

**V(A). Planned Program (Summary)**

**Program # 2**

**1. Name of the Planned Program**

Program in Animal Science

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation			5%	
301	Reproductive Performance of Animals			25%	
302	Nutrient Utilization in Animals			15%	
303	Genetic Improvement of Animals			5%	
304	Animal Genome			10%	
305	Animal Physiological Processes			10%	
307	Animal Management Systems			5%	
308	Improved Animal Products (Before Harvest)			10%	
311	Animal Diseases			5%	
701	Nutrient Composition of Food			5%	
722	Zoonotic Diseases and Parasites Affecting Humans			5%	
	<b>Total</b>			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	5.0	0.0	14.0	0.0
Actual	0.0	0.0	20.2	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	166685	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	135081	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	2337401	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

We have: (1) evaluated nutritional, physiological, and genetic mechanisms for differences in the use of dietary energy for growth, lactation, and animal maintenance, (2) evaluated sources of feedstuffs, and methods of processing for enhanced rumen function, and productivity in animals, (3) searched for candidate genes and DNA markers for improved quality and yield of meat in beef cattle, (4) searched for candidate genes and DNA markers for enhanced reproduction and nutrient utilization in dairy and beef cattle and for susceptibility or tolerance to animal disease, (5) developed new approaches and investigated the molecular and biological regulation of germ and somatic cells in mammalian spermatogenesis, (6) defined the underlying mechanisms responsible for the hormonal regulation of somatic tissue growth and development in rainbow trout and other species. (7) developed mathematical models to better understand and evaluate factors related to metabolism in the lactating dairy cow, (8) obtained gaseous and particulate emissions data from cattle feedlots and provide credible scientific information for making air quality policy.

**2. Brief description of the target audience**

In general, the target audience for the program includes consumers of food products produced by the livestock industry. However, the pathway of information from our research program includes commercial and seed stock producers in the dairy, beef, swine and sheep industries. It also includes companies that produce feeds, pharmaceuticals, and consulting to these industries.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	2500	5000	1300	2500
<b>Actual</b>	2500	5000	1300	2500

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

**Patent Applications Submitted**

Year: 2010

Plan: 1

Actual: 4

**Patents listed**

- Patent US 7,662,564 B2
- Patent US 7,666,599 B2
- Patent US 7,790,383 B2
- Patent US 7,662,567 B2

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2010	Extension	Research	Total
Plan	4	25	
Actual	6	33	39

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Peer reviewed journal articles

Year	Target	Actual
2010	25	33

**Output #2**

**Output Measure**

- Graduate Students supported by Agricultural Research Center and other grant funds

Year	Target	Actual
2010	7	7

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Enhanced understanding of nutrient utilization and mechanisms of nutrient use by animals.
2	Enhanced food quality, food safety, consumer acceptance of foods from animal sources and issues of animal and human health.
3	Identification of strategies to decrease the environmental footprint from livestock systems.
4	Enhanced reproductive efficiency of livestock.
5	Enhanced understanding of mechanisms associated with growth and differentiation of muscle cells and adipocytes.

## **Outcome #1**

### **1. Outcome Measures**

Enhanced understanding of nutrient utilization and mechanisms of nutrient use by animals.

### **2. Associated Institution Types**

- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	3	5

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Identifying ways to increase the efficiency of nutrient utilization will enhance the sustainability of livestock operations from financial and environmental perspectives. Thus, projects contributing new information to understanding genetic links associated with nutrient use in animals are valued by the animal production and allied industries. Work in this area is also currently supported by external competitive grants.

#### **What has been done**

Projects are implementing techniques to study metabolic activity and regulation at the subcellular level. As an example, gene expression techniques are being used to study lipolysis and lipogenesis in lactating cows and mitochondrial energy expenditures in beef cattle at various stages of production.

#### **Results**

Refereed journal articles, presentations at international conferences, graduate student training and USDA / CAP grant proposals.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
701	Nutrient Composition of Food

## **Outcome #2**

### **1. Outcome Measures**

Enhanced food quality, food safety, consumer acceptance of foods from animal sources and issues of animal and human health.

### **2. Associated Institution Types**

- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	11	21

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Projects are of immediate importance to consumers and producers as they impact food safety, food quality, animal behavior, and well being, and animal and human health issues. Results are used and valued by commercial beef industry, by leaders in livestock production using genomic technologies for breeding and selection decisions, and by consumers making informed decisions about the quality and safety of the meat they consume. External support for this work further identifies its relevance to industry.

#### **What has been done**

Methodology to quantify fatty acids associated with meat quality has been developed and is currently evaluated for commercial applications. Identification of genetic markers that are associated with meat quality traits and animal health are being investigated. Factors impacting animal responses to production and management techniques are evaluated.

