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

**Program # 9**

**1. Name of the Planned Program**

Animals Systems (OARDC Led)

☑ 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 | 0% | | 10% | |
| 302 | Nutrient Utilization in Animals | 0% | | 10% | |
| 303 | Genetic Improvement of Animals | 0% | | 15% | |
| 304 | Animal Genome | 0% | | 5% | |
| 305 | Animal Physiological Processes | 0% | | 10% | |
| 306 | Environmental Stress in Animals | 0% | | 10% | |
| 307 | Animal Management Systems | 0% | | 15% | |
| 308 | Improved Animal Products (Before Harvest) | 0% | | 10% | |
| 311 | Animal Diseases | 0% | | 15% | |
| | **Total** | 0% | | 100% | |

## V(C). Planned Program (Inputs)

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

| Year: 2012 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 0.0 | 0.0 | 16.0 | 0.0 |
| Actual Paid Professional | 0.0 | 0.0 | 10.1 | 0.0 |
| Actual Volunteer | 0.0 | 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** |
| 0 | 0 | 1343492 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 0 | 0 | 3730294 | 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

On -going research activities to advance animal and global food security goals include both basic and applied research. Laboratories, animal enclosures, farms, and multiple field sites/research stations are available throughout state to permit data gathering and to continue long - term experiments. Ohio on-farm research takes place as do national and international studies. Effective research requires a mixture of laboratories, animal enclosures, and on-farm research sites to maximize knowledge. Emerging threats now require more advanced facilities such as a biosecurity lab, particularly needed in the study infectious animal diseases. Final preparation for BL3 laboratory research is well underway. All functional laboratories and sites are improved over time as program need warrants. OARDC faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal stakeholders such as fellow extension personnel, and with external stakeholders.

### 2. Brief description of the target audience

Targeted audiences include, but are not limited to: specific individuals or groups who have expressed a need for food animal systems information that is to be derived through new research, extracted from on-going research, or is 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; populations who have not requested the information but will likely benefit from that information, e.g. small or recreational farmers; other scientists and scientific groups; political entities; extension personnel; students for pre-school to post doctorate studies; news organizations; and business groups such as Farm Bureau or commodity groups.

### 3. How was eXtension used?

eXtension was not used in this program

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

### 1. Standard output measures

| 2012 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| Actual | 0 | 0 | 0 | 0 |

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

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

| 2012 | Extension | Research | Total |
|---|---|---|---|
| Actual | 0 | 69 | 0 |

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

**Output Target**

**Output #1**

**Output Measure**

- Number of graduate students completed.
  Not reporting on this Output for this Annual Report

### 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 | Increase nutrition utilization for the purpose of increased growth and quality of products commensurate with consumer demand, as well as nutrition utilization, performance, and efficiency to the point that savings will off-set increases in costs of animal feedstocks |
| 3 | 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 |
| 4 | 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 |
| 5 | Provide new contributions 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 |
| 6 | Improve management for multiple animal farm types, including organics, that will produce higher yields for and lower costs to the producer and consumer |
| 7 | 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. |
| 8 | Animal disease researchers will continue to serve on first responder teams when stakeholders have an immediate disease problem |
| 9 | 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 |
| 10 | 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

Increase nutrition utilization for the purpose of increased growth and quality of products commensurate with consumer demand, as well as nutrition utilization, performance, and efficiency to the point that savings will off-set increases in costs of animal feedstocks

### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2012 | 0 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Complex, multi-ingredient diets for dairy cows are the norm because it is thought that multiple ingredients are necessary to ensure that all required nutrients were provided.

**What has been done**
OARDC scientists compared three different diets: (1) a typical Midwestern diet for dairy cows based on corn silage, alfalfa silage, corn grain and soybean meal; (2) extensive use of a simple milled corn gluten feed byproduct that contained only corn silage, the corn byproduct and supplemental minerals; (3) same as the second diet but included supplemental rumen protected methionine and lysine. The hypothesis was that milk yield, milk composition, and feed efficiency would be similar between the control diet and the byproduct diet that included supplemental amino acids but milk protein would be lower in the byproduct diet without amino acids.

