

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security - Animals and Their Systems, Production and Health

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%	10%	20%	30%
302	Nutrient Utilization in Animals	15%	10%	20%	20%
303	Genetic Improvement of Animals	15%	10%	17%	20%
307	Animal Management Systems	15%	15%	18%	0%
311	Animal Diseases	5%	5%	10%	20%
312	External Parasites and Pests of Animals	5%	3%	5%	0%
313	Internal Parasites in Animals	2%	20%	5%	0%
315	Animal Welfare/Well-Being and Protection	5%	7%	2%	7%
404	Instrumentation and Control Systems	5%	0%	0%	0%
511	New and Improved Non-Food Products and Processes	3%	0%	0%	0%
512	Quality Maintenance in Storing and Marketing Non-Food Products	5%	0%	0%	1%
601	Economics of Agricultural Production and Farm Management	4%	5%	1%	1%
602	Business Management, Finance, and Taxation	3%	5%	1%	1%
604	Marketing and Distribution Practices	3%	10%	1%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	60.0	6.0	105.0	8.0
Actual Paid	74.0	6.0	101.0	7.2
Actual Volunteer	60.0	0.0	40.0	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
1307740	176710	1772520	668251
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1307740	150811	1772520	231499
1862 All Other	1890 All Other	1862 All Other	1890 All Other
4761695	4913	12699000	29789

V(D). Planned Program (Activity)

1. Brief description of the Activity

This plan of work includes broad and extensive research and extension programs. NC Agricultural Research Service scientists will conduct research projects to study methods to improve the efficiency of animal production. Research will focus on methods to improve reproductive performance, nutrient utilization, and genetic influence on growth and reproduction. Scientists will also work to improve animal management systems, decrease the incidence of animal diseases and parasites (external and internal) and improve the management of animal and agricultural pests. Species and commodity groups included in this plan of work are also very broad and include poultry such as turkeys, broiler chickens, and table-egg chickens. The plan of work also includes swine, fish such as flounder, and cattle such as beef and dairy, and numerous pests such as house flies. Research will include many phases of commodity production such as meat and dairy goats, chicken breeders (both broiler and table egg birds), commercial broilers (commercial refers to those animals produced for meat), breeder turkeys, commercial turkeys, swine breeders, commercial swine, all phases of aquaculture and beef and dairy production. Disciplines that will be involved include nutrition, physiology, reproductive physiology, genetics, virology, bacteriology, microbiology, mycology, entomology, and many animal management systems such as grazing and forage management programs, hatchery management, feeding and drinking water systems, litter and bedding management, lighting programs, and breeder selection and management. A very important part of this plan of work is to transfer technology and knowledge to our stake-holders and clientele. Therefore, an extensive outreach effort through Cooperative Extension will be conducted by field and campus based faculty who are based on-site as well as being located across the state and based in local communities. Stakeholders and clientele will be directly engaged in many ways including workshops, conferences, discussion groups, one-on-one teaching, demonstrations, field days, short-courses, continuing education classes, and scientific meetings. Indirect methods to reach stake-holders and clientele will include long-distance education, newsletters, web sites, newspaper releases, television and radio programs, trade journals, scientific journals, and popular press articles. Participants and programs will be evaluated at least annually for success, progress, and effectiveness. Special educational programs focused on limited resource farmers will continue to be a priority for NCA&T focused Extension efforts in pasture based production systems, aquaculture and alternative breeds.

2. Brief description of the target audience

The target audience will be primarily aquaculture, poultry, livestock producers, small-scale limited resource, beginning and underserved growers and agribusiness personnel in North Carolina. However,

2014 1330

Output #2

Output Measure

- Relevant and impacts focused research projects to be conducted

Year	Actual
2014	100

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Additional income gained by animal producers improved planning, marketing, and financial practices
2	Net income increased by producers improving animal husbandry practices
3	Number of animal producers adopting improved animal husbandry practices
4	Number Livestock Producers Adopting and Applying Improved Planning and Financial Management Practices
5	Number of new technologies developed to prevent/treat animal diseases
6	New organic, farmers and agritourism markets established by individual entrepreneurs

Outcome #1

1. Outcome Measures

Additional income gained by animal producers improved planning, marketing, and financial practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	15500000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 2010, the Canadian government implemented regulations regarding importations of fish into Canada resulting in a sizeable economic burden to the many North Carolina hybrid striped bass producers that sell their fish to Canada.

