ranked second in ethanol production capacity, with 25 operating plants having production capacity of 2.25 billion gallons (851,717,651 dal). Over 40% of the State's 2011 corn crop was utilized in ethanol production. At the beginning of 2013, seven of Nebraska plants were either shutdown or idled representing about 30% of the capacity in this state. Commercial biodiesel plants in Nebraska currently have the capacity to produce 5,400,000 gallons although both plants have ceased production.

Our Extension programs no longer target landowners negotiating contracts with wind energy developers. We will rewrite this outcome measure for future annual reporting.

#### **What has been done**

Home and Farm Energy Production: UNL has received a grant from DOE to develop research and demonstration of solar and wind energy systems for smaller scale home and farm based energy production. As part of the grant six solar array products, two small wind turbines, and a center pivot powered by 98% ethanol using a specially designed engine are installed at a regional research farm in Northeast Nebraska. Live internet streaming of data is accessible at (<http://cropwatch.unl.edu/web/bioenergy/sustainable-energy-options> ). Performance data collection and associated workshops, tours, and webinars based upon research data and experiences with these operation data began in 2012.

Switch grass Production: Faculty installed a demonstration addressing switch grass production plot and hosted training for Extension Educators and Crop Consultants (through our annual Crop Management Diagnostic Clinics) as part of the CenUSA Bioenergy multistate AFRI grant. In

addition, the Bioenergy Friday Web Seminars continued in 2012 addressing topics of ethanol, energy codes, photovoltaics for electrical power generation, wind physics, biomass production, switch grass production, pyrolysis, farm energy efficiency, turbine certification, and ethanol engines.

Visibility of Wind Towers: Extension faculty is collaborating with National Agricultural Aviation Association and Nebraska Aviation Trades Association in the teaching of owners of wind measurement towers about the importance of marking them correctly. After the death of a California pilot due to an unmarked tower the need for improved visibility was clear and led to this project.

Youth Education: Wired for Wind and related energy curriculum is being targeted for middle school youth. Wired for Wind curriculum was developed for the National 4-H Council in 2011.

Energy Audits for Irrigation Systems: Work is continuing on a joint UNL Extension and Michigan State University curriculum for training individuals displaced by the economic situation to conduct energy audits of irrigation systems for use by the NRCS and US Irrigation Association. In addition the team is developing a tool for predicting pumping plant field performance.

Climate Masters Training: UNL Extension faculty are leading the Climate Masters of Nebraska training program for the purpose of reducing energy consumption and increasing citizen engagement in climate change discussions. The training program, piloted in 2012 with plans for expansion in 2013, is based upon the Master Gardener concept of engaging citizens in public education and demonstration roles around climate and energy related issues.

## Results

Home and Farm Energy Production: No results to share at this time.

Switch grass Production: The CenUSA Bioenergy program has engaged over 80 Extension educators and crop consultant on professional development addressing establishment and production of switch grass and warm season perennials. At the Crop Management Diagnostic clinic, crop consultants influencing over 900,000 acres reported a 72% increase in basic agronomic knowledge of switch grass. The Bioenergy Friday Web Seminars engaged 250 live participants and nearly 1,000 archived viewings in 2012 from 16 States. Evaluation of the participants of these professional development sessions suggested that 35% plan to use the information to teach others while 15% plan to use it in written communications such as news columns.

Visibility of Wind Towers: Outputs include over 1500 views of two YouTube videos in the first two months (<http://www.youtube.com/watch?v=Mc6TdFmqkE8> and <http://www.youtube.com/watch?v=W9VmW3LIULo> ), contact with every wind measurement tower owner in Nebraska, and registration of one previously unregistered tower (registration is required by state law).

Youth Education: Wired for Wind curriculum has been taught to more than 100,000 youth nationally since it was published in 2011. In Nebraska, energy focused curriculum has been taught to more than 500 youth in 2012.

Energy Audits for Irrigation Systems: No results to share at this time.

