V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Global Food Security and Hunger: Biotechnology

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		100%		100%
	Total		100%		100%

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.2	0.0	1.0
Actual	0.0	0.2	0.0	1.1

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	9981	0	56110
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	12844	0	12844
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	31859	0	43949

V(D). Planned Program (Activity)

1. Brief description of the Activity

Researchers will develop a local peanut nucletide database and build a bio-informatics pipeline for peanut gene discovery.

2. Brief description of the target audience

All peanut producers in Oklahoma.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	20	100	0	0
Actual	25	120	0	0

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

Patent Applications Submitted

Year: 2010
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Plan	0	1	
Actual	0	6	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Biotechnology.

Year	Target	Actual
2010	0	10

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of farmers learning about the peanut nucelotide database.
2	Number of farmers using the peanut nucleotide database.
3	Farmers who use the peanut nucleotide database or new peanut gene discoveries to improve their peanut production system.

Outcome #1

1. Outcome Measures

Number of farmers learning about the peanut nucelotide database.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	20	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need for developing improved peanut and daylily genotypes that are higher yielding and more diseased and insect resistant. Improved nutritional varieties would include higher protein levels but alleviation of plant DNA that causes allergens. The pace for developing these improve genotypes will be accelerated through the use of modern techniques such as those used in the Biotechnology Program at Langston University.

What has been done
Year 2010 has focused on microarray and cell biology activities. On peanut microarray, organ mRNAs were isolated for probe preparations. The latter were used to screen more that 20,000 clones that were spotted earlier on genes chips for organ specific genes identification. Developmental organ tissues were freshly collected from plants grown in the greenhouse. Sample tissues from roots and stems were used to isolate total RNA and mRNA. cDNA molecules that were copied from mRNAs were labeled as probes with microarray dyes for chips hybridizations. The optimization of the protocol resulted in initial successful screening of root and stem-specific genes. During the same period, cell biology research was conducted on both peanut and daylily. The results led to the development of peanut with a more efficient method for plant formation in cotyledonary tissue. An efficient protocol for cell shoot-commitment was developed for individual peanut organs, other than cotyledon. Expanded screening for additional daylily varieties was also conducted and resulted in more efficient protocol for daylily plant formation in vitro. These activities were used for year-round laboratory hands-on research experience for 12 undergraduate students. Overall 14 students and faculties participated in the local Langston University and regional Oklahoma Research Day meetings, where they all presented experimental results. Six manuscripts were written and submitted to peer-reviewed journals.

Results
During 2010, twelve Langston University students were provided training which allowed them to develop new skills in biotechnology and scientific inquiry. One out of two daylily varieties tested responded positively to quality improvement treatments. This has increased the hopes of Oklahoma daylily farmers for solutions to insect and drought problems. Successful cell biology study of peanut hair developmental morphogenesis will provide an added research value for potential new direction and funding opportunities for genetic studies in this crop. This success has already generated foundational information for expanding related genomic research scope for our biotechnology program. The successful spotting of peanut gen clones has laid the ground work for successful transitioning of related genomic research into its final phase.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

Outcome #2

1. Outcome Measures

Number of farmers using the peanut nucleotide database.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	10	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need for developing improved peanut and daylily genotypes that are higher yielding and more diseased and insect resistant. Improved nutritional varieties would include higher protein levels but alleviation of plant DNA that causes allergens. The pace for developing these improve genotypes will be accelerated through the use of modern techniques such as those used in the Biotechnology Program at Langston University.

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4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

<u>Outcome #3</u>

1. Outcome Measures

Farmers who use the peanut nucleotide database or new peanut gene discoveries to improve their peanut production system.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	3	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Competing Public priorities

Brief Explanation

- Time series (multiple points before and after program)

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

1. Evaluation Studies Planned

- Time series (multiple points before and after program)

Evaluation Results

Annual progress with mapping pathways and develoing DNA libraries for improving test species.

Key Items of Evaluation

Developing DNA libraries.