V(A). Planned Program (Summary)

Program # 18

1. Name of the Planned Program

Horticulture

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	5%		10%	
132	Weather and Climate	5%		5%	
201	Plant Genome, Genetics, and Genetic Mechanisms	5%		25%	
204	Plant Product Quality and Utility (Preharvest)	20%		10%	
205	Plant Management Systems	50%		25%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		15%	
213	Weeds Affecting Plants	5%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	13.8	0.0	40.2	0.0
Actual	8.2	0.0	64.6	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**
465448	0	659750	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1548243	0	6567249	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
893315	0	7766997	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In 2010 MAES research continued to make progress in providing new cold hardy fruits, flowers and woody plants to support Minnesota's horticultural industry and gardeners. Research also progressed on Minnesota's major horticultural crops, including potatoes, sweet corn and other vegetables. Some results of research this reporting year:

- Three recent rose cultivars, Northern Accents Lena, Ole and Sven continue to sell well in retail nurseries in the upper Midwest. Crosses, evaluations and selections of deciduous azalea and broad-leafed rhododendron in Minnesota represent the most comprehensive effort to develop USDA Zone 4 hardy cultivars for the upper Midwestern U.S. landscape nursery industry.
- Traditional approaches to invasive horticultural crop control have had limited effectiveness because these approaches do not address the industry's complexities and economic incentives. Research on contributing factors and risk assessment points to the need for consumer education.
- The use of polymer coated urea in vegetable and fruit crop production has increased in recent years to increase nitrogen use efficiency. However, the polymer is susceptible to fracturing or cracking. Research on best management practices has given growers different methods of application to reduce damage of the coating.
- Research as part of a North Central project to address the emerald ash borer infestation has led to recommendations used to develop local management guidelines in Minnesota.
- A new patented little bluestem grass variety is being propagated by several growers and work is underway to license this cultivar in Europe.
- Work on several fronts is continuing to study the advantages of high tunnel growing of fruits and vegetables, and is supporting Extension efforts discussed further under outcomes. One recent finding of research is that the protection from rain and wind in high tunnels allows for significantly higher yields.
- Potato breeders have been exploring cryotherapy as a method to eliminate potato viruses in vitro. They have had success regenerating four lines using this technology. Cryotherapy has the potential to reduce the virus eradication time-line by up to 1.5 years.
- Applying comparative genomics methods to identify disease resistance genes found in wild potato species has been fruitful. Researchers now have a library of more than 100 candidate disease resistance gene sequences isolated from a disease resistant wild potato.

Horticulture programs at the University of Minnesota Extension mobilize citizens to create green space where they live, work and play. Special projects this year brought community groups together to beautify schools, public housing facilities, neighborhood spots where gardens now grow, and even prison settings. Commercial horticulture programs have created a strong horticulture industry. Outcomes from commercial horticulture initiatives this year have improved the earning power of minority farmers, growers taking advantage of new technologies, and the food processing industry.

2. Brief description of the target audience

Audiences for commercial horticulture education and research are fresh market producers, including growers of fruits and vegetables for processing, the processing industry, associated agribusiness turf professionals, nurseries and garden centers, and landscape professionals. Several of these groups have high representations of new immigrants.

Audiences for consumer horticulture programs and research are those who grow in yards, gardens, landscapes and community spaces.These include audiences where information is needed in a timely fashion and those who want to build basic knowledge about horticulture and environmental stewardship over time.

Other specific research audiences include plant biologists, geneticists and pathologists, state and regional fruit and flower growers, vegetable processors, potato growers, the local regional and national wine industry, nurseries and beekeepers.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	143600	70000	5200	0
Actual	296611	1600000	107840	0

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

Patent Applications Submitted

Year: 2010
Plan: 1
Actual: 2

Patents listed
20100013 MN Prairie Junegrass Population 1
20100122 MN Albino Blueberry

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Plan	1	32	
Actual	19	40	59

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Workshops, classes and seminars will provide information to targeted audiences. (Target expressed as number of events.)

Year	Target	Actual

2010	160	8732

Output #2

Output Measure

- Master Gardeners, trained by Extension, will deliver hours of educational service to the residents of Minnesota. (Target expressed as the number of volunteer hours committed by Master Gardeners in a year.)

Year	Target	Actual
2010	103100	137381

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Participants of Horticulture program events will achieve significant learning gains regarding horticulture. (Target expressed as the percentage of participants who achieved learning gains.)
2	Participants of Horticulture program events intended to improve participant horticulture practices will improve practices as a result of attending events. (Target expressed as a percentage of participants that changed one or more horticulture practice.)
3	Growers will continue to adopt high tunnel technology to expand their growing season. (Target expressed as number of high tunnel users.)
4	Wine grape research will provide growers with cold hardy varieties to support the U.S. wine industry.