#### **Results**

17 Refereed publications, 4 patent applications, graduate student training, CAP grant proposals submitted, hosted regional research committee meetings (NC 1029), presentations at national and international conferences.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
303	Genetic Improvement of Animals
304	Animal Genome
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)

311 Animal Diseases

**Outcome #3**

**1. Outcome Measures**

Identification of strategies to decrease the environmental footprint from livestock systems.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2010	3	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The ability to quantify and monitor inputs and outputs of livestock systems is essential for sustainable production. The impact of livestock systems on water and air quality are being addressed in several projects having direct impact on the production systems as well as social impact to the community. Projects are also supported with competitive external federal funds. An NSF-IGERT grant focusing on nitrogen has resulted in multidisciplinary expansion of efforts and graduate student training.

**What has been done**

Novel techniques to measure emissions from livestock units have been developed and results are being used in establishing federal and international regulatory guidelines. Precision feeding strategies have been designed to meet animal nutrient requirements while minimizing excretion of minerals. Education tools available to mass audiences nationally are being developed to aid producers in whole farm nutrient balance practices.

**Results**

Refereed publications, input to state and national policies, integrated extension and research efforts, graduate training.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals

307 Animal Management Systems

**Outcome #4**

**1. Outcome Measures**

Enhanced reproductive efficiency of livestock.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2010	2	5

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Reproductive performance and efficiency has many impacts on sustainable livestock production. Projects are designed to identify stimulating factors and mechanisms associated with both male and female germ cell differentiation. Impacts of this work may influence the breeding practices and reproductive performance in livestock operations and also have applications to human health. This work is also funded by external grants and industry support.

**What has been done**

Bovine testis xenografts have been successfully used to identify factors stimulating germ cell differentiation. In vitro culture requirements for porcine and bovine uterine and testicular fibroblasts were identified and will provide necessary information for future work. A new faculty member studying early pregnancy recognition and implantation has received external grant support and peer reviewed publications adding new strength to this area.

**Results**

Refereed publications, graduate training, invited presentations,

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals
304	Animal Genome

## **Outcome #5**

### **1. Outcome Measures**

Enhanced understanding of mechanisms associated with growth and differentiation of muscle cells and adipocytes.

### **2. Associated Institution Types**

- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	4	13

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Endocrine control and cellular mechanisms regulating growth of muscle and adipose cells provide important new information relevant to animals and humans. One project is designed to study the role of myostatin in regulating muscle growth in rainbow trout. Another project studies the regulation and differentiation of adipocytes in the study of fat accretion in domestic species. Projects in this area have potential to make important contributions to human growth and development as well. Work in this project area is also supported with external competitive grants and industry support.

#### **What has been done**

Mechanisms of action and regulation have been identified leading to more complete understanding of muscle growth and development and adipogenesis.

#### **Results**

13 peer reviewed publications, graduate training

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
305	Animal Physiological Processes

## **V(H). Planned Program (External Factors)**

### **External factors which affected outcomes**

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

### **Brief Explanation**

Budget issues, especially those that relate to reduced state support for WSU, created significant uncertainties. Ultimately, these relate to competing public priorities and the place that the research mission of Animal Sciences has in the state and university. We appear to be integrating two recent hires and have been authorized to move forward in filling an endowed chair, which was partly the result of external gifts.

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

### **1. Evaluation Studies Planned**

- During (during program)
- Other (See below)

## **Evaluation Results**

### **Key Items of Evaluation**

In October, 2008, the department was reviewed by an external CSREES team. Two of the departments goals addressed by the external review included solidifying our position as a department recognized as an important contributor in selected areas to the national and international research agenda and teaching arena.

The review team agreed that a key component in the department's future success is to continue to work towards the target of 25 faculty members in the department. Discussion of establishing or maintaining faculty critical mass and areas of emphasis was addressed throughout the CSREES review and continues to be a priority for the department. We currently have 18 tenure track faculty but a long term hiring plan is in place. In 2009, 2 faculty (Pru, Capper) joined the department. The Baxter Endowed Chair for Beef Research will be in place in May, 2011 and another funded chair position in Animal Sciences in the muscle biology area will be filled in Aug, 2011.

Review committee recommendations suggested that a long term plan and strategy to modernize our facilities needed to be articulated and defined with sufficient detail to

convey our needs to college and university administrations, engaged stakeholders and other interested parties. Dairy farm renovation planning has stalled in the last year due to unexpectedly high estimates and budget constraints at all levels. Some research laboratory facilities will be upgraded by 2012-13 when Animal Sciences will occupy a portion of a new, state of the art, research-intensive, laboratory-based facility to house selected research programs with biomedical application potential.

We believe that the external review provided valuable input and helped us focus our needs and priorities to position the department for a successful future. We will continue working to implement additional recommendations as the situation and resources allow.