V(A). Planned Program (Summary)

1. Name of the Planned Program

Agricultural Viability

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
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<th>% 1890 Extension</th>
<th>% 1862 Research</th>
<th>% 1890 Research</th>
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V(C). Planned Program (Inputs)

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

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<thead>
<tr>
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<th>Research</th>
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</thead>
<tbody>
<tr>
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2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

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<tr>
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<tr>
<td>1890 All Other</td>
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</table>

V(D). Planned Program (Activity)

1. Brief description of the Activity
Identify critical programmatic foci/needs based on Extension and stakeholder assessment. These can be broadly defined under three areas:

- Production BMPs (nutrient, pest, waste/by-products management, water quality and quantity, energy)
- Financial BMPs (marketing, labor, risk management, policy e.g. farmland preservation)
- Ag Systems (sustainable ag, organic ag, new crops and use/alternative)

Develop an inventory of local (county based), regional and statewide programs designed to meet these needs; identify team members and their roles.

Create a multi-task effort to generate and share research-based information with clientele through demonstrations, educational meetings and workshops, certification programs, trainings, development of recommendation and decision making guides, etc.

2. Brief description of the target audience

Stakeholders (broadly defined to include producers, processors, marketers, end-users, policymakers, legislators)
- Commercial agriculture producers and end-users (such as marketers, processors, consumers, etc.)
- Municipalities and other governmental and non-governmental agencies, etc.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

<table>
<thead>
<tr>
<th>Year</th>
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<th>Direct Contacts Youth</th>
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2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

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</table>

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

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<th>Extension</th>
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<th>Total</th>
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<tbody>
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<td>64</td>
<td>0</td>
<td>64</td>
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</table>

V(F). State Defined Outputs

Output Target

Output #1

Output Measure
- 166 articles in non-refereed journals, proceedings and abstracts; 492 professional presentations; 324 extension publications, popular press newsletters and fact sheets.

<table>
<thead>
<tr>
<th>Year</th>
<th>Target</th>
<th>Actual</th>
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</thead>
<tbody>
<tr>
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### V(G). State Defined Outcomes

<table>
<thead>
<tr>
<th>O No.</th>
<th>Outcome Name</th>
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</table>
| 1 | Short Term Increases in knowledge and skills of agricultural and horticultural industry professionals will occur.  
  - Nutrient management  
  - Pest management  
  - Waste/by-products management and utilization  
  - improving water quality and conserving water  
  - conserving energy  
  - marketing skills  
  - labor management  
  - risk management  
  - policy e.g. farmland preservation  
  - sustainable ag and organic ag production methods  
  - new crops and use/alternative crops |
| 2 | Medium Term Productive agricultural land is stabilized to meet the needs of the agricultural industry and the "open space" needs of people in NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food. |
| 3 | Long Term New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically. |
| 4 | Short Term - Increases in knowledge and skills of agricultural and horticultural industry professionals will occur. - Nutrient management - Pest Management -Waste/by-products management and utilization -Improving water quality and conserving water - conserving energy - marketing skills - labor management - risk management - policy e.g. farmland preservation - sustainable ag and organic ag production methods - new crops and use/alternative crops. |
| 5 | Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the 'open space' needs of people in NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). - Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. - Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. - The products of NJ agriculture will add to the nutritional quality of New Jerseyans food. |
| 6 | Medium Term Productive agricultural land is stabilized to meet the needs of the agricultural industry and the 'open space' needs of people in NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food. |
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Long Term - New Jersey's agriculture will remain viable and important industry. - New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

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- New Jersey's agriculture will remain viable and an important industry. - New Jersey residents will recognize importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
Agricultural Viability

Outcome #1

1. Outcome Measures
   Short Term Increases in knowledge and skills of agricultural and horticultural industry professionals will occur.
   • Nutrient management
   • Pest management
   • Waste/by-products management and utilization
   • improving water quality and conserving water
   • conserving energy
   • marketing skills
   • labor management
   • risk management
   • policy e.g. farmland preservation
   • sustainable ag and organic ag production methods
   • new crops and use/alternative crops

2. Associated Institution Types
   • 1862 Extension

3a. Outcome Type:
   Change in Knowledge Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
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3c. Qualitative Outcome or Impact Statement
   Issue (Who cares and Why)

   What has been done

   Results

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
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<tbody>
<tr>
<td>215</td>
<td>Biological Control of Pests Affecting Plants</td>
</tr>
<tr>
<td>604</td>
<td>Marketing and Distribution Practices</td>
</tr>
<tr>
<td>601</td>
<td>Economics of Agricultural Production and Farm Management</td>
</tr>
</tbody>
</table>

Outcome #2

1. Outcome Measures
   Medium Term Productive agricultural land is stabilized to meet the needs of the agricultural industry and the "open space" needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseys food.