Climate Masters Training: Project evaluation showed 19 participants completed the course, 88% of participants reported that the course led them to make informed changes in their lives to reduce

participants towards educating others in their community. In addition, these same faculty developed a climate change resource handbook and curriculum for extension educators and delivered to 130 extension educators across 12 states in the North Central United States through the North Central SARE professional development program.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

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

##### Brief Explanation

Economy: 2012 was a year of record setting crop prices for crops and solid year for farm income levels for crop producers. Because of the high grain and forage costs and lack of range and pasture grass production, livestock farmers experience unparalleled feed costs. For ranchers, their ability to secure sufficient forage has forced many to move cows into dry lot production space or significantly down size cow herds. The historical trend of downsizing the beef cow herd as well as cattle placement on feed continued in 2012 and is expected to accelerate in Nebraska in 2013 due to drought conditions. Despite the challenges faced by Nebraska cattle producers, U.S. poultry, egg and pork shipments exceeded previous highs for value and volume set in 2011. International beef sales dipped slightly in volume but broke the previous value record.

According to Bruce Johnson (published in Cornhusker Economics, March 20, 2013, [http://agecon.unl.edu/c/document\\_library/get\\_file?uuid=7fcaa994-3cda-4041-85e2-9e701058cb1b&groupId=2369805&.pdf](http://agecon.unl.edu/c/document_library/get_file?uuid=7fcaa994-3cda-4041-85e2-9e701058cb1b&groupId=2369805&.pdf) ) "Despite an extreme drought and indicators of weaker agricultural earnings on the horizon, the markets for agricultural land in Nebraska have remained strong into early 2013. Preliminary findings from the 2013 University of Nebraska-Lincoln Nebraska Farm Real Estate Market Developments Survey show the state's all-land average value rose **25 percent** over the 12-month period ending February 1, 2013 (Figure 1 on next page and Table 1 on page 3). Following on the advances for each of the previous two years of 22 percent and 32 percent, respectively, the 2013 all-land value of \$3,040 per acre is more than double the value of just three years previously, in early 2010."

Public policy and Government Regulations: Loss of federal blending credits, implementation of California standards for biofuels, high corn prices and low energy prices have created considerable volatility in corn based ethanol productions. Electrical production ownership by public power authority and low Nebraska electrical rates have slowed wind energy development in Nebraska. However, changes in state law have begun to encourage public/private partnerships for wind energy development resulting in modest wind energy growth in 2012 and several proposed wind energy developments for 2013. 2012 EPA rules

for advanced biofuels is creating an increased demand for ethanol fuel based on sorghum production and creating renewed farmer interest in growing sorghum.

**Energy Production in Nebraska:** According to a recent Associated Press story by Brandon Nelson, "With corn becoming an increasingly scarce commodity, the ethanol business is feeling the pinch. The persistent drought is taking its toll on the industry and has forced about 20 ethanol plants nationwide to halt production on the corn-based fuel. Data recently provided to the Associated Press by The Renewable Fuels Association shows nearly two-dozen of the nation's 211 ethanol plants have stopped production during the past year. Production is unlikely to resume before the 2013 corn harvest in late August or September and the down time affects the state's production as six of the stalled plants are in Nebraska." At the beginning of 2013, seven of Nebraska plants were either shutdown or idled representing about 30% of the capacity in this state.

**Appropriation Changes:** Steady state tax collection and soaring federal deficits has led to static state and declining federal budget support in 2012 with significant federal reductions possible in 2013. Elimination of some research and extension program areas is anticipated.

**Competing public priorities:** The food vs. fuel debate continues to present some public relations challenges for the ethanol industry. However, other factors such as ethanol's high octane property and the need for higher octane fuels as the auto industry standards for fuel efficiency increase suggest a strong long-term future for ethanol demand. The current high prices for corn, due in part to ethanol demand, is creating a demand for additional acres for corn production resulting in fewer acres devoted to other row crops, small grains, and grassland.

## **V(I). Planned Program (Evaluation Studies)**

### **Evaluation Results**

UNL Extension has divided into five spires of excellence with four Extension faculty contributing to two action teams addressing energy related topics: 1) Water/Climate/Environment for Agriculture and 2) Water/Climate/Environment for Community. However, these Action Teams have not identified Energy related topics as Signature Outcomes for which statewide implementation of targeted. Our primary evaluation initiatives are focused on UNL Extension's Signature Outcomes. As such, only limited impact data is collected for Energy related UNL Extension programs.

### **Key Items of Evaluation**

No evaluation plan exists for UNL Extension programs related to Energy.