What has been done

After years of negotiations between the United States and Canada, the United States Department of Agriculture (USDA) Animal and Plant Inspection Services (APHIS) developed a registration program that satisfied Canadian importation requirements. The North Carolina Cooperative Extension Service area aquaculture agent, responsible for aquaculture educational programs in the northeast part of North Carolina, as part of his educational program, developed a standard operation procedure (SOP) document for the HSB producers to utilize when registering their farms with USDA APHIS. This SOP document was used in the successful registration of the first fish farm to export to Canada and will serve as a template for other farms in North Carolina and the United States.

Results

As a result of this program, the fish producers in North Carolina and the United States will save approximately \$2,000 per export transaction going to Canada, amounting to savings of over \$100,000 for the North Carolina producers alone.

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
312	External Parasites and Pests of Animals
313	Internal Parasites in Animals
315	Animal Welfare/Well-Being and Protection

Outcome #2

1. Outcome Measures

Net income increased by producers improving animal husbandry practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Most of the 5.8 million sows in the U.S. are fed to a subjective body condition target. Yet, visual sow body condition scores typically have low associations with estimated body composition. Developing accurate, cost effective tools to replace visual body condition scoring will allow pig farmers to optimize feeding levels while maximizing sow well-being, subsequent reproductive performance and profitability.

What has been done

An NCSU scientist worked with an engineer to create a prototype caliper that quantifies the angularity of a sow's topline. The sow caliper design was completed based on data collected from commercial industry farms (Prestage Farms). A research project has been initiated with Goldsboro Milling and Prestage Farms to identify the optimal sow body condition in relation to subsequent reproductive performance. Sow calipers have been distributed to farmers in nine countries worldwide and 10 U.S. states. Within North Carolina, Ivey Spring Creek Farms, JC Howard, Murphy-Brown LLC, Prestage Farms, Purvis Farms, Spring Meadow Farms, TDM Farms, NCSU Swine Teaching and Research Farm, North Carolina A&T and the NCDA Tidewater Research Station are using the sow calipers to reduce feed cost and improve animal well-being.

Results

The economic and societal implications of the sow body condition caliper are great. Farms that are overfeeding all or a portion of their sows will realize lower feed costs through the implementation of this new technology. Herds that contain sows that are too thin will realize improvements in sow well-being and subsequent reproductive performance. As a result of using the sow body condition caliper, one N.C. farmer experienced tremendous improvement in gestation feed usage across an 18,000 sow system. Since implementing the sow caliper in 2013 this farmer has reduced his feed cost by nearly \$300,000 in both 2013 and 2014. Hence the development and implementation of the sow body condition caliper is significantly improving the profitability of pig farmers.

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
312	External Parasites and Pests of Animals
313	Internal Parasites in Animals
315	Animal Welfare/Well-Being and Protection

Outcome #3

1. Outcome Measures

Number of animal producers adopting improved animal husbandry practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	9437

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Dairy producers in North Carolina can improve their farm profitability through effective use of reproductive and health management data. Numerous decision support tools and protocols are available in the industry, but all rely on effective input and storage of reproductive and related health data. Prior to 2014, the available means of capturing these data included paper, desktop herd management systems, and more recently, mobile systems such as PocketDairy designed for small, cell-phone size devices. No comprehensive cow-side portable software application was available to farmers.

What has been done

Dairy Records Management Systems (DRMS) received feedback from numerous farmers that reproductive management would be enhanced by using a more extensive view of individual cow data. The existing phone-sized PocketDairy application brought the data handling cow-side, but farmers requested that DRMS combine the PocketDairy convenience with the comprehensive view provided by their desktop applications. The DRMS development team designed and released Vet Check Maxx, the trade name for an all-in-one view of reproductive and health data combined with complete data entry capabilities.

Results

Since the introduction of Vet Check Maxx, DRMS has seen a steady increase in daily subscription levels, now averaging a net increase of 33 paying farms per month (approximately 50 additional users per month). The average herd size of the mobile user is 360 cows, so the mobile system is in use in the management of 328,000 cows. Vet Check Maxx received the ?Top 10 New Products? award at the World Ag Expo in February 2015, likely leading to increased farmer awareness of this system.

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
312	External Parasites and Pests of Animals
313	Internal Parasites in Animals
315	Animal Welfare/Well-Being and Protection

Outcome #4

1. Outcome Measures

Number Livestock Producers Adopting and Applying Improved Planning and Financial Management Practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	9437

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With feed prices for livestock and horses at an all time high, producers are looking for ways to save money and help with feeding expenses. Eastern North Carolina producers wanted to graze and utilize their land in more ways but did not know how to accomplish that.

What has been done

Perquimans County Cooperative Extension helped seven producers with a total of 105 head of cattle save money by creating new and renovated pastures for the summer. Extension partnered with NCDA, and Soil and Water Commission to help establish grazing systems that would fit into each specific farm.