2. Associated Institution Types
   • 1862 Extension
3a. Outcome Type:
Change in Action Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
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<th>Year</th>
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</table>

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
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</thead>
<tbody>
<tr>
<td>215</td>
<td>Biological Control of Pests Affecting Plants</td>
</tr>
<tr>
<td>601</td>
<td>Economics of Agricultural Production and Farm Management</td>
</tr>
<tr>
<td>604</td>
<td>Marketing and Distribution Practices</td>
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</tbody>
</table>

Outcome #3

1. Outcome Measures

Long Term New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

* 1862 Extension

3a. Outcome Type:
Change in Condition Outcome Measure

3b. Quantitative Outcome

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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

<table>
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<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
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</thead>
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<tr>
<td>215</td>
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<tr>
<td>604</td>
<td>Marketing and Distribution Practices</td>
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</table>
Agricultural Viability

Outcome #4

1. Outcome Measures
   Short Term - Increases in knowledge and skills of agricultural and horticultural industry professionals will occur. - Nutrient management - Pest Management - Waste/by-products management and utilization - Improving water quality and conserving water - conserving energy - marketing skills - labor management - risk management - policy e.g. farmland preservation - sustainable ag and organic ag production methods - new crops and use/alternative crops.

2. Associated Institution Types
   • 1862 Extension

3a. Outcome Type:
   Change in Knowledge Outcome Measure

3b. Quantitative Outcome

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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Northeast Small Farm & Rural Living Expo & Trade Show

The Northeast Small Farm & Rural Living Expo and Trade Show (a.k.a. Expo) is an educational program designed, planned and delivered by Extension Agents from three universities—Rutgers, Penn State and Cornell. The scope of the Expo is to provide a vertically integrated educational program for the relatively new and ever growing 'small farm' interests in the northeast served by the three universities. The vertical integration of the Expo is designed to provide multiple programming in Extension educational based workshops and lectures combined with demonstrations from existing service related industries and small farm entities. Many of the new small farm audience due to their non agricultural background, do not know about Extension and the Extension mission(s) that can assist them as they pursue their small farm experience. Additionally, the small farm producers bring non-agricultural resources and dollars to the regional agriculture infrastructure and economy. Extension can provide valuable education and guidance to the small farm producers to help them be successful in their small farm endeavors.

What has been done

The Expo has been held annually since 2001 in all three states (twice in New Jersey and New York and three times in Pennsylvania) and has attracted over 22,000 participants from eleven states and four countries. The Expo was developed and designed to present educational and extension research based information combined with hands-on programming and real world opportunities for a diverse small farm audience across the state and region. Support agencies and service providers participate as exhibitors and quite often provide added lectures and demonstrations for the small farm producers. Over the last seven years, the Expo has presented over 700 educational programs/lectures given by Extension professionals, industry leaders and small farm producers. Over 900 volunteers have assisted over the seven years with over 375 businesses and agencies providing support and networking opportunities for the small farm producers. Extension personnel and support agency personnel serve on the annual planning committee from each respective state where the Expo is to be held, along with Extension personnel from the other two state universities. New Jersey has over 9,000 farms based on the farm tax assessment records of which over 90 % would be considered 'small' and over fifty percent or more of them would fall in our target audience. Generally, the attendance at the Expo has been made up of new producers who have just acquired small acreage and want to start a small farm enterprise, potential producers who are just beginning to explore the 'small farm dream' and existing small farm producers and even large farm producers that are looking for new enterprises to complement or improve on their farming endeavor. Those attending represent traditional, organic and niche producers. To date over 26,000 participants have attended the seven Expo's. In 2006, over 15,000 people visited our web page two weeks prior to the event held in New Jersey. In addition an expanded 'youth' program emphasis has been developed to involve youth at the event, both as participants and as spectators.