**Results**

Results from an OARDC study using a corn milling product challenges the premise that multiple ingredients dairy cattle diets are necessary. A very simple diet with only three ingredients performed almost as well as a much more complex diet. The simple diet is cheaper and will reduce inventory needs on a dairy farm, both of which should improve profitability. Enhanced performance was observed by adding two important amino acids but the response was much less than expected. This experiment may lead to a change in the approach taken to formulate diets. Many farms with limited land base can grow adequate corn silage but must purchase other feedstuffs. This simple, three ingredient diet approach would be quite beneficial to such producers. The simple diet would usually be much less expensive and should improve dairy farm profitability.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 302 | Nutrient Utilization in Animals |
| 305 | Animal Physiological Processes |
| 307 | Animal Management Systems |
| 308 | Improved Animal Products (Before Harvest) |

**Outcome #3**

**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

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2012 | 0 |

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

**Issue (Who cares and Why)**
Ruminant animals, such as cows and sheep, depend on the bacteria residing in their rumen to extract nutrients from feed. As such, any attempt to improve ruminant nutrition, feed efficiency, or to develop new feeds or feed additives must involve analysis of ruminal bacteria.

**What has been done**

An OARDC project has developed the Rumen Array analyzer to enable both comprehensive and cost-effective analysis of rumen bacteria. The Rumen Array can be used to analyze up to six rumen samples simultaneously for 1,600 different bacteria present in the rumen. The analysis afforded by the Rumen Array is relatively inexpensive and less time-consuming. Such unprecedented, comprehensive analysis of multiple samples provides a new platform to enable more effective and rational studies of ruminant nutrition and development of new feeds and feed additives.

**Results**

The Rumen Array is a microarray with 1,660 specific probes that enable detection and semi-quantification of individual species. The microarray is designed to include one universal probe that detects total bacteria and archaea and also incorporates several control probes to ensure proper normalization and validation of microarray analysis. Collectively, the Rumen Array enables simultaneous detection and quantification of most bacteria in the rumen. This comprehensiveness exceeds any currently available techniques or methods. The Rumen Array is designed on phylogenetic marker sequences collected worldwide, enabling the analysis of ruminal microbiome of ruminant animals in any country. The Rumen Array enables simultaneous detection and analysis of most bacteria in the forestomach of ruminant animals: dairy cows, beef cows, buffalo, sheep, goats, and wild ruminant animals.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 302 | Nutrient Utilization in Animals |
| 305 | Animal Physiological Processes |
| 307 | Animal Management Systems |

**Outcome #4**

**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 #5**

**1. Outcome Measures**

Provide new contributions 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 #6

### 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

### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2012 | 0 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Ohio aquaculture has an estimated impact of $50 million annually. Aquaculture sales in Ohio have tripled from $1.8 million to $6.6 million in recent years. Nationally, Ohio ranks first in sales of yellow perch for food and is the number one bluegill producing state. Ohio also ranks fourth in sales of baitfish and largemouth bass sold for sport, and fifth in number of baitfish farms. Yellow perch remains the primary food fish for human consumption. To be economically viable and to provide for production efficiency, improved lines of yellow perch must be developed.

**What has been done**
Genetically improved yellow perch were evaluated on three sites in two states using both separate rearing and communal rearing methods. Results showed the OSU improved fish strain exhibited 42.1 ? 59.4% higher production, and 25.5% - 32.0% higher growth rates, and even have 12.3% - 27.8% higher survival than local strains. CFAES - South Centers now has capacity to create genetic relatedness charts and genetic pedigrees of selected broodfish. Family identification technology using DNA for selective breeding has been established. These are now available to stakeholders.

**Results**
Multiple improved lines of yellow perch have been developed, and over one million genetically improved fish have been distributed to Ohio fish farms by South Centers research and extension team. An additional third generation of improved fish was produced in 2012 through the crossing and mating of more than 100 families. Evaluation of 1-stage and 2-stage selection was completed, and the results have been published in the Journal of Animal Science. Three male populations with a female genotype have been developed, which will produce fast-growing all-female populations for the aquaculture industry.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 301 | Reproductive Performance of Animals |
| 303 | Genetic Improvement of Animals |
| 307 | Animal Management Systems |
| 308 | Improved Animal Products (Before Harvest) |

## Outcome #7

### 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 #8

### 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 #9

### 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 #10

### 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

Not Reporting on this Outcome Measure

## 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

As noted above a number of factors continue to impact this planned program. The impact is typically situational as to the degree that any particular external factor affects outcome. As noted in other planned programs the greatest challenge is for OSU Extension and OARDC to find adequate resources to respond to growing demand. Often if there is an immediate need for OSU personnel to intercede to assist a stakeholder with a pending pest or pathogen, there is no time to structure a research grant for cost recovery or surplus funds to support additional extension personnel needed to meet these growing challenges.

## V(I). Planned Program (Evaluation Studies)

### Evaluation Results

No formal evaluation results to report from OARDC. Publications, research grants garnered, n of stakeholders served, and anecdotal data provide a positive assessment of this planned program.

### Key Items of Evaluation

No key items to report