

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Natural Resources and Environmental Management

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	12%		12%	
104	Protect Soil from Harmful Effects of Natural Elements	14%		8%	
111	Conservation and Efficient Use of Water	18%		15%	
112	Watershed Protection and Management	10%		7%	
121	Management of Range Resources	5%		7%	
132	Weather and Climate	2%		7%	
141	Air Resource Protection and Management	3%		5%	
205	Plant Management Systems	8%		8%	
511	New and Improved Non-Food Products and Processes	15%		12%	
601	Economics of Agricultural Production and Farm Management	3%		3%	
603	Market Economics	7%		3%	
605	Natural Resource and Environmental Economics	3%		13%	
	Total	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	30.0	0.0	23.0	0.0
Actual Paid Professional	55.0	0.0	74.0	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
1347705	0	1029562	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
4751325	0	9143144	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1355340	0	1360342	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Understand the sources, fate, and transport of important water contaminants (i.e., fecal coliform bacteria, nutrients, sediment, and pesticides [especially atrazine herbicide]), and develop and determine the environmental and economic effectiveness of best management practices for these potential contaminants.

- Quantify the environmental and economic effectiveness of best management practices for improving water quality at the watershed level.

- Disseminate science-based information through environmental education programs for both youth and adults, and deliver extension programs aimed at stakeholders that focuses on adoption of best management practices in targeted areas for water quality improvement.

- Develop and test new crop, livestock, bioenergy, and riparian forest systems that will reduce water use while optimizing productivity, environmental quality, and profitability, including water saving technologies for concentrated animal feeding operations (CAFOs) and industries that process agricultural commodities.

- Develop an information and education program for policy makers, producers, water professionals, and youth audiences with respect to the Ogallala Aquifer, including assessment of the potential impacts of climate change on this important water resource.

- Develop an understanding of air quality impacts of rangeland burning, including extent and timing of burn events, influence of fuel load on emissions, modeling the downwind transport of particulate matter, and developing a climatology of extreme events.

- Disseminate science-based information and transfer technologies to stakeholders, and implement youth education programs focused on air quality.

- Disseminate science-based information regarding the sustainability of biofuel production and processing.

- Develop new processes to modify agricultural-based materials into higher value products.

- Develop resources and pathways to increase climate literacy.

- Provide decision tools for adaptive best management practices that address the effects of climate change.

2. Brief description of the target audience

Agricultural producers, youths, policymakers/regulators, crop and livestock consultants. Growing industry based on bioprocessing and bioconversion, including the existing ethanol and biofuels industry. International grain processors; industrial products manufacturers: adhesives, composites, bio-based

chemicals, solvents, and lubricants. Entrepreneurs and investors seeking to enter this industry.

We will choose audiences whose production systems will be influenced by climate change, as well as those who consult or influence the decision-makers of these producers. Secondary audiences will be decision-makers and leaders responsible for preparing communities for change (e.g., state and local elected officials, environmental groups).

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	12182	0	1600	0

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

Patent Applications Submitted

Year: 2012

Actual: 5

Patents listed

Peptide-Albumin Hydrogel; Starch Spherulites with Controlled Enzyme Digestibility; Processes for Production of Low-fat and Low-ash Sorghum Flour; Soy Protein Based Elastomers; Yogurt Spread

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	16	29	45

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational programs delivered

Year Actual

2012 423

Output #2

Output Measure

- Number participating in educational programs

Year	Actual
2012	12182

Output #3

Output Measure

- Number of refereed research publications

Year	Actual
2012	16

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Producers adopt BMPs that protect environmental quality (measured by number adopting BMPs)
2	Producers adopt BMPs for atrazine and soil erosion (measured by number of acres)
3	Measurable improvement in water quality (percent reduction atrazine) in Little Arkansas River Watershed
4	An enhanced or improved economy as a result of bioenergy development (measured by number of new bio-based businesses created)
5	Improve utilization of biological raw materials as bioconversion substrates (measured by number of new processes developed).
6	Improved environmental conditions through sustainable biofuel production and utilization (measured by: PPM of CO2 in atmosphere, water quality, average temperature during year; gallons biofuel, gallons of cellulosic ethanol, gallons of biodiesel. . . produced in KS).
7	Agricultural/natural resource producers, and/or business representatives modify existing practices or technologies and/or adopt new practices to protect/enhance natural resources and/or enhance biodiversity (measured by number documented)
8	Development of new knowledge and technologies (measured by percentage of participants who increase knowledge of management practices under climate variability and change).
9	Improve climate mitigation strategies and their adoption (measured by number of farms and landowners reducing carbon and energy footprints)

Outcome #1

1. Outcome Measures

Producers adopt BMPs that protect environmental quality (measured by number adopting BMPs)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	63

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Restoring water quality requires a fundamental change in practices and behavior toward the land and water. Behavior change in agriculture with respect to improving water quality involves raising awareness of issues and problems, identifying options for action, securing technical and financial assistance, and implementing change.

What has been done

Best Management Practices (BMPs) were delivered through 423 events (i.e., workshops, demonstrations, and tours; field days; and public meetings to face-to-face contacts). In addition, onfarm environmental assessments and plans were developed.