Results
To evaluate the impact of the Expo, an exit card questionnaire was designed that established a random mailing list from participants that attended the annual multi-state Expo. The post cards were either turned in upon exiting the Expo or were mailed back. Door prizes were administered to encourage the filing of the exit card with a return of 250 to 350 cards annually. Approximately three months after the Expo a questionnaire was mailed out to the exit card list to measure the impact or changes resulting from attending the respective Expo. To date four major reasons for attending the respective Expo’s have been recorded by the producers/participants:

* starting a small farm
* explore small farm opportunities
* improve management capabilities
* explore methodologies to enhance country living

Furthermore participants identified specific issues or concerns that they would change or became aware of after attending the seven Expo’s:

*64 % agreed that they had identified alternative or new commodities
*77 % indicated that they had interacted and learned from others participating at the Expo

*30 % said they would develop a production and marketing plan
*60 % indicated they developed a better understanding and awareness for support agencies
*51 % indicated they had improved their knowledge on evaluating building and equipment needs
*49 % indicated they had improved their knowledge for marketing
*53 % indicated they were able to take actions that improved their production skills
*63 % indicated they had taken actions to improve their profitability and sustainability

As a direct result of attending the Expo’s, participants indicated they had take the following actions based upon the knowledge or information presented at the Expo:

*purchased livestock to better fit their small farm plan
*purchased equipment more appropriate to their small farm needs
*purchased items to assist them with living in the country
*purchased land better suited to their small farm plan and need
*contacted agricultural service agencies for information
*contacted specific growers and producers for more detailed information geared to their small farm goals
*contacted commodity or breed organizations
*performed specific activities related to exhibits, lectures and demonstrations presented at the Expo that would improve on production and marketing skills
*gained knowledge and awareness of Extension and other support agencies

The majority of participants that attended the annual Expo’s said they did so to gain knowledge that would assist them in making their small farm enterprise successful and to network with other producers and support agencies.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>601</td>
<td>Economics of Agricultural Production and Farm Management</td>
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<tr>
<td>604</td>
<td>Marketing and Distribution Practices</td>
</tr>
<tr>
<td>215</td>
<td>Biological Control of Pests Affecting Plants</td>
</tr>
</tbody>
</table>

Outcome #5

1. Outcome Measures

Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the ‘open space’ needs of people in NJ. - Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). - Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. - Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. - The products of NJ agriculture will add to the nutritional quality of New Jerseyans food.

2. Associated Institution Types

• 1862 Extension
Agricultural Viability

3a. Outcome Type:
   Change in Action Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantitative Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>(No Data Entered)</td>
<td>0</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Reducing Greenhouse Energy Use by Investing Current and Alternate Technologies

Controlled environment plant production systems (greenhouses and growth chambers) are used worldwide to produce high quality plant material (produce, floriculture-, and nursery crops). Rising energy prices have made a significant impact on the profitability of many greenhouse operations. Engineering information and solutions can help growers reduce energy use and operating costs. Alternative energy sources need to be investigated for potential applicability and economic return. Some of the technologies involved require relatively high initial investment costs. Therefore, research is needed to determine the best possible applications before growers are able to make informed investment decisions.

What has been done
Original research was conducted at the open-roof greenhouse located on Hort Farm 3 (Cook Campus, New Brunswick, NJ) investigating the energy flows associated with the operation of a greenhouse floor heating system. Extensive measurements were collected and used for a computer simulation model that evaluates temperatures and heat distribution throughout the crop environment. The research resulted in the publication of a peer reviewed publication and a trade journal article, and these recommendations for the design and operation of greenhouse floor heating systems can directly be applied by greenhouse growers. Invited presentations on greenhouse energy conservation strategies were conducted at out-of-state extension meetings/workshops (OFA and PPA in Columbus, OH and in Hiroshima, Japan). For both OH meetings, energy audit checklists were developed that growers can use to evaluate their operations and/or to make smart energy decisions about retrofits and/or new construction. Research was conducted and is continuing on three alternative energy projects funded by the New Jersey Department of Environmental Protection (landfill gas fired microturbines used for heat and power production at the NJ EcoComplex greenhouse in Bordentown, NJ), New Jersey Board of Public Utilities (state-wide bioenergy and related technology assessment), and the Rutgers Equine Science Center (digestion of horse manure).

Recent renewal of interest in energy requirements for greenhouses has prompted a series of presentations around the US and abroad on conservation and alternatives. Commercial greenhouses that have adopted most practices developed under the predecessor projects of NE1017, including gutter connected double IR inhibited poly structures with movable insulation and floor heating require about one tenth the heating energy of the average Ohio greenhouse in 1979. Recent efforts to further reduce fossil fuel requirement have focused on designing systems with heat pumps contributing to the first increment of base load heating. Using a spreadsheet design approach with hourly weather data, the option of using storage so a small heat pump can operate 24 hours per day is shown to be advantageous. Utilizing the first increment of energy for floor heating at relatively low delivery temperatures maximizes the efficiency (coefficient of performance) of the heat pump. The feasibility of using the heat pump to cool water during the daytime with a heat exchanger for first stage cooling and storing the heat for night use in floor heating is also being investigated as a design option. Simulation with a Mid Atlantic composite hourly weather data set for a well insulated greenhouse indicate a system incorporating a heat pump delivering only 10 percent of peak heat requirement can provide 38 percent of annual heat requirements when drawing heat from the greenhouse when it requires cooling and from a ground source at other times. A system based on this design concept is under construction at a commercial greenhouse facility.

