V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Animal Systems

☑ 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
301	Reproductive Performance of Animals	15%	0%	18%	
302	Nutrient Utilization in Animals	0%	0%	6%	
303	Genetic Improvement of Animals	10%	0%	0%	
304	Animal Genome	0%	0%	5%	
305	Animal Physiological Processes	0%	0%	6%	
306	Environmental Stress in Animals	0%	0%	7%	
307	Animal Management Systems	60%	100%	15%	
311	Animal Diseases	15%	0%	28%	
312	External Parasites and Pests of Animals	0%	0%	5%	
315	Animal Welfare/Well-Being and Protection	0%	0%	2%	
402	Engineering Systems and Equipment	0%	0%	4%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%	0%	4%	
	Total	100%	100%	100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	32.0	4.0	0.0	0.0
Actual Paid Professional	44.0	6.1	24.2	0.0
Actual Volunteer	13.0	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**
784164	253352	504360	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
3593721	253352	2274167	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
200000	0	1266299	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The Master Beef Producer Program was led by a team of University of Tennessee Extension specialists and agents, with the support and involvement of representatives of state agencies, businesses and organizations with an interest in the state's cattle industry. The Master Beef Producer Program:

1. Included a series of 12 educational sessions that focus on cow-calf production and issues facing the beef industry. These were conducted at various off-campus locations accessible to Tennessee beef producers. These sessions included hands-on demonstrations, mini-lectures, discussions, question and answer sessions, etc.

2. Enhanced the profitability and competitiveness of cow-calf operations by providing essential, technical information.

3. Provided participants with a beef production reference manual for their operations.

4. Allowed producers to interact with trained facilitators and encourage sharing of ideas with other producers.

UT AgResearch conducts applied and basic research in animal health, nutrition, physiology, and genomics to address high priority problems of the livestock industries. We disseminate information gained from these studies to producers, veterinarians, and others associated with the animal industries through outreach programs and publications.

Surveillance of possible disease vectors is maintained by UT AgResearch throughout the insect season; suspected vectors are tested for appropriate viruses. Risk factor analysis test results are compared between sites where disease risk is high vs. those where disease risk is low. Mastitis susceptible and resistant dairy cows are used to identify potential genes, immune components, and other factors associated with and responsible for mastitis resistance. A series of trials uses pigs to test various feeding regimens and feed additives to determine effects on the number of antibiotic resistant foodborne pathogens occurring in those animals and their environment. Additional studies are detecting the prevalence of antibiotic resistant bacteria associated with cattle and surrounding environments. These studies should help determine strategies to limit such foodborne risks.

Goats are an environmentally adaptive specie of livestock, extremely opportunistic and afford the

small limited resource landowner(s) an alternative enterprise. The goat provides food security, high quality protein (for human nutrition), biological land enhancement and many 'value-added' products to increase revenue generated on a holistically sustainable rural farm. With the decrease in planted tobacco acreage and income from this traditional crop, the production of goats becomes a natural alternative. Tennessee continues to rank second in meat goats in the U.S. The total number of meat goats in Tennessee on January 1, 2009 was 133,000 head, up 9,000 head from 2008. Milk goats totaled 5,800 head, unchanged from the previous year (TN Farm Facts, February 4, 2009). Meat goat numbers have been significantly increasing within the United States since the early 1990's but goat meat consumption has surpassed available supply, based on ethnic group statistics. The importation of goat meat (30 pound carcass equivalent) surpassed export in 1994. There is no longer an export value for goat meat; the import value has tripled.

The Tennessee Browsing Academy was established in May 2007 as an extensive four day hands-on training for producers, educators / government agency personnel interested in the biological and environmentally sound practices of vegetative management with small ruminants (specifically goats). This class is taught through lecture and applied practices as the participants learn new techniques.

The most outstanding example of successful outcomes encompassing the work of extension specialists, county extension agents, and clients is the Master Meat Goat Producer Program. The Small Ruminant College has become an annual two-day event covering a different major production theme each year. Along with the two days of both inside lectures and outside hands-on demonstrations, the attendees receive proceedings to complement the topics covered. Work will continue in working with small ruminant farmers as well as with professionals through Heifer International. Presentations and demonstrations in the state are designed for extension agents, government agencies, meat goat organizations, farmer forum initiatives, and 4-H groups.

2. Brief description of the target audience

Producers, veterinarians, and others associated with the animal industry. Tennessee cattle producers are primarily cow-calf operators. All of the state's cow-calf operators were the target audience for this planned program.

3. How was eXtension used?

This Animal Systems Planned Program was enhanced through the service of:

- 13 Tennessee Extension personnel on the "Beef Cattle" CoP;
- two Tennessee Extension personnel on the "Goat Industry" CoP; and
- two tennessee Extension personnel on the "HorseQuest" CoP.