**V(A). Planned Program (Summary)**

**Program # 4**

**1. Name of the Planned Program**

Childhood Obesity

Reporting on this Program

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
702	Requirements and Function of Nutrients and Other Food Components	15%		35%	
703	Nutrition Education and Behavior	25%		3%	
724	Healthy Lifestyle	25%		14%	
802	Human Development and Family Well-Being	10%		34%	
806	Youth Development	25%		14%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

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

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	37.0	0.0	15.0	0.0
Actual Paid Professional	22.0	0.0	11.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
502433	0	243156	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
599073	0	86209	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**

The Institute will conduct research and deliver extension education programs that will enable Nebraskans to increase their consumption of foods that match their specific MyPyramid recommendations and increase their physical activity levels. A variety of teaching strategies will be used for program delivery including face-to-face education, distance learning technologies, and use of eXtension programming.

In addition, long-term research strategies are aimed at 1) using use genome-based technologies to develop individualized nutritional strategies that will impact chronic "lifestyle" diseases and obesity, and 2) developing bioactive foods that provide health-promoting functionality when consumed.

**2. Brief description of the target audience**

The target audience includes:

- high risk families,
- children,
- families of young children (young children defined as those 0 - 8), and
- adults interested in increasing their overall health.

**3. How was eXtension used?**

In 2012, 21,00 visits to eXtension originated from Nebraska resulting in 67,000 eXtension web page viewings. In addition, 325 Ask an Expert questions originated from Nebraska and 523 responses were supplied by UNL Extension faculty. We have 147 faculty and staff that are members of 45 of 59 CoPs and 17 who provide leadership for CoPs.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8000	16000	25000	50000

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

**Patent Applications Submitted**

Year: 2012  
 Actual: 1

**Patents listed**

INHIBITORS OF FATTY ACID UPTAKE AND METHODS OF USE.

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**



<b>2012</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Actual</b>	5	18	23

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of scholarly publications and curricula related to childhood obesity.

<b>Year</b>	<b>Actual</b>
2012	14

**Output #2**

**Output Measure**

- Number of extension in-depth workshops.

<b>Year</b>	<b>Actual</b>
2012	35

**Output #3**

**Output Measure**

- Percentage of Agricultural Research Division HATCH projects in childhood obesity, fundamental nutritional sciences, and family well-being.

<b>Year</b>	<b>Actual</b>
2012	3

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Youth will consume foods that match their MyPyramid recommendations.
2	Youth will increase the number of minutes spent in daily physical activity to recommended levels.
3	Adults will apply behavior change strategies to increase weight loss
4	Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in child obesity

## **Outcome #1**

### **1. Outcome Measures**

Youth will consume foods that match their MyPyramid recommendations.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	24000

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

In Nebraska, over \$498 million dollars are spent annually on obesity related health care. Obesity and physical inactivity are risk factors for heart disease and stroke, diabetes, and some cancers. In Nebraska, overweight and obesity affect 65% of adults and 33% of youth. The obesity issue translates into missed work, higher health care costs, and a negative impact on Nebraska's economy.

#### **What has been done**

One-on-one education, group meetings, on-line programs, social media, web sites, and educational applications (apps) are tools being used to share MyPlate recommendations to young people. Programs such as "5-4-3-2-1-Go!" were offered by Extension faculty statewide and emphasize the healthier eating and decreased screen time. In addition, 4-H programs have the overall goal of increasing healthy behaviors.

iCook is a new program under development. There are six sessions in the curriculum that have been pilot tested by a 5-state collaborative team through a USDA AFRI grant. The lessons are based off of UNL Extension Curricula titled Fast Foods and Youth in Motion. Each lesson includes culinary skill development, a specific nutrient focus, physical activities, family engagement and dinner time talking strategies.

#### **Results**

In 2012, 24,000 young people were reached with educational programs aimed at increasing the consumption of foods that match MyPlate guideline by UNL Extension. Of these, 89% reported increased knowledge of the food groups and eating a broader variety of foods.

As part of UNL Extension's nutrition programming, Nebraska's Nutrition Education Program (NEP)

offered school enrichment kits to 11 counties and reached 9,804 youth. In 2013, kits will be available in 51 counties. As a result of the school enrichment kits: 41% of Kindergarteners showed improvement in their hand washing knowledge. Ninety-eight percent of 1st graders correctly identified a food from the fruit/veggie food groups, 94% of 2nd graders correctly identified food groups in a sack lunch picture, 94% of 3rd graders identified food should be thrown in the trash if they think it is spoiled, 62% of 4th graders read food labels on the foods they ate, and 75% of 5th graders correctly identified the steps of Fight BAC! One Nutrition Education Program (NEP) Extension Assistant noted: "A 4th grader told me she taught her family how to read food labels and they stopped eating some foods because the food label helped them learn they weren't nutritious. It's important to teach youth nutrition because they have such an impact on the food choices of a family."