Results
Agricultural Viability

The original floor heating research has resulted in a M.S. thesis, a peer-reviewed publication, a trade journal article, and has contributed to a soon-to-be released revision of the Rutgers Cooperative Extension Root Zone Heating Extension Bulletin. An energy audit checklist was developed for commercial greenhouse operations. The checklist has been distributed throughout the northeast and beyond. Growers who implemented the information resulting from the research and the various presentations and publications have been able to (conservatively) realize energy savings between 5 and 30%.

Updating and disseminating energy conservation information is helping to further reduce dependence on scarce fossil fuel resources. Incorporation of heat pump technology to take advantage of heat storage to provide both heating and cooling can reduce total energy requirements.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>601</td>
<td>Economics of Agricultural Production and Farm Management</td>
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Outcome #6

1. Outcome Measures

Medium Term Productive agricultural land is stabilized to meet the needs of the agricultural industry and the ‘open space’ needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

<table>
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agricultural Viability

Peach Production with Emphasis on Variety Development

The six county area served produces approximately 7,100 acres of peaches and nectarines (fuzzless peaches) with a 2007 production value of $33,000,000 and a tree value of $135,000,000. Approximately 45 commercial peach growers grow and market peaches for the wholesale and retail market. Ninety five percent of the peach crop is grown in this 6 county area.

New Jersey has a long history and tradition of producing peaches. The state for many years has ranked 4th or 5th in production measured by acreage and yields behind California, South Carolina and Georgia. In 2007 New Jersey was actually number 2 in the nation in total peach production.

New Jersey's climate and environment is conducive to the production of high quality peaches. The tree thrives and produces well in our temperate climate. Our sandy loam soils are ideal for the adaptability of peach trees. We generally have abundant rainfall to meet the crops moisture needs and have ample surface and ground water to supplement rainfall. Southern New Jersey is very close to large population centers that are a major advantage in marketing our crop profitably.

In spite of our climate we have difficulties with tree longevity since many of our peach soils have been planted with 3-4 generations of peach trees. Virgin peach soils are hard to find and some of our best peach land is now planted in houses. We also have a wide range of insects, diseases, nematodes, weeds and wild life that not only reduce peach tree health but also blemish and damage the fruit.

To sustain profitability and viability of our industry we must try and understand short life problems and all pests. Our orchards must be efficient and productive. We must also produce quality fruit of the best cultivars since competition is keen in our markets. The marketing season is only three months in southern New Jersey and peaches have a very limited shelf life after harvest.

To sustain this industry we focused on research and education to keep our peach orchards healthy and productive. We conduct research to help our growers produce high quality fruit in a cost effective manner. We conduct research and deliver educational information to help them harvest, handle and store peaches to meet the needs of a competitive market.

What has been done
NJAES faculty and staff supported the following programs:

Pest Management Research and Outreach: Three specialists conduct applied peach research in weed science, tree fruit pathology, and fruit entomology all effectively combating pest problems. Information on their accomplishments and recommendations was delivered at our Mid Atlantic Fruit and Vegetable Convention and Trade Show to 980 fruit growers. In depth information by these specialists was also presented at our South Jersey Fruit meeting to 73 growers. Also held were three twilight and evening fruit meetings and delivered information to 148 growers. Our early summer tour and fruit research meeting was held for 111 growers.

The IPM fruit program associate and IPM fruit agent were involved in diagnosing pest problems and reading and making fertilizer recommendations to 50% of my growers who produce 80% of the peaches.

Pomology and Soil Science Research and Outreach: The extension pomologist conducted applied research on the testing and evaluation of fruit cultivars; the post harvest physiology and evaluation of peaches; the effect of cable girdling on early maturing peach varieties, and the effect of Retain(r) on peach drop and maturity. We also develop and deliver information on other horticultural practices. We have also delivered educational information at these meetings and through our New Jersey Peach Festival with over 30,000 people (including growers and all our legislators in our district) attending, and our fruit variety showcase with 65 growers, breeders and nurserymen in attendance. Our Fruit Breeder at the New Jersey Agricultural Experiment Station and our soils specialist at NJAES Cooperative Extension also participated in one evening fruit meeting and the Fruit Variety Showcase. We are in the process of introducing 7 new peach varieties with our breeder.