Results

BMPs such as adding grass buffers, reducing livestock numbers, adding waste storage facilities, controlling extraneous drainage, and alternative water sites for water quality issues were implemented by more than 63 individual producers involving about 9,488 animal units.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
141	Air Resource Protection and Management

Outcome #2

1. Outcome Measures

Producers adopt BMPs for atrazine and soil erosion (measured by number of acres)

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Measurable improvement in water quality (percent reduction atrazine) in Little Arkansas River Watershed

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

An enhanced or improved economy as a result of bioenergy development (measured by number of new bio-based businesses created)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Industry interested in our technology and findings through reading our publications.

What has been done

We did services for bioindustry such as biomass composition analysis, sweet sorghum composition analysis, and provided technical support. We did not directly create any new business but the results from our research can be adopted by industry.

Results

Research collaboration with industry.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Improve utilization of biological raw materials as bioconversion substrates (measured by number of new processes developed).

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The U.S. consumes more than 140 billion gallons of transportation fuels annually. Due to finite reserves, non-uniform distribution, and volatile prices of fossil fuels, renewable fuels from biomass could make a significant contribution toward a more sustainable future. Recent legislation has called for this nation to annually produce 36 billion gallons of renewable fuel by 2022 to help offset impending concerns over climate change and energy security. Such targets have implications of national security, economic development, and sustainable practices for the future.

What has been done

Both fundamental and applied research has been conducted in the area of biofuel production. Key projects include 1) grain sorghum, sorghum biomass and sweet sorghum as a viable renewable resource for biofuels; 2) Impact of water availability on grain quality; 3) potential of big bluestem for biofuel production; 4) pelleting biomass to increase cellulosic ethanol production; 5) syntheses of acid functionalized nanoparticles for hydrolysis and pretreatment of lignocellulosic biomass; and 6) pyrolysis of biomass for bio-oil and bio-char production. These research projects were supported by NSF, USDA, DOE/USDA, DOT Sun Grant Initiative and State of Kansas.

Results

Our main results include: (1) further confirmation that waxy sorghum is an excellent feedstock for bioethanol production with low energy input; (2) developed a new method to increased biofuel yield from photoperiod sensitive sorghum through utilizing both soluble sugars and cellulose; (3) identified the effects of biomass pelleting on composition change and biofuel yield; (4) improved the performance of acid-functionalized nanoparticles for biomass pretreatment and hydrolysis; and 5 evaluated the potential of big bluestem for biofuel production. As research results, we published 16 peer reviewed papers and presented 13 meeting papers.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Improved environmental conditions through sustainable biofuel production and utilization (measured by: PPM of CO2 in atmosphere, water quality, average temperature during year; gallons biofuel, gallons of cellulosic ethanol, gallons of biodiesel. . . produced in KS).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Effect of deficit irrigation on grain quality, yield and biofuel yield. Farmers care about their water uses and how reduced water resource affects agricultural yield.

What has been done

We find the effect on water availability on grain yield, quality, and end product yield.

Results

Shared results with radio talk about availability on grain yield, quality, and end product yield through K-State extension radio.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
205	Plant Management Systems
603	Market Economics
605	Natural Resource and Environmental Economics

Outcome #7

1. Outcome Measures

Agricultural/natural resource producers, and/or business representatives modify existing practices or technologies and/or adopt new practices to protect/enhance natural resources and/or enhance biodiversity (measured by number documented)

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Development of new knowledge and technologies (measured by percentage of participants who increase knowledge of management practices under climate variability and change).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is need to adequately clarify and explain significant relationships between agricultural producer knowledge of climate variability; producer perceptions of short-term vulnerability and long-term resilience to risks associated with climate change; and factors considered when

deciding to adopt or refrain from adoption of best management practices.

What has been done

This survey has been taken by a small purposive sample of the population, six agricultural producers. This group will serve as a small pilot test for the instrument in order to improve the survey so that a larger group can take it in the next year of this project. Additionally, initial meetings took place to determine what current communication efforts were being used by K-State Research and Extension related to climate change risk and personal responsibility.

Results

This survey will provide baseline data about what agricultural producers perceive as risks related to climate change.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
132	Weather and Climate
605	Natural Resource and Environmental Economics

Outcome #9

1. Outcome Measures

Improve climate mitigation strategies and their adoption (measured by number of farms and landowners reducing carbon and energy footprints)

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

This area continues to be quite volatile with policy changes and incentive programs affecting economics of target processes. This proves to be challenging to stay focused on the fundamental scientific issues that are the basis for solving problems independent of

policy changes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

One example of an evaluation tool:

EVALUATION 2 MANAGING SOIL NUTRIENTS AND FERTILITY

Please rate your learning in this session. Your honest responses are valued. Your responses will be used to assist the instructor(s) to make improvements in the design of this course. Please circle the number to indicate your response.

1. Overall, how much did you learn from this program?

Nothing=1.....2.....3.....4.....5=A lot

2. My ability to develop environmentally responsible nutrient management plans.

Before Participation

Low=1.....2.....3.....4.....5=High

Now, After Participation

Low=1.....2.....3.....4.....5=High

3. List one action you intend to take as a result of this program.

4. List one behavior you intend to change as a result of information learned in this session:

5. What was the most important thing you learned in this session?

6. Please list more in-depth topics you would like more information about.

Key Items of Evaluation