In 2012, 16,804 youth participated in the SNAP-ED program. Before SNAP-Ed, 45% of youth reported that they ate breakfast or a snack before school that day compared to 82% of youth after SNAP-Ed. Youth also increased their knowledge in regards to the MyPyramid recommendations and the Dietary Guidelines. Of the 2,895 youth who participated in EFNEP, 72% of 997 youth increased knowledge of the essentials of human nutrition. Approximately 1,676 youth impacted through the Eating Smart from the Start program in Nebraska, 50% of childcare providers are purchasing and serving more fruits and vegetables.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
703	Nutrition Education and Behavior
724	Healthy Lifestyle
802	Human Development and Family Well-Being
806	Youth Development

**Outcome #2**

**1. Outcome Measures**

Youth will increase the number of minutes spent in daily physical activity to recommended levels.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	24000

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

While making appropriate food choices is one part of the overall obesity issue, increasing physical activity is another part of that equation. Increased physical activity can lower risk for disease and illness which will eventually lead to lower long term medical costs for families and communities.

#### What has been done

Creating Balance with Food & Fitness is a program that addresses: balancing calories to manage weight, knowing which foods and nutrients to increase and decrease, and increasing physical activity levels. The 7 week program was piloted statewide in Spring, 2012 by Extension Educators live via webinar and archived on the eXtension website. Participants showed statistically significant improvements in physical activity levels, eating more fruits, vegetables and whole grains, using Nutrition Facts Labels, setting specific goals, and drinking more water. Created by Extension Specialists, Educators, and Assistants, this dynamic four-part curriculum is on the UNL Marketplace and provides over 25 hours of programming.

#### Results

Of those 24,000 youth who participated in nutrition education programs offered through UNL Extension in 2012, 78% of youth reported that they are almost always physically active every day and 76% percent reported knowing the amount of physical activity they need each day.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
802	Human Development and Family Well-Being
806	Youth Development

### Outcome #3

#### 1. Outcome Measures

Adults will apply behavior change strategies to increase weight loss

#### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

#### 3a. Outcome Type:

Change in Action Outcome Measure

#### 3b. Quantitative Outcome

Year	Actual
2012	670

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

In Nebraska, overweight and obesity affect 65% of adults. As stated previously, this has a negative impact on Nebraska's economy because of missed work and higher health care costs. In addition, because parents are often the food providers in the home, negative food behavior of adults leads to negative behavior in children and a more serious obesity spiral.

#### What has been done

In addition to the previously mentioned programs focused on increasing adherence of MyPlate guidelines and increasing physical activity, another program offered by UNL Extension designed to increase weight loss is Control Diabetes for Life. This is an educational program broadcast to several locations throughout the state and recorded for later viewing. Participants learn to control diabetes while preparing nutritious and delicious foods that are low in sugar and fat. This six-hour program helps participants establish new goals for diabetes self-management, control their blood sugar levels, and understand how physical activity contributes to the good health of a diabetic. Control Diabetes for Life has reached 4,500 people in its nine year history, providing a way to reach low income people diagnosed with diabetes and is offered free of charge in coordination with Nebraska Department of Health and Human Services and the University of Nebraska-Lincoln Extension.

#### Results

As a result of the "Control Diabetes for Life" program, participants reported statistically significant changes in: selecting and modifying new recipes to help families develop tastes for healthier foods and how to modify components in casseroles; developing techniques to use when cooking with sugar substitutes; understanding complications due to low levels of Vitamin D; understanding that being diagnosed with diabetes can increase the likelihood of experiencing winter time blues and/or depression and ability to identify causes of seasonal "blue" mood. Results of a one-year follow up survey showed that program participants had significantly either improved or greatly improved in the following areas: exercising (58%), using diabetes appropriate foods on special occasions (71.7%), avoiding nighttime lows in blood sugar (61.3%).

Estimates from the Department of Health and Human Services calculate the value of diabetes education at \$900 per person saved in medical costs and loss of earning due to illness. Control of Diabetes for Life sessions for the November 2011-November 2012 had 670 participants in formal program settings. The calculated savings in medical costs for 800 participants (accounting for minimal amounts of on-line and TV participation) would equate to \$720,000.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
802	Human Development and Family Well-Being

## **Outcome #4**

### **1. Outcome Measures**

Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in child obesity

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	6800

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

With an increased need for scientists across the nation, a primary interest of Nebraska 4-H is to provide opportunities for youth to pursue science, engineering, technology, and applied math. It is anticipated that these traits and excitement will create a robust science pipeline that will be prepared to meet the challenges of multi-disciplinary issues like obesity. As a primary food producing state, 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 that increasingly suggest that the food we eat is directly linked to our overall health status.