88 field visits to orchards and packing houses were made not only to diagnose grower problems and make recommendations, but also conduct field research.

Writing and Publication: Educational information is delivered to 80 of the states peach growers and 390 other growers, researchers, and allied industry people and 14 agricultural libraries through the publication 4 times per year of New Jersey Horticultural News. 16 articles on fruit science were published to assist these growers through this magazine. Seven of these articles were on peach science.

One hundred and thirty copies of the 2007 Commercial Tree Fruit Production Guide were sold and distributed in the six county area.

Five new information fact sheets on fruit varieties and variety sourcing are in review for publication to growers and allied industry. One fruit variety release has been written for publication office and is being reviewed.

A newsletter called Plant Pest Advisory Fruit is produced and mailed to 235 subscribers by e-mail, ground mail and fax. An additional 1850 hits and downloads were received in 2007 on the newsletter at our RNJAES web site. 16 articles have been written for the newsletter and submitted another 22 for publication to help growers. Four other specialist have written five articles and a regular pest management update is written by the IPN Fruit Agent and his Program Associate.

Six issues of Gloucester Grower News was also written and mailed to 290 growers (45 fruit growers) in 2007. The newsletter contains general information on agricultural management to assist fruit farm viability. The newsletter is also posted on the RNJAES website and received 940 downloads in 2007. Four invited presentations were made to out of stage growers in 2007.

A peach science website is updated regularly with peach information for growers and allied industry. A County NJAES/Cooperative Extension website is updated and maintained with 87,000 visits annually and contains much information on peach programs and other agricultural activities.

Results
Agricultural Viability

We have improved our production efficiency (yield per acre) but due to low temperatures during bloom in the spring our volume was reduced in 2007. Peach prices were lower by about 1.2 cents per pound in 2007.

The challenges are many for our New Jersey growers, but our peach science research and outreach production program has stabilized the industry.

We have continued to be very successful in evaluating and introducing new cultivars. Based on informal survey with fruit trees nurseries all of the major varieties planted in New Jersey are the result of our peach and nectarine cultivar research program. The ten most important yellow- fleshed planted by NJ growers are in relative order of importance: John Boy, Flamin Fury(r) PF24-007, Laural, Encore, Sentry, Bounty, Flamin Fury(r) PF 23, Flamin Fury(r) PF 17, Flamin Fury(r) PF 27A, and Flame Prince. Two new yellow fleshed peaches developed by the RNJAES Messina(tm) and Gloria(tm) are being heavily planted in 2007 and 2008 with over 5000 trees planted and ordered. Other varieties heavily planted as a result of our research and recommendations ate Glenglo, GaLa, Flamin Fury(r) PF 7, Flamin Fury(r) PF Lucky 13, Flamin Fury(r) PF Lucky(r) 24C, Contender, Autumn Star, Flamin Fury(r) PF 28-007 and Victoria(tm). Yellow-fleshed peaches make up 88% of our production volume.

We have also made major impacts in researching novel and other types of peach varieties now recommended to our growers. The production of nectarines has declined slightly because of pest management problems but two varieties researched and tested by us for growers are the yellow fleshed varieties Easternglo and Flamin Fury(r) PF 11; and the white fleshed varieties; Arctic Star, Arcticglo, Arctic Sweet, Arctic Jay, and Arctic Pride.

Our research continues to make an impact in the slow resurgence of white-fleshed peach varieties. From our research and recommendations growers continue to plant Spring Snow. White Lady, Klondike, Sugar Giant and Snow Giant. We also see a slight increase in plantings of flat peaches with Saturn(r) and the newly developed varieties from our NJAES program; NJ 14, NJ 15, NJ 16, and NJ 17. We know almost 900 trees of these new flat peach varieties have or will be planted in 2007 and 2008. Our research and recommendations on peach cultivars are the basis of peach plantings in the Mid Atlantic states.

