

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

**Program # 1**

**1. Name of the Planned Program**

Global Food Security and Hunger

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
121	Management of Range Resources	25%		0%	
202	Plant Genetic Resources	0%		15%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		15%	
204	Plant Product Quality and Utility (Preharvest)	0%		5%	
205	Plant Management Systems	50%		0%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		5%	
212	Pathogens and Nematodes Affecting Plants	0%		30%	
301	Reproductive Performance of Animals	5%		10%	
302	Nutrient Utilization in Animals	20%		10%	
305	Animal Physiological Processes	0%		5%	
702	Requirements and Function of Nutrients and Other Food Components	0%		5%	
	<b>Total</b>	100%		100%	

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

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

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	21.0	0.0	25.0	0.0
Actual Paid Professional	12.0	0.0	37.0	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
450000	0	1450000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
674000	0	2180000	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**

Meet with stakeholder groups to gather input and refine program directions.  
 Develop improved crop cultivars acceptable to growers and those who use and process the grain.  
 Conduct research on alternative grazing and feeding systems.  
 Conduct research on the effect of maternal treatments on the productivity of offspring.  
 Present crop and livestock research results at field days and grower meetings, popular press, radio and TV spots, web sites, and educational classes and workshops to foster producer adoption.  
 Evaluate the effectiveness and impact of the extension programming.

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

Grain and livestock producers, crop consultants, nutritionists and feed personnel, veterinarians, Extension personnel, commodity groups, crop improvement associations, and grain processors.

**3. How was eXtension used?**

The 'Ask An Expert' widget/feature in eXtension was 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
<b>Actual</b>	1169	45500	207	905

**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**

<b>2012</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Actual</b>	1	32	33

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

**Output Target**

**Output #1**

**Output Measure**

- {No Data Entered}

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

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

O. No.	OUTCOME NAME
1	Number of additional acres grown with new NDSU developed crop varieties with improved disease resistance and the ability to produce a high quality crop under both favorable and marginal growing conditions.
2	Number of North Dakota livestock producers with increased knowledge of practices to improve the efficiency of livestock production systems, including use of improved livestock genetics, use of practices to improve reproductive efficiency, and use of improved nutrition.
3	Increased percentage of livestock producers that utilized NDSU developed cover crop mixtures as forage to improve livestock production per land area, reduce costs to feed an animal, and ability to produce a high quality forage crop for livestock grazing under both favorable and marginal growing conditions.
4	Percentage of seeded acres in ND that are grown with new NDSU developed crop varieties with improved disease resistance and the ability to produce a high quality crop under both favorable and marginal growing conditions.

## **Outcome #1**

### **1. Outcome Measures**

Number of additional acres grown with new NDSU developed crop varieties with improved disease resistance and the ability to produce a high quality crop under both favorable and marginal growing conditions.

Not Reporting on this Outcome Measure

## **Outcome #2**

### **1. Outcome Measures**

Number of North Dakota livestock producers with increased knowledge of practices to improve the efficiency of livestock production systems, including use of improved livestock genetics, use of practices to improve reproductive efficiency, and use of improved nutrition.

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

- 1862 Extension
- 1862 Research

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

Change in Action Outcome Measure

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

<b>Year</b>	<b>Actual</b>
2012	50

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

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

Feed costs are a major component of overall production costs in cow/calf, growing, and finishing cattle systems. Improving the efficiency of feed utilization or using lower cost feeds, therefore, can have dramatic effects on profitability and sustainability of the beef industry.

This research is aimed to improve the profitability of beef cattle production through improving efficiency of production and/or reducing input costs. Improving efficiency also has the potential to reduce the environmental impact of beef production systems. This research aims to improve efficiency of production through integrative research on nutrition, genetics, and reproduction of ruminants. These research objectives include both basic research to better understand physiological systems important in regulating feed efficiency as well as studies to examine the effects of different nutritional or management programs on performance in ruminants.

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

Research projects were conducted on: 1) the effects of corn dried distillers grains plus solubles supplementation on backgrounding calf performance, 2) the effects of increasing corn distillers

grains plus solubles and degree of dry-rolled processing on finishing cattle performance, the effects of maternal nutrition on 3a) maternal pancreatic function and fetal pancreatic development, 3b) maternal and fetal hepatic and intestinal energy utilization, and 3c) maternal endocrine function as related to feed intake and energy balance.

### **Results**

The summarized research results are: 1) supplementation with corn dried distillers grains plus solubles to growing cattle fed medium quality hay increased ADG, improved feed efficiency and decreased hay meal size and intake, 2) feeding 40% vs 20% corn dried distillers grains plus solubles improved feed efficiency, increased number of meals per day, and decreased meal size, and feeding fine-rolled vs. coarse-rolled corn influenced feeding behavior but did not influence growth performance in finishing cattle, 3a) nutrient restriction of ewes during early to mid-gestation decreases beta cell size in fetal pancreas in late gestation (samples from cow experiment currently being analyzed), 3b) nutrient restriction and realimentation during early and midgestation alters maternal and fetal liver and small intestinal mass and in vitro oxygen consumption in cows, and 3c) sample analysis is underway to determine effect of nutrient restriction on leptin and neuropeptide Y concentrations in plasma. These results have increased our knowledge on the effects of feeding corn dried distillers grains plus solubles and on corn processing on feeding behavior and growth performance in growing and finishing cattle. These results also have increased our knowledge on how maternal nutrition influences fetal development of pancreatic function and of energy metabolism in liver and intestine of pregnant ruminants, which could have long-term implications on post-natal performance, health, and longevity. Results have been presented at Extension and scientific meetings in ND and elsewhere.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
702	Requirements and Function of Nutrients and Other Food Components