#### **What has been done**

Nebraska 4-H is working to increase young people's interest and skill level in science by providing hands on learning experiences that encourage the development of science skills and abilities leading to an increase in science literacy amongst 4-Her's. We are doing this by developing comprehensive programming, curriculum, professional development, and resource materials for youth and adults. For example, as a result of Nebraska 4-H Science programming, nearly 800 youth participated in the 3rd Annual Robotics Expo. The Expo featured 48 teams from around the state competing in the FIRST Lego League, the CEENBoT competition, and the new Jr.First Lego League competition for youth ages 6-9.

In addition, 74 summer Gear Tech T-21 4-H Robotics Camps were held nationwide in 2012 serving nearly 1,800 youth. An additional 44 new Nebraska robotics clubs were started in 2012 with a total of nearly 5,000 youth participating in the project. Each of these experiences is a high dosage program focusing on science, engineering, and technology skills.

A holistic engineering curriculum centered on robotics the 4-H Robotics: Engineering for Today and Tomorrow curriculum was written, produced, and evaluated. The curriculum consists of three separate tracks, virtual robotics, junk drawer robotics, and platforms, each with three levels of content.

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**

Nebraska 4-H is developing science interests, skills and abilities in the areas of agriculture, energy, environmental stewardship and technology. Results of a statewide survey of 4-H participants reported that 88 percent of 4-H'ers agreed or strongly agreed that they can explain their science-related decisions to others. Eighty-nine percent agreed or strongly agreed that science is important in solving everyday problems. Ninety-nine percent agreed or strongly agreed that good scientists work together to solve problems. Sixty-nine percent felt they learned skills they could use to solve problems in school.

In 2012, there were over 424 Baccalaureate and over 170 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**

<b>KA Code</b>	<b>Knowledge Area</b>
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
802	Human Development and Family Well-Being
806	Youth Development

## **V(H). Planned Program (External Factors)**

### **External factors which affected outcomes**

- Economy
- Appropriations changes
- Public Policy changes

### **Brief Explanation**

Nebraska's support of higher education and UNL Extension allowed us to meet our goals as planned. UNL Extension continues to be cognizant of over-arching issues such as feeding nine billion people, global water supplies, and how those will impact our work related to childhood obesity.

## **V(I). Planned Program (Evaluation Studies)**



## **Evaluation Results**

UNL Extension continues to identify signature outcomes and indicators in each of its programming areas and is collecting statewide data to assess progress made toward achieving those outcomes. In 2012, each Extension Action Team completed an outcome report highlighting their efforts and the impact of those efforts on clientele. These reports have been instrumental in working with stakeholders who in turn used them to advocate on behalf of the Extension program. Additional efforts are underway to enhance the skills of Action Team leaders in order to strengthen selected indicators and evaluation strategies.

Information regarding Academic Analytics can be found at: <http://www.academicanalytics.com/>

## **Key Items of Evaluation**

**V(A). Planned Program (Summary)**

**Program # 5**

**1. Name of the Planned Program**

Food Safety

Reporting on this Program

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	30%		32%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	30%		5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	30%		29%	
806	Youth Development	10%		34%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	28.0	0.0	13.0	0.0
Actual Paid Professional	29.0	0.0	12.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
635538	0	266301	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
605232	0	281482	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**

IANR will use a holistic approach in addressing food safety from farm to fork. Research and extension programming will target reducing food borne illnesses. A variety of teaching strategies will be used for program delivery including face-to-face education, distance learning technologies, and eXtension programming.

**2. Brief description of the target audience**

The target audience for this program includes:

- producers,
- food processing and retail establishment owners/workers, and
- consumers.

**3. How was eXtension used?**

Food Safety programming continues to benefit from eXtension resources. In addition to serving as a reference for new topics, eXtension content is regularly linked back to our umbrella food website (food.unl.edu) which houses our food safety resources. UNL Extension faculty are regular contributors to the eXtension site in the food/nutrition and food safety areas.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	1500	3400	1900	20000

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

**Patent Applications Submitted**

Year: 2012  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

<b>2012</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Actual</b>	3	37	40

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of scholarly publications and curricula related to food safety.