Outcome #1

1. Outcome Measures

Participants of Horticulture program events will achieve significant learning gains regarding horticulture. (Target expressed as the percentage of participants who achieved learning gains.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	60	80

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
One example of educational outreach to growers is programming for local and immigrant farmers. Due to an influx of new immigrants and increased unemployment, more are investigating the possibility of producing fruits and vegetables to supplement incomes. Education makes these growers aware of risks and benefits and informs decisions. Also, as Americans add more fresh fruits and vegetables to diets, safe handling in production and distribution is important.

What has been done
Through educational conferences for Minnesota growers of small fruits, apples, potatoes and diverse vegetable crops, novice and experienced growers increased profitability and enhanced food safety. At least 70 conference participants were new immigrants. Also, tomato variety trials were performed at a farm operated by the Minnesota Food Association, which works with immigrant farmers.

Results
Over 40 percent of program participants who were not currently farming stated that what they learned would help them initiate new farming practices, especially in relation to disease management and getting safe and high-quality produce to market. Also, 50 - 80 percent of attendees at the annual fruit and vegetable growers' conference stated that the programs would help them initiate new practices, including ways to save energy, good agricultural practices and growing root crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

204	Plant Product Quality and Utility (Preharvest)
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #2

1. Outcome Measures

Participants of Horticulture program events intended to improve participant horticulture practices will improve practices as a result of attending events. (Target expressed as a percentage of participants that changed one or more horticulture practice.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	50	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Industry professionals need to connect with research to understand latest developments that affect the processing of, for example, sweet corn, peas, corn, beets, carrots and potatoes. Processors can apply information about production efficiency, environmental sustainability and emerging issues such as herbicide label changes, antibiotic update potential from manure-applied soils, and more.

What has been done
Members of the horticulture team developed and delivered a tri-state conference (Wisconsin, Minnesota and Illinois) sponsored by the Midwest Food Processors Association. Over 100 representatives from processing companies located throughout the region participated in the two-day conference. A field day was held in June, and ongoing research was discussed.

Results
The impact of the partnership has led to greater production efficiencies through the adoption of new integrated pest management strategies and reduced inputs without compromising quality. The processing industry has reduced by half insecticide use on sweet corn, with an estimated cost savings of $1.6 M per year. The information generated has also had a positive influence on policy that impacts the industry's competitiveness. Processors estimate that research alone saves them $10 / acre on $5,000 acres per year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
204	Plant Product Quality and Utility (Preharvest)
211	Insects, Mites, and Other Arthropods Affecting Plants
213	Weeds Affecting Plants

Outcome #3

1. Outcome Measures

Growers will continue to adopt high tunnel technology to expand their growing season. (Target expressed as number of high tunnel users.)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	250

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Harsh and long winters challenge the profits of growers of fruits and vegetables in Minnesota. High tunnel technology allows growers to bring produce to market sooner and to continue production later in the season, potentially giving a higher return. This is a relatively new production practice in Minnesota, meaning that growers and other interested individuals have not had access to information about how to implement the technology and practice.

What has been done
The horticulture team conducts educational programs to advance skills in high tunnel use. Additionally, to continue to educate growers the team developed a web site to make research information available quickly. (http://hightunnels.cfans.umn.edu) Videos and list-serves also reach interested users. Working with the USDA Natural Resource Conservation Service, the team is teaching growers about cost sharing through the EQUIP program in Minnesota, which makes high tunnels more economically feasible.

Results
As a result of these efforts, the number of high tunnels in Minnesota has grown in the past two

years from less than 100 to over 250. Growers in northern Minnesota are now selling high tunnel-produced tomatoes and are enjoying increased annual income.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
205	Plant Management Systems

Outcome #4

1. Outcome Measures

Wine grape research will provide growers with cold hardy varieties to support the U.S. wine industry.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The northern U.S. wine producers needs hardy varieties that produce quality wine to build their industry and meet consumer demand.

What has been done
MAES supported research to develop cold hardy wine grape varieties has produced several varieties that have been enthusiastically accepted by growers and vineyards. Marquette is a descendant of the pinot noir and can survive temperatures as low as 35 degrees below zero. La Crescent is another extremely cold-hardy grape with excellent quality. Frontenac gris, the white wine version of Frontenac, one of the first of the wine grape releases, is also very popular.

Results
Marquette has been planted in wineries from New York to California. One Minnesota winery uses Frontenac gris to produce a wine they've labeled "Minnesota Nice Wobegon White." This wine was recently selected "Best Minnesota White Wine" by Minnesota Monthly magazine. La Crescent's popularity is growing all over the Northern U.S., with vineyards producing great examples from Minnesota, Michigan and Vermont. One vineyard won the Minnesota Governor's Cup at the 2010 International Cold Climate Wine Competition. La Crescent is being introduced

overseas, most recently in China.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
204	Plant Product Quality and Utility (Preharvest)

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (Improved data collection process.)

Brief Explanation

The numbers of persons served by horticultural programs are increased because more educators and specialists are reporting educational events to an on-line data management tool. Master Gardeners' data base has also improved its data collection.

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

1. Evaluation Studies Planned

- Retrospective (post program)
- Case Study

Evaluation Results

Key Items of Evaluation