V(A). Planned Program (Summary)

Program # 7

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
102	Soil, Plant, Water, Nutrient Relationships	10%	0%	10%	0%
111	Conservation and Efficient Use of Water	10%	0%	10%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	50%	0%
205	Plant Management Systems	40%	0%	10%	0%
402	Engineering Systems and Equipment	30%	0%	20%	0%
606	International Trade and Development Economics	10%	0%	0%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	1.0	0.0
Actual Paid	0.0	0.0	17.0	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**
0	0	638406	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	1051091	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	2142307	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

AgriLife Extension
Agricultural producers and the energy industry have a keen interest in the role that agriculture will play in contributing to renewable energy for America, and are looking to AgriLife Extension to help define which second generation crops will fit this market and how they will be produced. Texas is a major livestock feeding state and faces a feed grain deficit at current production levels, making second generation crops the only practical feed stocks for bioenergy. AgriLife Extension has responded by applied and demonstrations of candidate oilseed and lignocellulosic feedstock crops; holding workshops and field days for agricultural producers, by meeting with commercial interests from the energy sector to interpret potential for a variety of plant based bioenergy options. As crop-based bioenergy other than the traditional ethanol from feed grains is still in its infancy, actual adoption of second generation bioenergy is limited. Research involved the development of cropping system BMPs, testing and development of novel dedicated oilseeds and lignocellulosic bioenergy crops, advanced plant breeding systems, micro- and macro-algae, logistics and conversion technologies. Our focus is on second generation oilseeds and lignocellulosic feed stocks rather than on corn, soybeans, and other crops that can be used for food and feed. Drought and salinity tolerance, adaptation to marginal growing conditions and wide hybridization are emphasized in research in order to increase adaptation and sustainability of alternative energy systems. Organic residuals at livestock production systems offer a concentrated source of feedstock for the bioenergy production. Demonstration of identification, selection, harvesting and transportation of quality organic residuals for entering bioenergy production is critical to ensuring a sufficient energy resource.

AgriLife Research
Research involved cropping systems, novel dedicated energy crops, advanced plant breeding systems, micro- and macro-algae, novel oilseeds, logistics and conversion technologies. Our focus is on lignocellulosic and unique plant oil feedstocks for liquid motor fuels rather than on corn, soybeans, and other crops that can be used for food and feed. Drought tolerance and wide hybridization were emphasized in breeding research in order to increase adaptation and sustainability of alternative energy systems. Best management practices are needed to identify, collect, separate, transport and process these organic residuals. Development of best management practices has helped to ensure availability of quality organic residuals for entering bioenergy production.

2. Brief description of the target audience

The target audience includes traditional petroleum and natural gas energy companies, farmers, seed companies, start-up companies in bioenergy, electric generating companies, and the general public.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	450	0	0	0

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

Patent Applications Submitted

Year: 2014

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	37	37

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of educational programs conducted.

Year	Actual
2014	8

Output #2

Output Measure

- # of research-related projects.

Year	Actual
2014	13

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of people reporting knowledge gained through participation in educational activities.
2	# of people reporting a willingness to adopt practices through participation in educational programs.

Outcome #1

1. Outcome Measures

of people reporting knowledge gained through participation in educational activities.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	485

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To meet the long-term needs of the U.S. for energy, new and sustainable sources of bioenergy will be essential. High tonnage sorghums developed specifically for biomass for bioenergy offer great potential, as well as other lignocellulosic feedstocks such as energy canes and hybrid sweet sorghum. Economically sustainable oilseed crops for biodiesel and bioproducts production include jatropha, castor, cottonseed, and sunflower.

What has been done
Research was conducted by Texas A&M AgriLife to evaluate yield and potential bioenergy production potentials of various crops including high-tonnage sorghum, guar, canola, etc. Studies focused on incorporating bioenergy crops into comprehensive cropping systems. Primary emphasis was placed on production economics, sustainability, and protection of soil and water resources.

Results
Multi-county and regional conferences, workshops, and field days were delivered to educate over 450 agricultural producers and allied industry regarding the use of agricultural crops for bioenergy production. Fifty individuals participated in a workshop in Corpus Christi, Texas focused on the use of oilseed crops for biodiesel production. In addition, seven workshops and regional educational programs were conducted across the state focused on crops such as canola and other oilseeds. A major regional workshop also was conducted in South West Texas focused on guar production with 36 agricultural producers in attendance.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
201	Plant Genome, Genetics, and Genetic Mechanisms
402	Engineering Systems and Equipment

Outcome #2

1. Outcome Measures

# of people reporting a willingness to adopt practices through participation in educational programs.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	449

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Bioenergy sources will be essential to meet the long-term energy needs of the U.S. High-tonnage sorghum and other crops developed specifically for biomass for bioenergy offer great potential. Other lignocellulosic feedstocks include energy canes and hybrid sweet sorghum. Economically sustainable oilseed crops for biodiesel and bioproducts production include jatropha, castor, cottonseed, and sunflower. Due to its very high oil content, microalgae has potential for production of jet fuels and other bioproducts.

What has been done
Texas A&M AgriLife conducted research to evaluate yield/bioenergy production potentials of various high-tonnage sorghums. Studies measured yields as well as greenhouse gases from biofuel production scenarios to help quantify the carbon footprint of a bioenergy cropping system and evaluate compliance with federally mandated reduction goals. Outreach education programs were conducted to educate and assist agricultural producers with the selection and management of adapted crops.

Results
A total of 8 multi-county and regional conferences, workshops, and field days were delivered to educate agricultural producers and allied industry regarding the use of agricultural crops for

bioenergy production. Fifty individuals participated in a workshop in Corpus Christi, Texas focused on the use of oilseed crops for biodiesel production. A regional workshop conducted in South West Texas and focused on guar production was attended by 36 individual. Multiple field days were conducted focused on bioenergy crop options, management systems, sustainability, and marketing. Pre-Post surveys indicated that 92.3% of attendees planned to adopt recommended production practices as a result of participation in the educational programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
201	Plant Genome, Genetics, and Genetic Mechanisms
402	Engineering Systems and Equipment

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Dramatic increases in oil production spurred by the development and refinement of horizontal drilling and fracturing substantially reduced overall opportunity for bioenergy crops. As a result, the demand for research and education programs was limited in the early portion of 2014. However, with marked reduction in barrel prices at the close of 2014 and in early 2015, there may be increased interest in 2015. Base programs will be continued for bioenergy sorghum and several key oilseed crops.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Pre- and/or Pre-Post surveys were used to evaluate producer understanding production practices, management considerations, and economic opportunities. Results indicated that approximately 99% of participants gained knowledge regarding effective selection and management of bioenergy crops. In addition, results showed that over 90% of attendees planned to adopt recommended production practices as a result of participation in the educational programs. Overall, all programs were very well received and future programs were discussed and planned to provide additional information and specifics on crop selection and management for key production regions in Texas.

Key Items of Evaluation

Producers expressed concerns about consistency of markets and future growth for of the bioenergy industry. Identification of specialty/optional markets to provide market outlet assurance was a key issue.