Tennessee Extension professionals shared program implentation strategies, outcome measurement, and evaluation protocols with their CoP colleagues.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	373952	2094893	67039	0

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

Patent Applications Submitted

Year: 2013

Actual: 2

Patents listed

1. Bile salt hydrolase inhibitors as animal growth promoters (Lin)
2. on-site diagnostic technology (Eda)

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	4	34	38

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of exhibits displayed to promote awareness of and participation in this planned program.

Year	Actual
2013	113

Output #2

Output Measure

- Number of research-based publications distributed as part of this program.

Year	Actual
2013	452618

Output #3

Output Measure

- Identified and characterized novel sperm biomarkers for reproductive efficiency in cattle. (Rispoli)

Year	Actual
2013	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Extension Economic Impact: The total economic impact of Extension animal systems programs. (The target is expressed in millions of dollars.)
2	Beef Production and Marketing: Number of beef producers who utilized improved sires, artificial insemination or other genetic improvement methods.
3	Educational assistance was provided to beef producers resulting in increased Tennessee Department of Agriculture cost-share assistance for improved facilities, equipment and genetics.
4	Beef Production and Marketing: Number of beef producers who improved marketing methods.
5	Beef Production and Marketing: Number of producers who improved forages for livestock by broadleaf weed control, planting clover, stockpiling fescue or planting warm-season grasses.
6	Beef Production and Marketing: The number of calves managed according to Beef Quality Assurance (BQA) guidelines.
7	Goat Production: Number of goat producers who have implemented practices related to genetic improvement, nutrition, health, reproduction and other information as a result of the Master Goat Program.
8	Dairy: Promoting Sustainability of Tennessee Dairy Farms
9	Understand Attachment Processes in Ruminant Pregnancy (Godkin)
10	Treat Campylobacter Infection in Poultry (Zeng)
11	Exploit Pathways for Leanness in Poultry/Humans (Voy)
12	Assaying CBG to Monitor Cattle Stress (Kattesh)
13	Will Producers Prescribe Grazing for GHG Reduction? (Clark, Jensen, Lambert, Yu)
14	Prostaglandin Production in Cattle (Godkin)
15	Can Voluntary Afforestation to Reduce Cattle GHG Emissions? (Clark, Jensen, Lambert, Yu)
16	Willingness-to-Pay for Carbon-friendly Beef Practices? (Clark, Jensen, Lambert)

Outcome #1

1. Outcome Measures

Extension Economic Impact: The total economic impact of Extension animal systems programs. (The target is expressed in millions of dollars.)

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	40

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Challenges facing the animal industry in Tennessee range from the adoption of very basic management practices to complicated global market drivers that affect input costs. Nutritional, reproductive, genetic and health management are the general areas that most impact profitability.

What has been done
Extension agents and specialists reached more than 440,000 contacts with youth and adults in horse, beef, and dairy programs. Selected programs included Master Beef Producer, Master Goat Producer, group meetings, field days, and one-on-one consultation.

Results
UT Extension educated farmers on the benefits of warm-season grasses, clover, and stockpiling tall fescue. Extension also demonstrated hay storage, feeding methods to reduce waste and spoilage, and broadleaf weed control. Tennessee farmers saved more than $19 million from better forage production, including following fertilizer recommendations, storage, and feeding practices.

Experts estimate farmers earned an average of $8 per head more by managing cattle according to Extension?s beef quality assurance program and $25 per head by selecting bulls based on genetic potential. As a result of these programs, farmers realized $3.4 million in additional sales revenue. UT Extension assisted farmers with preparing and implementing financial plans for their farms, increasing cash income by a combined $1.8 million this year.

Extension agents and specialists formulated 1,480 custom rations based on forage sample test results by the UT Soil, Plant and Pest Center. Past research has shown that each ration results in a mean savings of $1,125 in reduced annual feed costs. Tennesseans realized $1.6 million in

reduced feed costs for cattle, sheep, goats, and horses. Tennessee horse owners depend on UT Extension's research-based programs for horse health and nutrition. UT Extension taught rotational grazing to increase forage production, vaccinations, dental care, and correct deworming practices. These practices helped 342 horse owners, owning more than 1,000 horses, to save a combined $1.2 million.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #2

1. Outcome Measures

Beef Production and Marketing: Number of beef producers who utilized improved sires, artificial insemination or other genetic improvement methods.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3046

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals

Outcome #3

1. Outcome Measures

Educational assistance was provided to beef producers resulting in increased Tennessee Department of Agriculture cost-share assistance for improved facilities, equipment and genetics.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Beef Production and Marketing: Number of beef producers who improved marketing methods.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	5792

