

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
201	Plant Genome, Genetics, and Genetic Mechanisms	5%		10%	
204	Plant Product Quality and Utility (Preharvest)	10%		5%	
205	Plant Management Systems	10%		10%	
206	Basic Plant Biology	5%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	5%		5%	
212	Pathogens and Nematodes Affecting Plants	5%		5%	
213	Weeds Affecting Plants	5%		5%	
216	Integrated Pest Management Systems	5%		5%	
301	Reproductive Performance of Animals	5%		10%	
302	Nutrient Utilization in Animals	8%		5%	
304	Animal Genome	2%		5%	
305	Animal Physiological Processes	5%		5%	
306	Environmental Stress in Animals	2%		5%	
307	Animal Management Systems	15%		5%	
311	Animal Diseases	10%		10%	
315	Animal Welfare/Well-Being and Protection	3%		5%	
	Total	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	39.1	0.0	129.1	0.0

Actual Paid Professional	29.3	0.0	172.7	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
808555	0	3237045	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2192819	0	13881057	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1013012	0	16793319	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Corn and soybeans are Minnesota's most important agronomic crops, but small grains and sugar beets are also important in the northwestern areas of the state. High prices for corn has increased the acreage planted, but acreage of spring and winter wheat stabilized in 2012. Swine, dairy, poultry and cattle create an important and diversified animal agriculture sector in Minnesota. Both crops and livestock producers were challenged in 2012, with drought and floods, a challenging growing season especially in some parts of the state, and threats by re-emerging and new pests and diseases. MAES supported research tackled the challenges on several fronts.

Here are some examples of research progress and impact in 2012:

- Demand continues to grow for U of M developed food grade soybean varieties. In 2012, 11 varieties of various maturities, seed sizes and seed coat colors were increased on research plots at the U of M. One new conventional soybean cultivar was released in 2012. Also four food type soybean cultivars were also released and licensed in 2012. It is estimated that recently released general purpose and special purpose cultivars from the U of M has contributed about \$1,000,000 of extra income for soybean producers compared with yield and other traits of older cultivars.
- Barley genetics researchers completed the genomic map of barley, which is now being used by the national and international scientific community for genetic and breeding studies.
- A completed field survey of wheat fields for root rot diseases determined that crown rot is more prevalent than had been recognized. Researchers developed best management practices using integrated strategies.
- Corn genetics research focused on a new area of study--epigenetics--which looks beyond genes to molecules that modify gene activity in a way that, like genetic information, is also passed from one generation to the next. The novel research has resulted in a new \$3.4 million NIH grant to study the added value of elucidating the epigenome in addition to the genome.
- A new spring wheat variety, Norden, was released in 2012 with good leaf rust resistance and agronomic qualities making it useful for growing in the northern part of the state.
- Research into breeding nonconventional corn has been developing a new line of high oil corn from a Korean High Oil corn line. Success has led to plans to release a new high corn oil variety with 20 percent oil content in 2013.