<b>Year</b>	<b>Actual</b>
2012	16

**Output #2**

**Output Measure**

- Number of extension in-depth workshops.

<b>Year</b>	<b>Actual</b>
2012	24

**Output #3**

**Output Measure**

- Percentage of Agricultural Research Division HATCH projects in food safety.

<b>Year</b>	<b>Actual</b>
2012	10

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Increased adoption of pre-harvest methods for beef quality and safety.
2	Increased implementation of safe food handling practices by food service providers and consumers.
3	Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in food safety.

## **Outcome #1**

### **1. Outcome Measures**

Increased adoption of pre-harvest methods for beef quality and safety.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	2500

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Agriculture is the economic driver in Nebraska's economy accounting for 12 billion dollars annually. Over half, 7.1 billion dollars, of this revenue comes from the beef industry. Improving the profitability of beef producers contributes to the economic vitality of Nebraska cities and towns. There are 1.71 million beef cows in Nebraska, ranking us 4th nationally. The cow-calf enterprise is a complex production system that integrates human, financial, and natural resources. As world populations continue to grow, the efficient, sustainable conversion of forage and feed resources into high quality protein products will be increasingly important. Nebraska farmers and ranchers are positioned to be leaders in the production of economical, safe, and healthy food.

#### **What has been done**

UNL Extension's Beef Systems program focuses on:

- \* Improving the competitiveness, diversity, sustainability and profitability of Nebraska's beef producers,
- \* Adoption of approaches to animal care that improve health, well-being, quality and wholesomeness,
- \* Improving business and management skills,
- \* Increasing consumer education about beef systems

Programs include:

- \* Ranching practicums that deliver in-depth educational programming
- \* Beef systems home study courses emphasizing nutrition and health,
- \* Satellite delivery of the latest research through Beef Satellite Short Course,
- \* Nationally recognized web delivery including Ask an Expert (<http://beef.unl.edu> and <http://www.extension.org/beef+cattle>)
- \* Chuck roll cutting demonstrations and basic meat science

For example, the 4-H Livestock Quality Assurance (LQA) Online Program teaches youth about the quality of meat and food products that come from livestock. Quality assurance for livestock producers means making a promise to the consumers, or the people who consume the meat, milk and dairy products, and eggs that come from livestock poultry. The promise made is that products from livestock will be the highest possible quality and producers will do everything possible to make these products safe to eat. All Nebraska 4-H youth ages 8-18, who are enrolled in a livestock project (beef, dairy cattle, dairy goat, meat goat, poultry, rabbit, sheep, and swine) are required to complete three modules in the LQA Online Course in order to get certified. Certificates of completion are then turned into their local Extension office in order to receive full credit for completion allowing youth to participate in local, state and regional livestock competitions.

### **Results**

Since March of 2012, 2,438 youth have participated in the 4-H Livestock Quality Assurance (LQA) Online course reaching youth in 80% of Nebraska counties, with 7,972 module certificates earned (youth are required to complete at least three for LQA certification each year). Certificates are only issued when a youth has achieved an 80% competency on the module content. Resources have been accessed over 155,000 times. Youth have access to the course from a variety of locations (home, extension office, library, etc.) including one youth who told us they were able to complete their LQA requirements on the bus using their smartphone on the way to a basketball game. Examples from youth when surveyed, "Why do you think it's important to learn about LQA": so I know what to do when my animal is sick; so I can provide a good product for consumption; keep animals and meat safe; and so our animals are treated properly and we are safe around them.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
501	New and Improved Food Processing Technologies
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
806	Youth Development

### **Outcome #2**

#### **1. Outcome Measures**

Increased implementation of safe food handling practices by food service providers and consumers.

#### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

#### **3a. Outcome Type:**

Change in Action Outcome Measure

### 3b. Quantitative Outcome

Year	Actual
2012	1000

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

About 48 million people (1 in 6 Americans) get sick, 128,000 are hospitalized, and 3,000 die each year from foodborne diseases, according to recent data from the Centers for Disease Control and Prevention (CDC). The Food Safety Modernization Act (FSMA), signed into law by President Obama on January 4, 2011, when fully implemented will shift the focus of food safety for federal regulators from responding to contamination issues, to preventing them.

