

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Animal Systems-OARDC Led

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	0%		15%	
302	Nutrient Utilization in Animals	0%		15%	
303	Genetic Improvement of Animals	0%		10%	
304	Animal Genome	0%		5%	
305	Animal Physiological Processes	0%		15%	
306	Environmental Stress in Animals	0%		5%	
307	Animal Management Systems	0%		10%	
308	Improved Animal Products (Before Harvest)	0%		15%	
311	Animal Diseases	0%		10%	
	Total	0%		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	0.0	14.8	0.0
Actual	0.0	0.0	20.5	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	1182341	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	3507233	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Animal systems research activities in 2010 resulted in a wide variety of publications using all the various media from print to social to communicate its research findings to (a) specific stakeholder groups, (b) support publics such as fellow agencies, political entities, (c) targeted populations, and (d) the broader general public, including mass media releases. Publications also included peer-reviewed journal articles and trade journal articles. Commercialized techniques as well as non-commercialized techniques were part of the program activity this year as were consultation services and meetings with stakeholders and supporters. Researchers in this program worked with OSU Extension to facilitate training programs/workshops for other scientist and for specific groups of stakeholders, including international visitors. They also held planning meetings with advisory groups and business and industry partners to communicate findings and plan new research.

2. Brief description of the target audience

Targeted audiences included individuals or groups who have expressed a need for food animal systems information that was derived through new research, extracted from on-going research, or was derived from scientific literature. Often those requests are communicated to OARDC by an intermediary such as a staffer at a USDA office, NRCS, Ohio Department of Agriculture, or a county extension agent. Fellow agencies or support organizations who will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change, partnered with the animal scientists. Also targeted were populations who did requested science - based information but will likely benefit from that information, e.g. small or recreational farmers. Other scientists and scientific groups at OSU and elsewhere as well as political entities, extension personnel, students for pre-school to post doctorate studies, news organizations and business groups such as Farm Bureau or commodity groups represented targets in 2010.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	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	70	
Actual	0	100	100

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- peer-reviewed publications will be tracked

Year	Target	Actual
2010	70	0

Output #2

Output Measure

- patents by number and who partnered/purchased/commercialized;

Year	Target	Actual
2010	0	0

Output #3

Output Measure

- Number of graduate students completed.

Year	Target	Actual
2010	23	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Improve reproduction efficiency and enhanced application of new technologies over the next five years to fully meet the competitive demands faced by OARDC's stakeholders in areas such as early maturation, estrus, fertility, and ovulation
2	Provide research finding within ten years that are needed to reverse the fertility decline in animal populations such as dairy
3	Increase nutrition utilization for the purpose of increased growth and quality of products commensurate with consumer demand
4	Improve nutritional utilization, performance, and efficiency to the point that savings will off-set increases in costs of animal feed stocks
5	Show incremental gains annually in dietary research to increase utilization of food stocks (e.g. via better understanding of protozoal ecology), increase bioavailability of nutrients including trace minerals, and protect animal and human health
6	Meet the demand of fellow scientists and stakeholders within ten years for materials relating to genetics and breeding, including id of molecular markers for improved animal health and reproductively, and increased quality and quantity of products
7	Provide at minimum one new contribution annually to the body of literature that will positively food animal genetics, e.g. molecular techniques and materials to aid in identifying genetic codes of bacteria in that breaks down cellulose
8	Improve management for multiple animal farm types, including organics, that will produce higher yields for and lower costs to the producer and consumer and will allow the farmer to profit within a reasonable business plan
9	Annually advance modeling, decision-making, & alternative strategies to provide greater flow of needed information to food animal farmers to ensure business stability, including forage based cattle and niche market demands
10	Advance preharvest research over five years to the extent that new technologies are being adopted and showing profitability in area such as improved muscle growth, quality of meat, tenderness, lower fat in dairy products, etc.
11	Animal disease researchers will continue to serve on first responder teams when stakeholders have an immediate disease problem
12	Animal disease researchers will provide the necessary research to inform producers in a timely manner how to protect against known and present diseases, e.g. bovine mastitis
13	Animal disease researchers will advance the research frontiers in emerging disease investigations to the extent that OARDC continues to serve as a center for excellence