- A MAES agronomist generated risk assessments for two invasive weeds using tools he developed for use by the Minnesota Department of Agriculture to meet the requirements for risk assessment under the new Minnesota Noxious Weed Law.
- Research on nutrient management in corn led to new nitrogen guidelines for corn grown on irrigated sandy soils which are being adopted by growers.
- 2012 marked the greatest sucrose yield and efficiency of sugar beets grown in Minnesota in 10 years. Part of this increase in efficiency has been because of MAES nitrogen management research.
- In other nutrient management research, in 2012 researchers updated the sulfur recommendations for corn. Current findings suggest that following the new guidelines would create anywhere from 20-to-50 bushel yield increases on some soils.
- Results of 2012 surveys of the quality of U.S. commodity and U.S. food soybean crops were completed and shared with purchasers in Taipei, Taiwan, and Tokyo.
- By examining soybean seedling rate studies across a very wide geography (from Baton Rouge, LA to Crookston, MN) researchers found that soybean seeding rates need not vary by latitude as greatly as has previously been noted. Due to increased grain prices, researchers determined that increased soybean seeding rates beyond those previously recommended will provide additional economic benefit to the producer.
- Mycotoxin contamination of feed has led to over \$140 million in losses annually for the poultry industry. MAES supported researchers found predictive gene targets for increasing resistance in turkeys exposed to the aflatoxicosis which results from consuming contaminated feed.
- The high pathogenicity influenza viruses remain a major global threat to both agriculture and public health. In 2012 avian researchers identified how an avian host may respond pro-inflammatorily, and how that response is regulated in chicken cells.
- Work on the turkey genome continues to advance with a new sequence assembly due for release in 2013. Whole genome sequencing of the Ocellated turkey and a representative of the Eastern wild turkey are in process.
- U of M poultry disease researchers studying MAP (Mycobacterium avium subsp. Paratuberculosis) have found that MAP is capable of sporulation, which is a paradigm-shift in the basic understanding of MAP biology. The new information may have wide ranging implications in transmission, gene regulation and vaccine and therapeutic design.
- A disease called Proliferative enteropathy (PE) is an important infectious disease of swine and other animals. In 2012, researchers evaluated and published the bactericidal activity of seven commercial disinfectants. They also provided information for effective interventions and preventative measures to reduce the incidence of PE in various animals.
- MAES has supported the development of an Infectious Agent Repository housed within the College of Veterinary Medicine. The mission of the IAR is to maintain an archive of pathogens with animal and human health significance.
- Research outcomes in pre-parturient dairy cow and nursery calf digestion and metabolism has resulted in increased efficiency of nutrient use, reduced morbidity and mortality in nursery calves.
- A project assessing two types of housing systems for dairy cows was completed. Researchers found that lameness prevalence in compost bedded pack barns was lower than in naturally ventilated and cross-ventilated free stall barns. Dairy welfare research at the U of M has helped dairy producers make housing and management decisions that can significantly impact the profitability of their operations.
- In recent years, the importance of vitamin D deficiency in the etiology of diseases, such as tuberculosis or Crohns disease, has been discussed in human medicine. In 2012 animal researchers completed a pilot study that investigated for the first time whether or not a connection exists between vitamin D and Johnes disease of cows., and discovered that there was an association between vitamin D concentration an immune response in cows.
- A multi-state multi-herd clinical trial was conducted to compare the efficacy of three commonly used dry cow mastitis formulations. Mastitis experts built a curriculum for a web-based, self-directed learning system for veterinarians and other milking system professionals.

Regional and county Extension educators, along with Extension and MAES specialists, delivered proactive and responsive educational programming to challenge and educate Minnesota's agricultural industry and producers. In 2012, we are reporting on efforts that achieved impacts in protecting ground water through cost-effective controls, responding to market demands and addressing threats to the health of crops and livestock.

2. Brief description of the target audience

Since its inception in 1909, **Extension** has worked with farmers to find solutions to the biggest challenges. For the past 25 years, Extension has shared the University's research and knowledge with ag professionals -- the people who have the most influence on farmers today. Extension's strategy with ag professionals targets consultants, seed and fertilizer dealers, pesticide applicators, and local Extension educators who work directly with farmers. This approach expands the ability of Extension to make a difference on Minnesota's farmland. According to a 2011 survey, ag professionals serve approximately 61 clients each, having an impact on some 48,000 acres. This means that just one of Extension's research-based education impacts about 4.3 million acres across the state and surrounding regions, based on participation in Institute for Ag Professionals Research Updates alone.

MAES target audiences include all of the above, and also include animal and crop researchers, nationally and internationally, and members of the agriculture industries, state and local public policymakers.

3. How was eXtension used?

Poultry educators refer constituents to eXtension when they have questions about backyard/small flocks. The educational materials and webinars typically address questions in an efficient manner. Minnesota educators may become part of a multi-state collaboration preparing poultry fact sheets in coming years.

An Equine educator has chaired the Horse eXtension in 2013.