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #5

1. Outcome Measures

Beef Production and Marketing: Number of producers who improved forages for livestock by broadleaf weed control, planting clover, stockpiling fescue or planting warm-season grasses.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	4289

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems

Outcome #6

1. Outcome Measures

Beef Production and Marketing: The number of calves managed according to Beef Quality Assurance (BQA) guidelines.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	132879

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #7

1. Outcome Measures

Goat Production: Number of goat producers who have implemented practices related to genetic improvement, nutrition, health, reproduction and other information as a result of the Master Goat Program.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	421

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases

Outcome #8

1. Outcome Measures

Dairy: Promoting Sustainability of Tennessee Dairy Farms

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Tennessee?s dairy producers are an aging demographic, which demonstrates the need to promote dairy farming as an attractive career to the next generation and ensure that required support programs are in place. Milk quality, reproductive management, and cow comfort are key general areas that are likely to have a positive impact on the long-term profitability and sustainability of Tennessee dairy farms.

What has been done

Extension dairy programs were conducted in 19 counties in 2013 reaching more than 14,000 contacts in group meetings, demonstrations, and farm visits. More than 4,000 Tennessee youth increased knowledge of dairy management, judging, and showing dairy cattle.

Results
?10 producers gained knowledge about certified organic dairy production, other niche marketing opportunities and the Tennessee Agricultural Enhancement program.
?23 producers gained knowledge about the benefits of pasture and grazing for dairy cattle.
?57 producers have gained knowledge about the need for production and sound financial records to manage their operations.
?32 producers have improved herds due to more AI and the use of better bulls and/or more structured crossbreeding in their herds.
?342 producers have received cost share from the Tennessee Agricultural Enhancement program including the livestock improvement program.
?339 producers that have increased profits due to better utilization of forages or grazing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
307	Animal Management Systems

Outcome #9

1. Outcome Measures

Understand Attachment Processes in Ruminant Pregnancy (Godkin)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done
GATA-1 may play a role in regulation of genes important to trophoblast attachment to the uterine endometrium. A co-culture system of endometrial epithelial cells and trophoblast cells was

developed that mimics several molecular and cellular events in vivo attachment processes in bovine conceptus-endometrium attachment (implantation) during pregnancy and should serve as a valuable tool in the investigation of attachment processes in ruminants.

Results
The transcription factor GATA-1 was shown to be expressed in trophoblast and endometrium between days 15 and 21 of pregnancy by a series of in situ hybridization, immunoblot and immunohistochemical methods.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
307	Animal Management Systems

Outcome #10

1. Outcome Measures

Treat Campylobacter Infection in Poultry (Zeng)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The studies help understand the pathogenesis mechanism and antibiotics resistance of Campylobacter, which leads to the development of on-farm control and therapeutical application in human.

What has been done
Characterized the iron-acquisition system and beta-lactam resistances in Campylobacter, and moved forward the evaluation of different vaccination strategies in chick model. Research on iron-acquisition system leads to the identification of the potential vaccination antigen.

Results
Research on beta-lactam resistance in Campylobacter changed our thinking on antibiotic growth

promoter in chicken industry and facilitated the development of novel therapy against Campylobacter infection.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #11

1. Outcome Measures

Exploit Pathways for Leanness in Poultry/Humans (Voy)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done
We have identified novel pathways associated with leanness and fat loss in the domestic chicken. These pathways have the potential to be manipulated favorably by diet and genetic selection in a manner that would reduce fat deposition. They may be equally relevant for human obesity due to similarities between humans and avians with respect to lipid metabolism in adipose tissue.

Results
We have begun to establish that some of the same pathways associated with leanness in chickens can also be manipulated in human adipose tissue, which has important implications for human obesity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

303	Genetic Improvement of Animals
304	Animal Genome
305	Animal Physiological Processes

Outcome #12

1. Outcome Measures

Assaying CBG to Monitor Cattle Stress (Kattesh)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The bioavailability of endogenous cortisol is predominantly influenced by CBG, and in situations where CBG levels are altered, total cortisol levels may not adequately represent the free cortisol fraction.

What has been done

Results
The bCBG ELISA we have developed provides a more efficient and precise means for assaying CBG to gain further understanding of the physiological role that it plays in cattle in response to various environmental and management-related stressors.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

Outcome #13

1. Outcome Measures

Will Producers Prescribe Grazing for GHG Reduction? (Clark, Jensen, Lambert, Yu)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
GreenHouse Gas (GHG) emissions are associated with cattle production.

What has been done
Preliminary results suggest that about 32.0% of the producers responding to the survey would not adopt prescribed grazing even it if were profitable to do so. Another 13.3% would adopt it even it unprofitable, and 54.9% would adopt it only if profitable to do so. Among those who were interested in adopting prescribed grazing, at a $10/acre per year incentive level, about 63.0 % of producers would convert land to prescribed grazing. However, as the incentive level increased, a higher percentage would convert land. At $90/acre per year, about 76.2 % would convert land. Among those who would convert land, the average number of acres that would be converted was 264.3 acres, while the median was 100 acres.