#### What has been done

UNL Extension continues to be the "go to" organization for food safety education for the meat processing industry, food service providers, and consumers. For example, UNL Extension reached 137 small and very small sized meat processing operations in Nebraska, Kansas, Missouri, and South Dakota with education on Hazard Analysis and Critical Control Point (HACCP) information.

When FSMA is fully implemented, fruit and vegetable growers may be facing new regulations aimed at reducing the potential for microbial contamination of produce by bacteria, viruses, and parasites that cause human illness. The issue of foodborne illness and its prevention is a new one for most fruit and vegetable growers. Contamination of produce may occur at any stage of production- field or greenhouse growth, harvest, postharvest handling or transportation- but there are many things that can be done to reduce risk. In the Good Agricultural Practices (GAPs) series of workshops, participants learned what causes foodborne illness, and how contamination can be prevented. They began to assess the current strengths and weaknesses of their production operations regarding food safety, learned how to integrate GAPs into their farm operations, and began to write a farm food safety plan.

In a new program offered through UNL Extension, 600 child care providers received food service safety training as part of a distance education program. In addition, UNL Extension reached 683 foodservice managers with 12 hours of training related to food safety and sanitation through the ServSafe course with a statewide pass rate of 86%.

The research components of the new USDA grant, "Food Safety for Diverse Families (Native American and Hispanic) with Young Children" has begun. Two graduate students have completed their research proposals and have submitted their IRB's for conducting the knowledge survey validation and focus groups. The project is a Multi-state project with the University of New Mexico

UNL Extension partnered in the development of the "4 Day Throw Away" program includes an iPhone app that helps consumers understand how long to keep leftover food for safety. The app provides specific time frames for specific foods and links food to the common culprit microorganism. Each microorganism listing includes symptoms, who is most at risk, how long after exposure before you get sick, what is the recovery and long-term complications, foods associated with this microorganism, and how to prevent getting sick. Social marketing drives the campaign. Traditional media (press releases, radio PSAs) and mascot appearances at grocery



stores were conducted. The website (4daythrowaway.com) contains videos with interactive polling, and food safety myths. The videos help families understand the importance of using leftovers within four days or throwing the items away. The "4-Day Throw Away" application software (app) features hundreds of individual food items, storage recommendations, reheating instructions and special considerations around food safety. The app also gives information on related foodborne illnesses, with details on symptoms, duration, complications and prevention.

### **Results**

As a result of HACCP education HACCP workshop participants indicated that they felt more comfortable in utilizing the HACCP principles in their programs and indicated that they would be using them regularly. The overall comfort levels of the participants for working with HACCP plans increased after completion the course and they indicated they would be more willing to discuss HACCP plans with co-workers.

In 2012, assistance was given to twenty small meat processing businesses for HACCP plan development, reassessment, and implementation of food safety procedures including standard operating procedures for E. coli O157:H7 sampling to small processors. And, assisting one company with establishing the USDA grant of inspection and provided startup advice to two additional companies.

As a result of the GAPs training, participants were surveyed following each program to measure knowledge gain in issues pertaining to good agricultural practices. (n=103): 85% increased their knowledge about the need for farm food safety; 95% increased their knowledge of field production practices that reduce the risk of produce contamination; and 92% increased their knowledge GAPs recordkeeping requirements.

As a three month follow up, GAPs participants indicated they made the following practice changes. (n=27): 74% implemented a hygiene program for all employees; 67% implemented a common sense recordkeeping system; 59% implemented a system to clean all harvest equipment on a scheduled basis; and 55% developed a food safety program for their farm that incorporated good agricultural practices

A research project on the impact of meat product mixing time on cooked product quality when reduced salt (sodium) levels are used or when salts of organic acids used as antimicrobial ingredients was conducted. Because the reduction of salt (sodium chloride) in meat products can impact food safety and shelf life and greatly impacts the texture and quality of meat products, this work will help meat processors understand the effects of reduced salt in their formulations and processing techniques that can enhance product quality.

Approximately 600 Childcare Providers who participated in the Web-based Food Safety Training reported improvements in several areas. For example, 51% increased their use of thermometers to measure food temperatures, 41% increased efforts to prevent cross-contamination

In 2012, UNL Extension trained 500 managers on ServSafe. These managers trained nearly 10,000 front-line staff. ServSafe Starters reported that: 52% increased their knowledge on calibrating thermometers, 38% increased their knowledge about the food temperature danger zone, 35% increased their knowledge on proper minimum cooking temperatures. As a result of ServSafe: 34% increased their knowledge of proper cooking temperatures, 32% increased their knowledge of how to not purchase food from unsafe sources.