The Dairy program team uses the search feature to look for specific topics, and they also contribute articles to the site.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	20221	502000	747	0

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

Patent Applications Submitted

Year: 2012
 Actual: 6

Patents listed

Norden, wheat

Conventional soybean cultivar, maturity group 0

Two small-seeded food type soybean cultivars

Two large-seeded higher protein food type soybean cultivars

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	32	106	138

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Conduct educational events and consultations to provide producers with latest applied research for improved crop management and livestock production. (Target expressed as number of events)

Year	Actual
2012	334

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Participants of Extension livestock and crop program workshops/classes and conferences will achieve significant learning gains regarding research-based knowledge and skills. (Target expressed as the percentage of participants who achieved significant learning gains as a result of attending Extension program workshops/classes and conferences.)
2	Participants of workshops/classes and conference sessions related to livestock and crop production will significantly improve their production practices as a result of attending the program. (Target expressed as a percentage of participants that significantly changed one or more of their practices as a result of attending workshops/classes and conference sessions intended to improve participant practices.)
3	Interventions will result in changes in conditions related to profitability, crop and livestock health or environmental conditions. (Target expressed as number of changes in condition reported each year.)
4	Through the Quality Count\$ program, bulk tank somatic cell counts will be maintained at a low level, and will move downward over time. (Outcome is the average 2012 Somatic Cell Count for the State of Minnesota.)
5	Through education, farmers will have the means by which they can reduce nitrogen fertilizer use by over 160,000 pounds of nitrogen per acre per year -- protecting ground water without reducing corn yield.
6	Calcium carbonate limestone used in the purification of sugar beet juice in the sugar production process was repurposed to improve productivity and reduce environmental risk.
7	Replacement costs for dairy herds will be decreased among those farmers taking advantage of gender selection and culling techniques. (Quantitative outcome is the percentage of increase in profitability for individual dairy herds.)
8	Development of new crop varieties will help Minnesota growers improve profitability
9	Research will provide growers with strategies to defend their crops against new and re-emerging pests.
10	Research on animal housing systems will provide information to producers on best management practices.
11	Research will provide information to support strategies to control animal diseases.

Outcome #1

1. Outcome Measures

Participants of Extension livestock and crop program workshops/classes and conferences will achieve significant learning gains regarding research-based knowledge and skills. (Target expressed as the percentage of participants who achieved significant learning gains as a result of attending Extension program workshops/classes and conferences.)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	82

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In highly competitive markets, farmers need to understand current issues, become aware of technology options, and address barriers that might exist between their product and their available markets.

What has been done

Through conferences, consultations and sponsored workshops, as well as online educational materials, Extension delivers current and relevant information to Minnesota's livestock and crop producers.

Results

Of those program recipients who took pre-post evaluations, 82 percent responded that they had gained valuable learning from Extension's educational offerings. Several examples demonstrate that this learning delivers value to participants. In the dairy industry, producers learned about cattle breeding for organic production, helping them assess whether this market is viable for their operation. Corn producers received newly released research about diagnosis and risk management options for Goss's wilt in corn, which laboratory studies have shown is widespread in Minnesota.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
304	Animal Genome
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #2

1. Outcome Measures

Participants of workshops/classes and conference sessions related to livestock and crop production will significantly improve their production practices as a result of attending the program. (Target expressed as a percentage of participants that significantly changed one or more of their practices as a result of attending workshops/classes and conference sessions intended to improve participant practices.)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	71

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Armed with relevant and research-based information, farmers and farm advisors can change their practices in ways that benefit all of Minnesota through environmental protection, while supporting

rural economies through the agricultural industry.

What has been done

Through conferences, consultations and sponsored workshops as well as online educational materials, Extension delivers current and relevant information to Minnesota's producers, helping them take action to increase their farm's productivity, assure access to available markets and protect Minnesota's environment.

Results

Examples of behavior changes affected by Extension in 2012 include:

- 1) To reduce cost of herd replacement, dairy industry producers began using gender-selected semen to produce more heifer calves, used beef semen on low-genetic value animals, and engaged in gender testing.
- 2) To comply with FDA regulations, a major dairy rewrote an agreement with a grower to control the health treatment of heifers.
- 3) Low-cost parlors and sand bedded freestalls were installed in farms after a field day highlighted the new low-cost technology.
- 4) Farmers throughout a county with very sandy soils took action to more frequently evaluate nitrogen rates, as informed by local field tests. When growers apply the optimum nitrogen fertilizer rate, they maximize profitability while minimizing risks to the environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
304	Animal Genome
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #3

1. Outcome Measures

Interventions will result in changes in conditions related to profitability, crop and livestock health or environmental conditions. (Target expressed as number of changes in condition reported each year.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	16

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As noted in our description of audiences, Extension county educators are a primary audience for education from state and regional Extension educators and specialists. With educational offerings, county educators are able to specifically address issues that are very limited in geographic scope, but are critical to local economies and environmental concerns.