Results

Each producer reduced his feed bill by two-thirds and resulted in an average of 4,500 lbs of available forage per acre. This is an increase of 3,500 lbs per acre. This project worked on 120

acres with a total of 420,000 lbs of forage available, which saved the producers from buying 494 bales of hay. At a cost of \$30 per bale, this resulted in total savings of \$14,824. Also in 2014, NCSU's Amazing Grazing program, a pasture-based livestock educational initiative, conducted producer-targeted summer grazing demonstrations and workshops in 10 North Carolina counties (and one South Carolina county) that attracted more than 670 producers. Amazing Grazing also conducted a national pastureland ecology course for NRCS grazing specialists from across the U.S.

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
312	External Parasites and Pests of Animals
315	Animal Welfare/Well-Being and Protection

Outcome #5

1. Outcome Measures

Number of new technologies developed to prevent/treat animal diseases

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Commercial swine production facilities (CAFOs) house large quantities of animals at a single location. There exists the potential for catastrophic foreign animal disease. In the event of an animal related disease or a bio-hazardous outbreak, state and federal agencies must be

prepared. Immediate and preemptive action is necessary to contain and eliminate further spread of disease. Systems currently used to euthanize swine that rely on the handling and restraint of individual animals (as exists in most on-farm steady-state situations) will likely prove much too slow to stem the spread of disease. Increased public awareness regarding human health and public safety has stimulated research to develop, demonstrate, and evaluate innovative engineering systems and technologies that reduce or eliminate these potential problems.

What has been done

Research was conducted to determine the effect of pig euthanasia by carbon dioxide, CO₂. This methodology has been extensively studied as a pre-slaughter stunning agent in swine and is an AVMA-approved agent for euthanasia of pigs. Final analytical results and research methodology have been prepared for final project reports, peer reviewed papers, and journal publications.

Results

A collaboration between NCSU and Murphy-Brown, LLC, has resulted in the development of a portable system for converting bulk liquid CO₂ to gas and increasing its temperature to acceptable levels, before administering metered quantities for mass depopulation. In the next phase of this research, this system will be evaluated for utilization in cold climates and sub-zero seasonal weather conditions on large production swine CAFOs. This research will enhance the health status of the U.S. meat supply by anticipating and responding to new or emerging biosecurity hazards.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #6

1. Outcome Measures

New organic, farmers and agritourism markets established by individual entrepreneurs

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is growing demand for pasture-based meats, and individual farmers face challenges scaling the supply for wholesale markets.

What has been done

Firsthand Foods, a company incubated by NCSU's Center for Environmental Farming Systems, connects local livestock producers to local markets by delivering local, pasture-raised beef and pork products to retail and specialty grocers, restaurants and direct to consumers.

Results

Firsthand Foods supports a network of 60 livestock producers and is expanding to regions beyond the Triangle area through new partnerships with companies like Foster-Caviness, a leading supplier of wholesale produce. In 2014, Firsthand Foods realized \$1.25 million in sales, with 75% of revenues going directly back to the farmers and processors in its supply chain.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices

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

Constantly changing environmental and economic conditions (weather, economic climate,

feed prices, regulatory climate) influence producers' abilities to accommodate change and innovation, while ensuring the sustainability of their enterprises. Economic pressures continue to influence federal, state and local support for research and extension activities. Regulatory and other governmental policies influence the educational and research capacities of our programs and present challenges to producers, processors, and marketers of animal products to comply with emerging and often expensive regulations. And in an environment of reduced appropriated funding, the program competition for existing funds becomes greater. Nevertheless, emphasis is placed on those research and extension opportunities which will have enduring benefits to farmers, their families, businesses, communities and their industries, in terms of economic, environmental, social and quality of life considerations.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of faculty activity reports, intellectual property creation (invention disclosures), peer reviewed journal articles, and data from our Extension Reporting System shows that our research and extension efforts in this planned program area are successful in engaging a wide array of animal agriculture producers, processors and marketers. The data indicate that delivery of relevant research information and research backed production best management practices are associated with significant improvement in profitability of livestock and poultry operations. Faculty are successful in influencing individual producers as well as production companies that our research findings can generate additional profitability in their operations, sometimes with added environmental benefit. The information also demonstrates the research and extension programs at our institutions are creative environments for our faculty to be productive in making new discoveries, publishing in quality journals, and creating new business opportunities.

Key Items of Evaluation

Qualitative and quantitative data collected show that our efforts in this planned program area are having significant benefit to users and to the state. Nevertheless, we are challenged to keep our evaluation tool kit in lockstep with the regularly changing research and extension needs. We will continue to refine our reporting and data collection system to most effectively collect data that represent the real world situation with respect to the impacts of our programs.