Our peach research program on pest management has a major impact on peach plantings and sustainability in southern New Jersey. Our "Production guide" is the main source of peach information, it is a best management practice document used by the State Agricultural Development Committee. Ninety percent of our growers follow weed management programs utilizing the pesticides we evaluate and recommend. Because of the high incidence or pest pressure 99% follow our ongoing pest management recommendations for disease and insects. We have improved the control of diseases like brown rot, peach scab, rusty spot, and bacterial spot resulting in better fruit quality and tree health. We have improved the identification of varieties with natural tolerance, or susceptibility to rusty spot and bacterial spot. We have developed many alternatives in insect management through the use of better ground cover management, and insect pheromones and mating disruption to reduce insecticide applications.

We are learning more about fruit drop, thinning, fruit sizing and the handling and storage of peaches to lengthen the market season with high quality varieties.

All of these have helped the viability and sustainability of our peach industry. Our targeted and integrated pest management practice and our recommendations recommending less fertilizer usage have reduced cost and non-point source pollution in soils and waters.

4. Associated Knowledge Areas

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Outcome #7

1. Outcome Measures

Medium Term Productive agricultural land is stabilized to meet the needs of the agricultural industry and the 'open space' needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food.

2. Associated Institution Types

• 1862 Extension
3a. Outcome Type:
   Change in Action Outcome Measure

3b. Quantitative Outcome

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3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

Specialty Crop Production and Marketing

Economic opportunities have arisen in the last decade for specialty crop agriculture catering to the diverse consumer markets along the eastern coast of the United States. The rapid expansion of ethnic populations and a consumer demand for specialty and organically grown foods presents significant opportunities for fruit and vegetable producers in the region to take advantage of the comparative advantages associated with close proximity to densely populated areas. In response to a need for East Coast farmers to remain economically viable, a U.S. Department of Agriculture, National Research Initiative study was initiated to document and quantify the current available market opportunities so that farmers may engage the market by growing crops targeted from a demand perspective. In response to strengthening NJ commercial specialty crop production and marketing, an NJVGA grant was awarded for specialty tomato research which is needed to counteract the crashing markets for commodity tomato varieties.

**What has been done**
Analysis of 2006 consumer survey data continued through 2007. New specialty crop production data from years 2006 and 2007 were assessed to better determine agricultural activities. The Wats Room Incorporated (WATS), was contracted to conduct 1,355 telephone interviews using Computer-Assisted Telephone Interview (CATI) technology. Qualified (bi-lingual) interviewers received on-site Human Subjects Certification Program (HSCP) training, per Federal-wide Assurance guidelines, in addition to survey-specific training and practice, prior to conducting actual interviews. Over 13,000 potential interviewee leads were utilized by WATS in order to meet the sample size requirements.

Despite the competitive disadvantages relative to year-round producers in lower production cost areas, significant comparative advantages exist for local East Coast growers as a result of densely populated areas rich in ethnic diversity and subject to rapidly changing food trends. It has become increasingly necessary for these producers to adopt new crops and create new value-added opportunities in order to remain economically viable. Growing ethnic crops, classic vegetables and local organic produce present opportunities for producers to exploit existing comparative advantages associated with serving densely populated local markets in order to sustain farming operations and increase profitability. The coordination of production and marketing are critical to avoid the threats of rapid over-production (which can quickly lead to an oversupply of a particular product and depressed prices) and overcome inadequate marketing infrastructure in order to move product into community markets. Establishing and extending existing cooperative marketing memberships or affiliations along the East Coast, from North to South, can create an improved market system that provides appropriate year-round supplies to the area.

The general objectives of our USDA-NRI study were to:
1) identify and estimate the market size for ethnic segments that present significant opportunities to local growers; 
2) assess demand, conduct production studies, and make recommendations for appropriate ethnic produce items to locally address this market; and
3) develop strategies and production timelines to coordinate production of select ethnic crops to exploit this market niche.

The intended outcome of the project was to generate and distribute science-based information about production, marketability, and utilization of selected ethnic crops and herbs. This initiative bridges the supply-demand gap and expects to deliver practical solutions to economic problems faced by many vegetable growers, and contribute to the nutritional and health needs of regional consumers.

After completing the first phase of the ethnic produce project related to consumer survey results, the second phase focused on crop production research and demonstration. The four primary objectives of this phase were to:
1) establish a common set of field demonstration and research plots in each collaborating state; 
2) demonstrate and evaluate a variety of ethnic crops grown at each site;
3) conduct case-studies of specialty-ethnic produce growers; and communicate ethnic crop production information to advisors and growers via presentations, tours, websites, fact sheets, articles, and other forms of informational literature.

The general objective of our NJ specialty tomato studies over the last five years now focuses on developing a flagship product - the New Jersey bred Ramapo tomato with classic Jersey Tomato taste.