What has been done

County educators consulted with producers, growers and communities to coach and encourage the use of research-based information to solve local problems.

Results

Education and consultation from county educators helped producers resolve critical local issues in 2013. For example:

- 1) Farmers whose crops were damaged by an overpopulated elk population in northwest Minnesota agreed, after heated meetings, to a planned reduction through controlled hunts. This plan, implemented in 2009, resulted in no damage claims in 2011 or 2012.
- 2) Two counties were pummeled by a hail storm in June. Crop producers assumed they would have to replant. Specialists traveled to the affected counties to share how to determine whether replanting was necessary. Consensus among participants was that without this information, they may have been taken advantage of by salesmen, and that they were better informed in speaking with crop insurance adjusters.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)

205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
304	Animal Genome
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #4

1. Outcome Measures

Through the Quality Count\$ program, bulk tank somatic cell counts will be maintained at a low level, and will move downward over time. (Outcome is the average 2012 Somatic Cell Count for the State of Minnesota.)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	251000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

On January 1, 2012, the EU mandate that somatic cell counts (SCC) be below 400,000 was officially designated by the Agricultural Marketing Service of USDA. This new milk quality requirement has created greater urgency for approximately 20-25% of Minnesota dairies that struggle to keep bulk tank milk under the standard.

What has been done

In anticipation of this ruling, the Quality Count\$ curriculum was updated, as reported in our 2011 report. A "tool box" now contains over 70 factsheets, worksheets, spreadsheets, Power Point presentations and more, along with a search engine and links to mastitis milk quality websites available from Extension. The goal is to provide producers and dairy professionals with new tools to meet this challenge and to assure market access. This is essential so that Minnesota can stay competitive with other major dairy states.

Results

Since Quality Count\$ launched in July 2003, Minnesota has made yearly improvement. Spurred by the new market pressure, 90+ dairy producers enrolled, and there is continued interest in DHIA (Dairy Herd Information Association) SCC testing. In 2012, the DHIA average SCC is the lowest in Minnesota history. Every month, the SCC was lower than the same month in 2011. The average 2012 the SCC count was 251,000 -- down from 290,000 in 2011.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #5

1. Outcome Measures

Through education, farmers will have the means by which they can reduce nitrogen fertilizer use by over 160,000 pounds of nitrogen per acre per year -- protecting ground water without reducing corn yield.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	160000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Growing corn after alfalfa can eliminate or greatly reduce nitrogen fertilizer requirements for corn. Yet, surveys indicate that the most extreme cases of excess nitrogen fertilization for corn occur when corn follows alfalfa. Over-application of nitrogen wastes resources and increases the risk of nitrate leaching.

What has been done

During 2012, two on-farm field days were held on farms in southwest Minnesota where experiments were being conducted to determine optimum nitrogen fertilizer management for corn following alfalfa. The focus of these programs was to educate crop advisors and growers about best nutrient management practices for alfalfa-corn rotations, in part through demonstration of the management effects in on-farm research. Those attending managed more than 160,000 acres.

Results

After these events, 50 percent of respondents said they would modify nitrogen fertilizer management for corn after alfalfa much or very much. Assuming these attendees reduce nitrogen fertilizer by a conservative 40 pounds per acre, and that this cropping system represents five percent of land they manage or provide recommendations for, the program will cause growers to reduce nitrogen fertilizer by over 160,000 pounds per acre per year without reducing corn yield. This is an annual savings of over \$81,000 at \$0.50 per pound of nitrogen. With this reduction, energy input will be reduced by over 3.5 million megajoules per year, assuming 21.9 megajoules per pound of nitrogen. A summary of information from these programs was published in Progressive Forage Grower and Progressive Dairyman-Canada.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #6

1. Outcome Measures

Calcium carbonate limestone used in the purification of sugar beet juice in the sugar production process was repurposed to improve productivity and reduce environmental risk.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2012

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Minnesota's four sugar factories and North Dakota's three sugar factories process 57 percent of the total sugar beet grown in the U.S. The total economic activity of the sugar beet industry is over \$3 billion. Calcium carbonate limestone is used in the purification of sugar beet juice in the sugar production process. About 560,000 dry tons of precipitated calcium carbonate (PCC) results from the sugar extraction process annually and is stored outdoors in piles. The stored PCC is considered a potential environmental problem.

