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
205	Plant Management Systems	20%		20%	
402	Engineering Systems and Equipment	10%		10%	
404	Instrumentation and Control Systems	10%		10%	
511	New and Improved Non-Food Products and Processes	20%		20%	
512	Quality Maintenance in Storing and Marketing Non-Food Products	10%		10%	
601	Economics of Agricultural Production and Farm Management	20%		20%	
604	Marketing and Distribution Practices	10%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	2.6	0.0
Actual Paid	2.2	0.0	4.8	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**
85163	0	90585	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
85163	0	90585	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
58135	0	363751	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Conduct research on processing, densifying, storage, and transportation of energy beets and biomass.
• Conduct economic analyses of biomass sources for energy production.
• Assist growers in new producing regions with business organization, technology adoption, and market development, and formation of risk management strategies.
• Provide educational materials and programming on production, economics, and policy analysis to decision makers, growers, and industry personnel.

2. Brief description of the target audience

- Farmers
- Policy makers
- Biomass processors
- Equipment manufacturers

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	526	10000	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	2	5	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of growers and industry personnel who are aware of the potential opportunities of growing and processing energy beets or cellulosic biomass for industrial sugars or other biofuel feedstock.

Outcome #1

1. Outcome Measures

Number of growers and industry personnel who are aware of the potential opportunities of growing and processing energy beets or cellulosic biomass for industrial sugars or other biofuel feedstock.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	125

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
High energy prices and environmental concerns have led to a search for low-cost, green alternatives to the wide range of fuels, chemicals, and materials currently made using petroleum. Among the best opportunities is producing biofuels and bioproducts from sugar. However, today?s sugar growers and processors, be they in the United States, Brazil, or elsewhere, target food. Launching a new regional sugar sector that targets industrial uses requires a substantial research and development effort that considers agronomics, engineering, and economics

What has been done
Since 2008, NDSU Extension has educated potential growers and others about the economics of industrial beet production and processing as well as beet agronomics, post-harvest logistics, and process engineering. In 2014, economics-focused activities included the development and distribution of handouts on expected returns. Educational programs were held at five targeted locations for the first commercial-scale facility in North America. The target audience of these meetings were area growers. Discussions focused on the cost of production and agronomic considerations including rotations, soil health, and herbicide carryover.

Results
Understanding the economics of industrial beet production has allowed the diverse group of industrial beet stakeholders to advance more quickly than would have otherwise be the case. For example, having information on the cost of production and relative returns to crop has enabled farmers to evaluate their interest in growing the crop. This is critical given impacts of herbicide carryover on beet production and the availability of acres needed to support a new beet-ethanol refinery. Development efforts in North Dakota led by Green Vision Group and Heartland

Renewable Energy are transitioning from research to commercialization. Industrial beet production and processing is expected to begin in 2017.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems
511	New and Improved Non-Food Products and Processes
512	Quality Maintenance in Storing and Marketing Non-Food Products
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V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Government Regulations
- Other (Oil boom in western ND)

Brief Explanation

With the oil boom associated with the Bakken formation in western ND, interest in energy beets has decreased slightly. However, towards the end of 2014 the price of crude oil had dropped precipitously worldwide, and interest in energy beets is again growing.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Growers attending energy beet educational meetings were encouraged to provide feedback via a post meeting evaluation. All growers who returned evaluations stated that the energy beet economic profitability information was easy to understand and they were satisfied or very satisfied with the quality of the presentation. Of evaluations returned, 96% indicated they were satisfied or very satisfied with the subject matter knowledge of the specialist and the quality of the program. It should be noted that due to a tragic loss of a key faculty member in 2013 resulted in a delayed comprehensive energy beet program in 2014, therefore a more comprehensive evaluation component was not completed.

Key Items of Evaluation