Results
The results of the produce expenditure data from 1,084 surveys completed by ethnic produce purchasers, combined with the expertise of local crop specialists provided the tools necessary to prioritize crops for subsequent production research. The survey results were used by our USDA/NRI team to Assess Demand and Supply of ethnic vegetables and rank them by ethnicity. Results of the USDA-NRI survey of 271 randomly selected East Coast consumers from each of the four ethnic groups were used to rank the crops included in the questionnaire, within ethnicity, according to expenditure and/or purchase data. Multiple criteria were established to rank produce items according to: (1) mean (weekly) expenditures across all respondents (including zero purchases); (2) mean (weekly) expenditures across only respondents purchasing that item (excluding zero purchases); (3) frequency of purchase across respondents (binary; 1 or 0 for purchase or non-purchase, respectively), (4) volume (number of pounds, bunches, or units) purchased by each respondent for each produce item; and (5) overall rank (average of results rankings #1 thru #4) for each produce item. A summary of all this comprehensive information was provided in 2007 via several PowerPoint presentations created to over 20 agricultural organizations. At least 50 farmers adjusted their planting intentions to better capitalize on high value specialty crops.

The outcome of the detailed survey results has led to an immediate new view of the ethnic consumer, their location and concentrations and their power. Considerable data has been developed for consumer produce expenditures of ethnic crops and consumer demographics. The crop selection process has identified over 100 ethnic crops of interest and through a rigorous process of elimination settled on a refined list of 42 crops (10 each for Asian-Indian and Puerto Rican and 12 for Chinese) to assess demand. A final list for field production research and demonstration was designed for seven field sites in New Jersey, Florida, and Massachusetts. Summer 2006 and 2007 demonstration and research trials were established by collaborators in Massachusetts and New Jersey on research farms. The trials included several commercially available cultivars of the selected crops blocked by ethnic market, crop type, and/or production system. Crop quality and yield parameters were measured and evaluated statistically to determine suitability for commercial production. For the 2006/07 trials, four demonstration crops and three research crops selected on previously described criteria were established at six sites located in three states along the East Coast: two in Florida, one in Massachusetts, and three in New Jersey.

Crop quality and yield parameters were measured and evaluated statistically for each site, with specific regard for cost factors, seasonal/monthly yield variations, and seed availability (imports or recently developed hybrids) in order to make recommendations for geographic sequencing of production, by month/season. This outcome starts the marketing plan to sustain a twelve month production supply in the Eastern United States in a cooperative venture to ward off the threat of imports into the East Coast to exploit local comparative advantages and to assess the ability to increase local supply during peak demand periods.

As a result of the research and communication program for transitioning to specialty organic production, such as organic farming presentations, farm demonstrations and farm visits, six new blueberry farms were assisted in transitioning to organic blueberry production totaling over 55 acres and over 10 organic vegetable farms were added. In addition new courses were added to the undergraduate curriculum on international and organic agriculture.

### 4. Associated Knowledge Areas

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### Outcome #8

#### 1. Outcome Measures

Medium Term Production agricultural land is stabilized to meet the needs of the agricultural industry and the ‘open space’ needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food.

#### 2. Associated Institution Types

- 1862 Extension
Agricultural Viability

3a. Outcome Type:
    Change in Action Outcome Measure

3b. Quantitative Outcome

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3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

Preserving Farmland in Bergen County

Farmland in Bergen County has been disappearing at an alarming rate. Pressures for development have brought about the loss of Bergen's farmland at a rate higher than the rest of the state due to higher value per acre of developable land. According to USDA census of agriculture Bergen has lost over 13% of its farms in the past 15 years. In 1992 there were 70 farms; in 1997 there were 63; in 2007 there are 61. Looking at the past century, there were 1600 farms in 1890 occupying more than half of the county's land. The agricultural legacy of Bergen County as a supplier of crops is lost to history.

While the ornamental industry and allied professions maintain a strong and viable presence, there is precious little farmland and much is in eminent peril of being lost.

**What has been done**

To prevent further loss of farmland to development. The County Agricultural & Resource Management Agent has educated farm families, county government and the general public about the Farmland Preservation Program (FP) and emphasize the value of farmland for open space, anti-erosion, wildlife habitat, and air quality enhancement.