What has been done

Research was conducted to determine the impact of PCC on increasing pH of soils with low pH; the effect of precipitated calcium carbonate on controlling diseases; and its impact on yield of sugar beet, wheat, soybean and corn. Research recommendations on how to use PCC to improve sugar beet production was provided at growers' seminars, field plot demonstrations, and was published in the "Sugarbeet Research and Extension Reports."

Results

Research showed PCC increased pH in low pH soils, controlled *Aphanomyces cochlioides* which causes root rot and increased sugar beet yield, and did not cause any significant adverse impact on yields in crops grown in rotation with sugar beet. Now, the practice of using PCC is being widely adopted by sugar beet growers in Minnesota and North Dakota, especially in fields with a history of *Aphanomyces* root rot. At the Southern Minnesota Beet Sugar Cooperative and Minn-Dak Farmers Cooperative, where *Aphanomyces* root rot is more prevalent, growers over the past five years collected and used two to three times the amount of PCC produced annually. In the next 10 to 15 years, it is estimated growers will use PCC stockpiled over the past 40 years.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants

Outcome #7

1. Outcome Measures

Replacement costs for dairy herds will be decreased among those farmers taking advantage of gender selection and culling techniques. (Quantitative outcome is the percentage of increase in profitability for individual dairy herds.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One of the biggest issues facing the dairy industry over the past several years has been herd replacement costs. With high feed costs, it now costs producers about \$1,800 to raise a replacement heifer. Replacement cost is the second largest cost (behind feed cost for lactating cows) on most farms. Many producers began using gender-selected semen to produce more heifer calves when that technology became available. As a consequence, many producers were producing more heifers than they needed, further increasing total herd replacement costs.

What has been done

The dairy team presented information describing options to reduce replacement costs. This included targeting the number of replacements needed, continuing to use gender-selected semen on high genetic value animals, and using beef semen on low genetic value animals. These 1/2 beef-crossed animals are worth more in the marketplace. Also, by genetic-testing females, producers are able to identify inferior animals earlier and cull them earlier, thus reducing costs.

Results

This information was presented several times throughout the year and was published in articles in local and national dairy magazines. Roundtable discussions following up on educational sessions showed that about 1/3 of dairy farmers in attendance were now using some sexed and some beef semen. More were considering it. Our model shows that this will improve profitability by \$15/cow/year. This is a 5.8 percent increase in total herd profitability which, for a 100 cow herd is a \$1,500 increase in profitability.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Development of new crop varieties will help Minnesota growers improve profitability

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2012

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Over the years, U of M barley breeders have developed Minnesota barley varieties with disease resistance and desirable malting quality, essentially creating the Minnesota barley industry. New genomic techniques can help shorten the breeding cycle time to produce varieties and keep the industry healthy.

What has been done

MAES supported barley breeding and genetics researchers have been using genomic selection to select early generation lines for improved Fusarium head blight disease resistance and higher yields. In 2012 barley breeders completed the third cycle of genomic selection on over 1400 plants and had 69 lines in advanced yield trials with resistance to Fusarium head blight. Four new variety candidates were advanced to the American Malting Barley Association pilot malting evaluation programs. A previous entry was rated satisfactory in two years of pilot malt evaluations and is now eligible for plant scale brewing evaluation.

Results

Developing new improved malting and feed barley varieties for the Midwest improves farmers' profitability and helps to create a reliable grain supply for the malting and brewing industries. There were over 390,000 acres planted to Minnesota barley varieties in Minnesota and North Dakota in 2012. The new variety Quest was grown on 6,000 acres in 2012. Quest has about a 50 percent reduction in Fusarium head blight disease.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
204	Plant Product Quality and Utility (Preharvest)
212	Pathogens and Nematodes Affecting Plants

Outcome #9

1. Outcome Measures

Research will provide growers with strategies to defend their crops against new and re-emerging pests.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2012

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Recently, infestations of rootworm, known as the \$1 billion insect because of its cost to farmers, have exploded. Farmers in virtually every Minnesota county south of the Minnesota River have reported problems with the pest, especially where corn has been planted in the same field year after year. With the state's most valuable agricultural commodity at risk, MAES researchers have been working to get a handle on the developing problem.

