

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Energy

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
123	Management and Sustainability of Forest Resources			15%	
124	Urban Forestry			5%	
125	Agroforestry			25%	
131	Alternative Uses of Land			6%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			6%	
204	Plant Product Quality and Utility (Preharvest)			10%	
205	Plant Management Systems			21%	
511	New and Improved Non-Food Products and Processes			12%	
	Total			100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890

Actual	0.0	0.0	8.0	0.0
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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	169716	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	169716	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	5132242	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Basic and translational research will be conducted and the results disseminated via scientific publications, scientific meetings, workshops, conferences, etc.

2. Brief description of the target audience

Researchers, scientists, extension specialists, forest product producers, farmers.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	{NO DATA}	{NO DATA}	{NO DATA}	{NO DATA}
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2010

Plan:

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
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Actual	0	38	0
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V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed journal articles

Year	Target	Actual
2010	{No Data Entered}	22

Output #2

Output Measure

- Number of other peer reviewed publications (book chapters, proceedings, abstracts, etc.)

Year	Target	Actual
2010	{No Data Entered}	15

Output #3

Output Measure

- Number of invited papers and invited presentations

Year	Target	Actual
2010	{No Data Entered}	21

Output #4

Output Measure

- Number of graduate degrees awarded

Year	Target	Actual
2010	{No Data Entered}	5

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Research across disciplines will be conducted to improve the viability of biomass as an energy source by improving biomass production efficiency, developing new crops and uses, and improving handling and delivery processes for bioenergy products.

Outcome #1

1. Outcome Measures

Research across disciplines will be conducted to improve the viability of biomass as an energy source by improving biomass production efficiency, developing new crops and uses, and improving handling and delivery processes for bioenergy products.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Ethanol is considered a source of fuel that can help the US make the transition away from petroleum based energy sources. Current ethanol production in the US is based on corn. Alternative sources of biomass, which are less input intensive than corn, will be the key to developing cost effective alternative feedstock to ethanol production. Sweet sorghum, a corn-like grass related to sugar cane, can produce as much ethanol as corn but with far less intensive inputs, such as fertilizer. While sweet sorghum can and does grow in temperate zones such as Missouri, it often struggles or dies from cold temperatures when it is planted before early May.

What has been done

Agronomists at the University of Missouri are working to genetically adapt sweet sorghum to improve its productivity in Missouri. Most varieties of this native African plant do not grow fast enough in the American Midwest to make it a better ethanol producer than corn. Researchers are genetically blending sweet sorghum with other grass species such as sudangrass, in order to make a hybrid that is more cold-tolerant and yield a profitable crop in Midwestern states. Test plots with alternative varieties and different seasonal timings are being used to identify plants with better natural cold-tolerance and highest sugar content. The best-performing varieties may be candidates for efforts to genetically engineer a crop better suited to Missouri.

Results

Sweet sorghum uses less nitrogen and water in the growing process and returns more nutrients to the soil than corn. If cold tolerant varieties can be developed, it would be possible to get two harvest per season instead of one. Tests in Missouri so far show that sweet sorghum grown in high-quality silt loam soil plots produced stalks that contained enough sucrose and glucose to produce 600 gallons of biofuel per acre when fermented properly. Corn plots in the same study produced the same amount of ethanol, but required approximately three times the amount of

fertilizer.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

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

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Individual faculty were reviewed by their respective Division Directors. Faculty submitted their research goals and accomplishments. Besides evaluating individual progress, the Division Directors reviewed research progress and accomplishments in the context of the planned program. Results show continued progress in both basic and applied research.

Points of evaluation included the following:

Research focus: Was it relevant and consistent with the objectives of the planned program?

Successful scholarship: Were research results conveyed through peer reviewed publications?

Successful grantsmanship: Was the research quality high enough to successfully compete for external grant funds?

Key Items of Evaluation