Results
This information is useful for the design and implementation of voluntary programs to reduce GHG emissions associated with cattle production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

Outcome #14

1. Outcome Measures

Prostaglandin Production in Cattle (Godkin)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done
Bovine uterine endometrial epithelium cell culture system was used to investigate biochemical pathways of prostaglandin production. Through a series of studies using specific inhibitors, gene expression knock-down studies, cyclooxygenase and PG assays, it was determined that phospholipase A2 Group 4A is responsible for production of arachidonic acid used for PG biosynthesis. Then, a series of studies were performed to evaluate the phospholipase D (PLD) signal transduction pathway of oxytocin-stimulated PG production.

Results
Inhibition of PA production was shown to severely diminish PG production. Blockage of PAP-1 was shown to inhibit PGF2-alpha production but enhance PGE2 production. PA was shown to stimulate PGE2 production. DAG was shown to stimulate PGF2-alpha production. For the first time, the PLD signaling system was shown to be a major regulator of uterine PG production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

Outcome #15

1. Outcome Measures

Can Voluntary Afforestation to Reduce Cattle GHG Emissions? (Clark, Jensen, Lambert, Yu)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done
Preliminary results suggest that about 71.2% of the producers responding to the survey would not adopt afforestation even it if were profitable to do so. Another 4.1% would adopt it even it unprofitable, and 24.7% would adopt it only if profitable to do so. Among those who were interested in adopting afforestation, at a $70/acre per year incentive level, about 39.1% of producers would convert land to afforestation. However, as the incentive level increased, a higher percentage would convert land. At $180/acre per year, about 55.2 % would convert land. Among those who would convert land, the average number of acres that would be converted was 77.12 acres.

Results
This information is useful for the design and implementation of voluntary programs to reduce GHG emissions associated with cattle production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
307	Animal Management Systems

Outcome #16

1. Outcome Measures

Willingness-to-Pay for Carbon-friendly Beef Practices? (Clark, Jensen, Lambert)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done
Results of a study showed an estimated mean WTP of $194 per household per year. Respondents who are married, female, more educated, have higher incomes, live in urban area, not from the Northeastern states, concerned about climate change and food quality, do not demand cheaper food prices, support government regulations on food production, prefer local and organic foods, and have made donations to environmental purposes, are more likely to support and pay for the program.

Results
This information is useful to understanding consumer WTP for carbon-friendly beef practices and for the design of voluntary labeling programs or public policy designed to reduce GHG emissions associated with beef production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

The financial impact of UT Extension beef programing fluctuates form year-to-year depending on several factors including commodity prices, input costs and land value. However, these programs continue to enhance the lives and livelihood of Tennessee beef cattle producers.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Extension educational programs have been shown to produce substantial economic returns to the state of Tennessee. Our evaluation studies used research, questionnaires, observations, and sales records to record estimated economic impact.

Better Beef Marketing and Farm Financial Planning

Experts estimate farmers earned an average of $8 per head more by managing cattle according to Extension's beef quality assurance program and $25 per head by selecting bulls based on genetic potential. As a result of these programs, farmers realized $3.4 million in additional sales revenue. UT Extension assisted farmers with preparing and implementing financial plans for their farms, increasing cash income by a combined $1.8 million this year.

Optimizing Animal Production

Extension agents and specialists formulated 1,480 custom rations based on forage sample test results by the UT Soil, Plant and Pest Center. Past research has shown that each ration results in a mean savings of $1,125 in reduced annual feed costs. Tennesseans realized $1.6 million in reduced feed costs for cattle, sheep, goats, and horses. Tennessee horse owners depend on UT Extension's research-based programs for horse health and nutrition. UT Extension taught rotational grazing to increase forage production, vaccinations, dental care, and correct deworming practices. These practices helped 342 horse owners, owning more than 1,000 horses, to save a combined $1.2 million.

Key Items of Evaluation

Optimizing Animal Production

Extension agents and specialists formulated 1,480 custom rations based on forage sample test results by the UT Soil, Plant and Pest Center. Past research has shown that each

ration results in a mean savings of $1,125 in reduced annual feed costs. Tennesseans realized $1.6 million in reduced feed costs for cattle, sheep, goats, and horses. Tennessee horse owners depend on UT Extension's research-based programs for horse health and nutrition. UT Extension taught rotational grazing to increase forage production, vaccinations, dental care, and correct deworming practices. These practices helped 342 horse owners, owning more than 1,000 horses, to save a combined $1.2 million.