What has been done

Researchers have determined that increasing nitrogen fertilization rates diminished root injury from corn rootworm and increased yields. However, the relationship between nitrogen and corn rootworm survival, damage and yield is complicated by the various effects of nitrogen on larval colonization and competition, plant quality, and Bt-RW protein expression. Planting date effects on yield were confounded by severe drought conditions.

Results

U of M researchers collaborated with Extension IPM specialists to develop a publication that discusses corn rootworm trait resistance. They also produced a website dedicated to corn rootworm scouting. Rootworms can be controlled to some extent by pesticides and crop rotation, but history has shown that rootworm species have adapted to both, so the management plan has to be more complex.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

- 212 Pathogens and Nematodes Affecting Plants
- 216 Integrated Pest Management Systems

Outcome #10

1. Outcome Measures

Research on animal housing systems will provide information to producers on best management practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2012

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Market forces are rapidly driving big changes in housing systems for pregnant sows. Pork producers are wondering how to successfully transition from gestation stalls to penned gestation systems within the confines of existing buildings.

What has been done

U of M researchers conducted a field study design of retrofitting an existing swine facility building to larger pens. They used records from 815 sows while investigating the consequences that may be related to retrofitting a gestation barn from stalls to pens without changing sow inventory.

Results

The study showed that litter size farrowed and weaned was not affected by gestation housing system. The results may be helpful in addressing consumer concern about swine housing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
306	Environmental Stress in Animals
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

Outcome #11

1. Outcome Measures

Research will provide information to support strategies to control animal diseases.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2012

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Staph infections are a big and growing problem both in human and animal populations, due to the emergence of multiple drug resistant isolates. Staph infections are also a major causative agent in bovine mastitis and causes \$2 billion dollars in losses annually in the U.S.

What has been done

Given this rapidly emerging problem and the decreased efficacy of currently available antibiotic therapy, researchers have been looking for an alternative approach to combat these infections by understanding the molecular and cellular pathogenesis of these infections and finding new preventative and/or therapeutic agents. Researchers have adapted an advanced RNA sequence technology to study the infection in vitro culture, which has shown to be a useful tool.

Results

It allowed the researchers to extend this approach to identifying genes that show dramatically reduced expression during infection.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
311	Animal Diseases

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

No factors negatively affected outcomes. Teams worked to respond to natural disasters; economic forces and markets guided program content and design choices.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Crop and livestock production programs engage in in-depth evaluations for yearly events that have a broad impact and that will be repeated year to year. The goal of the evaluation is to measure whether the programs achieve their educational goals, and to determine whether programs can be improved in regard to marketing, target audience, logistics, content, teaching or structure.

Three such evaluations were managed in 2012. The Field School for Agricultural Professionals, the Research Update for Ag Professionals, and the 2012 Southern Wheat Tour. Beyond process evaluations findings, these evaluations demonstrated that:

1) Average learning gains for individual sessions ranged from .6 to 1.7. High gains in knowledge occurred for "Rust Diseases in Wheat", "Corn Rootworm Resistance Update" and "Bacterial Leaf Streak of Wheat."

2) The Research Update for Ag Professionals had an impact on 4.3 million acres across the state and surrounding regions, mostly from those professionals who would be disseminating new research findings through their jobs. The greatest knowledge gains were related to new research about plant disease and pesticides.

3) Average learning gains for the Southern Wheat Tour were + 1.53 points. Average behavior change scores were +1.04.

Generally, end-of-workshop surveys assess outcomes for crops and livestock educational opportunities. Pre-post questions determine the magnitude of learning gains, and participants are asked to indicate the likelihood they will change their behavior. Questions also ask for participants' logistical preferences regarding workshop offerings in an effort to better reach target audiences with future programming. Finally, demographic information is gathered to better understand who attends workshops and events.

Key Items of Evaluation

The University of Minnesota conducts yearly statewide events addressing timely topics in agriculture and crop production. Evaluations demonstrate that the management of these statewide events provide useful information and accomplish valuable learning gains and change behaviors that enhance profitability and environmental protection. In 2012, one such event had an impact on 4.3 million acres in the North Central region.