## **Outcome #3**

### **1. Outcome Measures**

Increased percentage of livestock producers that utilized NDSU developed cover crop mixtures as forage to improve livestock production per land area, reduce costs to feed an animal, and ability to produce a high quality forage crop for livestock grazing under both favorable and marginal growing conditions.

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

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Actual
2012	20

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Increasing the economic return and efficiency of harvesting forage and grain (and subsequent food) from the same land base is an innovative approach to increasing our food supply without adding land. A state-wide (North Dakota) livestock producer survey conducted by the North Dakota State University Animal Sciences Department showed almost 20% of our ranchers were interested in using cover crops (dual cropping) as a forage base in the future. Testing the economic efficiency of dual cropping the same land base versus a single cropping system and comparing to a traditional dry lot feeding system is important livestock growers and farmers to determine the success and failure in the Northern Plains. This practice also can create healthier soils and reduce input costs, thus creating a more sustainable ranching and farming operation that is cost effective and environmental safer. These environmental improvements can create cleaner drinking water, reduce erosion, and reduce carbon in the atmosphere.

#### What has been done

A five-year research/demonstration trial was developed study economic efficiency, livestock production, and grain/forage production on marginal cropland in south central North Dakota. The project was designed to compare no grazing, 50% grazing use, and full-grazing use on single and dual cropping systems and compare to dry lot. Parameters collected were to address if we can achieve more food production using NDSU cocktail mixtures from the same land area cheaper than a single crop system or dry lot. We also conducted a 1-day cover crop forum to train service provider professionals on using crop crops for soil health and livestock grazing. A post survey was conducted after the forum to provide guidance on future educational activities and material to develop.

#### Results

Full-use grazing a cover crop cocktail mixture following a barley crop for grain reduced the daily feed costs to the livestock producer by 239 % (\$0.89/day versus \$2.13/day) compared to dry lot feeding. Full-use grazing a cover crop cocktail mixture following a barley crop for grain increased per head return by 5% to the rancher compared to dry lot feeding. Early results indicate that livestock producers can dual harvest marginal cropland in south central North Dakota, while creating a harvestable grain crop that provided an economic return from the land. The second crop which was an NDSU designed cocktail mixture also provided an economic return when grazing at full-use. Heifers gained weight during the grazing period, creating an increased beef product from the same land that produced a grain crop. Outcomes from the cover crop forum survey indicated professional technical service providers desired more educational programs and materials. These programs should addressed recommended cover crop species for improving soil health and creating optimum grazing forage for livestock.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
302	Nutrient Utilization in Animals

#### Outcome #4

##### 1. Outcome Measures

Percentage of seeded acres in ND that are grown with new NDSU developed crop varieties with improved disease resistance and the ability to produce a high quality crop under both favorable and marginal growing conditions.

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2012	48

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

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

Growers, crop consultants, end users, grain marketers seek wheat varieties with increased yield with maintained or improved quality profiles. All of these individuals rely on sale of grain to maintain the profitability and sustainability of their farms or their businesses. End use quality of new varieties is needed to maintain the milling and baking quality desired by processors and the consumer. Ultimately, wheat production needs to be increased to supply an increasing global demand for product.

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

The durum wheat breeding/genetics program is developing improved varieties acceptable to growers in North Dakota and those who use and process the grain. Extension specialists shared this performance information with growers within North Dakota, and among peers in adjoining states.

###### **Results**

The state of North Dakota and NDSU, through the Foundation Seedstocks Program (FSP) and North Dakota State Seed Department (NDSSD), release more certified seed than any other state. NDSSD provides testing, inspections and regulatory services for all crops. FSP aims to increase, maintain and distribute genetically pure foundation class seed, coordinate with other agencies

locally and globally, and implement improved systems for foundation seed increases and distribution. Production, conditioning and seed distribution locations are the Agronomy Seed Farm at Casselton and Research Extension Centers at Carrington, Langdon, Minot and Williston. In 2012, 74 percent of the North Dakota wheat crop planted has a seed history traceable back to FSP, which has a value of approximately \$2 billion and an overall economic impact of approximately \$6 billion. Of all seeded acres in ND, 48 percent were grown with new NDSU developed crop varieties with improved disease resistance and the ability to produce a high quality crop under both favorable and marginal growing conditions.

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

<b>KA Code</b>	<b>Knowledge Area</b>
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants

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

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

- Natural Disasters (drought, weather extremes, etc.)
- Economy

##### **Brief Explanation**

Even though North Dakota suffered drought in 2012, Global Food Security and Hunger goals for 2012 were met.

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

##### **Evaluation Results**

See previous section.

##### **Key Items of Evaluation**