As a result of "4 Day Throw Away" new audiences that may not be familiar with Extension were reached with food safety education via social media and traditional methods. In its first year of the campaign, 5000 magnets were distributed; 500 posters with tear-off cards were posted which

directed recipients to a website (over 4000 visits) with leftover food safety information. The viral campaign included 4 YouTube videos (over 9000 views); a Facebook page (150 users with over 18,000 post views); and 48 followers on Twitter. Multiple media methods were necessary for success to increase awareness and change health behaviors. Traditional and social media methods used in the 4 Day Throw Away campaign reached the intended audience.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
806	Youth Development

#### Outcome #3

##### 1. Outcome Measures

Nebraska will have access to higher educated workforce trained in the new biology with skills applied to addressing critical science in food safety.

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2012	250

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Preparing Nebraska's youth to pursue meaningful career choices, especially in the areas of science and the new biology continues to be a top priority of Nebraska 4-H. The 2012-2017 Nebraska 4-H Strategic Plan sought to teach our youth the value of opportunity and connectivity, and to develop the skills necessary for acting on those opportunities. Through various 4-H programs, projects, and activities, youth were able to discover and pursue their interests as they relate to future career possibilities. In each of these endeavors, a special emphasis was placed on careers related to science. It is anticipated that this focus will help generate a new pool of science-ready students who can take on the challenge of feeding nine billion people. Food safety plays a critical role in meeting that challenge.

###### **What has been done**

As a part of their experience, each Nebraska 4-H participant is challenged to engage in projects that are of interest to them and match their skills. 4-Hers are then empowered to connect the dots between that set of skills and potential careers. The new Career Explorer app released in 2011 has been downloaded 2,143 (including 625 downloads in the last 90 days) with total game plays that reached the final page totaling 9,909. Top 10 careers chosen through the Career Explorer app in order were: lawyer, veterinarian, singer, actor, surgeon, pediatrician, animal breeder, architect, teacher and fashion designer.

**Results**

While not all directly related to food safety, the work of Nebraska 4-H in helping young people be college-ready and prepared to choose careers that would benefit the state are obvious. Over the last five years, the efforts of Nebraska 4-H have been evidenced by the significant increase in percentage of youth respondents who know a college major related to their 4-H program or project. After participating in a 4-H program, 83% said they interacted with someone working in a career area they're interested in; an increase of 55% from before the program; 97% of students agreed that they now understand the value of higher education in their future; 84% agreed that they understand the path to their desired career, an increase of 21% from 2011.

Nebraska 4-H is developing science interests, skills and abilities in the areas of agriculture, energy, environmental stewardship, food science and technology. When surveyed, 88% of 4-Hers agreed or strongly agreed that they can explain their science-related decisions to others; 89% agreed or strongly agreed that science is important in solving everyday problems and 99% agreed or strongly agreed that good scientists work together to solve problems.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
501	New and Improved Food Processing Technologies
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
806	Youth Development

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities

**Brief Explanation**

UNL Extension has been able to successfully meet goals as planned in the area of food safety. Research and Extension Faculty continue to be watchful for emerging issues and world conditions that could change food systems and the global trust that consumers have of U.S. agriculture. In addition, UNL Faculty are at the forefront of basic research in food allergies, food safety through the food chain, and microbiome profiling.

## **V(I). Planned Program (Evaluation Studies)**

### **Evaluation Results**

UNL Extension has developed an impact report for each of its Action Teams. These can be found on our Extension home page at: <http://www.extension.unl.edu//>.

The Nebraska Agricultural Experiment Station measures its success in our ability to provide Extension with cutting edge research results that impact Nebraska. In addition, we have begun to use a commercial product (Academic Analytics) to assess faculty productivity measures. We are still in the process of determining the robustness of their dataset.

### **Key Items of Evaluation**

UNL Extension continues to identify signature outcomes and indicators in each of its programming areas and is collecting statewide data to assess progress made toward achieving those outcomes. In 2012, each Extension Action Team completed an outcome report highlighting their efforts and the impact of those efforts on clientele. These reports have been instrumental in working with stakeholders who in turn used them to advocate on behalf of the Extension program. Additional efforts are underway to enhance the skills of Action Team leaders in order to strengthen selected indicators and evaluation strategies.

Information regarding Academic Analytics can be found at: <http://www.academicanalytics.com/>