Outcome #1

1. Outcome Measures

Improve reproduction efficiency and enhanced application of new technologies over the next five years to fully meet the competitive demands faced by OARDC's stakeholders in areas such as early maturation, estrus, fertility, and ovulation

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Provide research finding within ten years that are needed to reverse the fertility decline in animal populations such as dairy

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

REPRODUCTIVE PERFORMANCE IN DOMESTIC RUMINANTS - Enhanced reproductive performance is critical if the food animal industry is to remain profitable and meet increasing demand for beef that is priced within consumer reach.

What has been done

Recent experiments have, with the more effective estrous synchronization program developed at OARDC, improved the convenience of this program for producers and will further accelerate its adoption by beef producers. Furthermore, this research has continued to stimulate work by scientists at other universities with the aim of adapting this program for use in dairy heifers, lactating dairy cows, and beef heifers. This program is listed as a recommended program by the AI industry.

Results

The new technology developed for reproductive cycle control resulted in an approximately 12.5% increase in fertility in postpartum beef cows and heifers, i.e. 12.5% of cows would become pregnant 21 days earlier than with the traditional approach. If this approach was implemented

with 10% of the 500,000 beef and dairy cows in Ohio on an annual basis, the reduction in days open would be 131,250 days (500,000 cows x 10% adoption x 12.5% increase in pregnancy rate x 21 days). Each day that a beef or dairy cow remains non-pregnant incurs a loss of greater than \$3/cow. A second impact of adoption of this technology would be the reduction in replacement costs. An annual reduction in replacement rate of 1% for 500,000 cows would require 5000 fewer replacements in Ohio at a conservative replacement cost of \$1000 per replacement, or \$5,000,000.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Increase nutrition utilization for the purpose of increased growth and quality of products commensurate with consumer demand

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Improve nutritional utilization, performance, and efficiency to the point that savings will off-set increases in costs of animal feed stocks

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	0	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

REDUCING THE ENVIRONMENTAL IMPACT AND INCREASING PROFITABILITY OF DAIRY FARMING - Rumen protozoa in dairy herds promote emission of ammonia and methane,

reflecting inefficient use of dietary protein and energy. Because those nutrients represent 80% to 90% of feed costs, an improved ration evaluation system will reduce environmental impact while improving feed efficiency and dairy farm profitability. Inefficiencies result in 71% of national ammonia emissions, which can promote eutrophication of surface waters and acidification of soils. Ammonia accumulation can be detrimental to both farm workers and animals. Also, methane is 25 times more potent than carbon dioxide in enhancing global climate change.

What has been done

OARDC scientists have documented conditions that improve protozoal growth rate and outflow from rumens in dairy herds. Thus, the most desirable way to reduce ammonia and methane emissions is to improve efficiency of microbial fermentation to trap N into bacteria and protozoa that flow to the small intestine. This USDA regional project offers a software based equations in ration formulation. Ultimately, improving these models will increase willingness of dairy farmers to adapt dietary recommendations that improve feed efficiency to decrease ammonia and methane emissions per unit of milk produced because of reduced risk for increased feed costs and for decreased profitability resulting from dietary changes.

Results

Proper prediction of microbial protein synthesis will allow dairy farmers to reduce dietary protein by 0.5 units. At current prices of corn and soybean meal, this saves nearly \$15/cow per year, or \$135 million per year for the national dairy herd. Second, improving digestibility of forage fiber by 5% (the typical depression observed when researchers use dietary means to suppress protozoa) also saves nearly \$15/cow per year. Finally, if inhibition of protozoa increases risk of milk fat depression, maintenance of milk fat production adds another \$15 to \$58/cow per year. If the combined effects of optimizing dietary conditions to only partially suppress rumen protozoa while maintaining benefits, improved income over feed costs of \$55/cow per year enhances profitability in Ohio herds by \$15.4 million, and is amplified 5 to 7 fold through the various industries allied with dairy farming. Thus, the total economic benefit should exceed \$50 million per year for Ohio alone, all while reducing ammonia and methane emissions from dairy farms.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems

Outcome #5

1. Outcome Measures

Show incremental gains annually in dietary research to increase utilization of food stocks (e.g. via better understanding of protozoal ecology), increase bioavailability of nutrients including trace minerals, and protect animal and human health

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Meet the demand of fellow scientists and stakeholders within ten years for materials relating to genetics and breeding, including id of molecular markers for improved animal health and reproductively, and increased quality and quantity of products

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Provide at minimum one new contribution annually to the body of literature that will positively food animal genetics, e.g. molecular techniques and materials to aid in identifying genetic codes of bacteria in that breaks down cellulose

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Improve management for multiple animal farm types, including organics, that will produce higher yields for and lower costs to the producer and consumer and will allow the farmer to profit within a reasonable business plan

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Annually advance modeling, decision-making, & alternative strategies to provide greater flow of needed information to food animal farmers to ensure business stability, including forage based cattle and niche market demands

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Advance preharvest research over five years to the extent that new technologies are being adopted and showing profitability in area such as improved muscle growth, quality of meat, tenderness, lower fat in dairy products, etc.

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

Animal disease researchers will continue to serve on first responder teams when stakeholders have an immediate disease problem

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

Animal disease researchers will provide the necessary research to inform producers in a timely manner how to protect against known and present diseases, e.g. bovine mastitis

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

Animal disease researchers will advance the research frontiers in emerging disease investigations to the extent that OARDC continues to serve as a center for excellence

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

ADVANCES IN UNDERSTANDING INTERSPECIES TRANSMISSION OF INFLUENZA VIRUS - Identifying molecular determinants contributing to interspecies transmission of influenza viruses will help in improving surveillance strategies for early detection of variant strains that can cross species barriers.

What has been done

OARDC developed a new system to generate NS gene variants of influenza virus with potential use as live attenuated vaccines. The delNS1 variants are unique in that they differ in both the

length and nature of amino acid residues at the C-terminus of the NS1 they express. Furthermore, in collaboration with the University of Conn., the scientists found that understanding the nature of virus particle subpopulations in candidate vaccines can be used to predict the effectiveness of live attenuated influenza vaccine candidates, and also as a basis for enhancing the performance of vaccines.

Results

Protective efficacy of those vaccines has been demonstrated both in chickens and turkeys. Protection of poultry by effective control and prevention of influenza are critical in order to maintain wholesome poultry. Such efforts will also make a significant contribution toward national food security. In addition, the novel concept of modulating the nature of virus particle subpopulations in candidate vaccines should be broadly applicable to different species and for evaluating and enhancing the efficacy of vaccines in general.

4. Associated Knowledge Areas

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

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
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

For 2010 all planned programs in the CFAES were impacted by multiple factors. Perhaps the greatest factor has been the overall decline in base financial support over the past decade resulting in a significant reduction in research faculty and staff. While a portion of the research funds have been made up by increased extramural support, rehiring lost tenure-line research faculty members on those funds is not possible. Also as we commit more personnel time to meet research obligations associated with extramural contracts, less personnel time is available to address day to day science and consultation needs of our traditional stakeholders, as well as less time to address growing needs of new populations moving into the state and the underserved. Further reductions in base budgets, either in real dollars or in losses due to not keeping up with inflation, will reduce our capacity to compete for extramural support and further erode our capacity to respond to day-to-day stakeholder needs. The tornado that struck the Wooster Ohio campus in 2010 will have long lasting impacts even though remediation has been rapid and rebuilding was moving well at the end of 2010. Loss of facilities and even experiments, per se, disruption of the

research process, and demands to redirect funds for remediation and reconstruction beyond insurance payments, collectively, did and will continue affect our productivity.

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

1. Evaluation Studies Planned

Evaluation Results

Key Items of Evaluation