He has maintained a high level of activity at the Bergen County Agricultural Development Board. Activities include:
- Yearly outreach to farmland owners informing them of the Farmland Preservation (FP) Program and promoting its benefits
- Developing market pieces (brochures and posters) and distributing them yearly to entice farm families to participate in FP; educate the public about the importance of supporting FP.
- Yearly reviewing of applications for FP and ranking the applicants according to state guidelines.
- Yearly visits to existing preserved farms and to new applicants.
- Prioritizing applicants and making recommendations to County Agricultural Development Board, then to State Agricultural Development Board for funding.
- Working with existing farms to help ensure economic viability and success. Providing Best Management Practices and pest control recommendations to solve problems.

**Results**

- In 2007, one more Bergen County Farm (Kohout) was successfully preserved under the FP program. This farm totals over 40 acres. With this, there are 7 preserved farms totaling over 300 acres, representing 30% of remaining farmland.
- $1500.00 expended by Bergen County Department of Planning to print 5000 brochures and 750 posters promoting Bergen County farms and the FP program. These have been distributed at all agricultural events and other appropriate opportunities.
- There is continuous promotion of FP program
- There is ongoing assistance to all farms for maximizing Best Management Practices, economic viability, and assisting with emerging problems such as drought, hailstorms, deer, etc.

4. Associated Knowledge Areas

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Outcome #9

1. Outcome Measures
Agricultural Viability

Medium Term Production agricultural land is stabilized to meet the needs of the agricultural industry and the 'open space' needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food.

2. Associated Institution Types

• 1862 Extension
• 1862 Research

3a. Outcome Type:
Change in Action Outcome Measure

3b. Quantitative Outcome

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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Enhancing the Economic Opportunities of the New Jersey Blueberry Industry

New Jersey has approximately 8,000 acres of highbush blueberries and is ranked second in total production and value in the USA. The value of this industry was $90.2 million in 2007 and is one of the most viable agricultural industries in New Jersey. The top priority for the program is to provide New Jersey blueberry growers with all they need to remain viable and stay on the cutting edge of technology. Blueberries are being grown in more parts of the USA and the world than ever before and as a result competition for markets is ever increasing. New Jersey growers must remain on the cutting edge of production methodology. Extension personnel are the primary source of this information.

What has been done

A series of grower meetings is in place. The primary audience for the program objectives are the New Jersey blueberry growers and aspiring growers. Grower participation has increased every year at all extension meetings. A blueberry session is held on an annual basis at the NJ Vegetable Conference in Atlantic City. This first meeting of the year is to provide growers with an overview of the current research being conducted by Rutgers and USDA personnel. The second meeting of the season is called the Blueberry Open House and gives the growers knowledge on all aspects of blueberry growing, including the control of insects, diseases, nutrition, marketing, and pesticide regulations. A series of twilight meetings is held at various locations to address timely issues of blueberry production.

A newsletter is sent to growers on a weekly basis with information from Rutgers and USDA personnel plus IPM scouts. One on one visits are conducted to address any problems that arise on individual farms.

A blueberry advisory committee has been put together and three meetings took place in 2007 to address research and extension needs and priorities. Research projects are being conducted to address industry priorities.

Results

Survey data from the Blueberry Open House meeting indicated that 92% of attendees felt that this meeting was excellent or very good. In addition, the newsletter reaches growers in 37 states and 21 countries. New Jersey acreage increased in 2007 by 150 acres. The value of the New Jersey blueberry crop rose from $83 million in 2006 to $90.2 million in 2007 a 8.6% increase. 39% of growers attending the Blueberry Open House meeting stated that information obtained at this meeting will result in a re-evaluation of their current methods. The Blueberry Bulletin has a total circulation of 3,841 and on the web there were 6,101 downloads. 94% of growers rated the newsletter excellent. The Blueberry Grower Advisory committee has given RCE personnel a priority list of research needs and research projects in 2008 will reflect their suggestions.
4. Associated Knowledge Areas

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Outcome #10

1. Outcome Measures

Medium Term Production agricultural land is stabilized to meet the needs of the agricultural industry and the 'open space' needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food.

2. Associated Institution Types

• 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

New Blueberry Scorch Antibodies

Blueberry Scorch is an important and common disease of blueberries, and an result in severe blighting of flowers and young leaves, twig dieback, and yield reductions of more than 85%.

What has been done

Blueberry plants have been tested for two strains of Blueberry scorch virus following graft inoculation experiments of a range of blueberry cultivars performed at the Rutgers Marucci Center for Blueberry and Cranberry Research. This revealed several varieties that are symptomless following infection with either virus strain. Antisera and reagents for testing of nursery plants were provided to the New Jersey Department of Agriculture for continuation of their nursery stock testing program. More Blueberry scorch virus was propagated in the greenhouse and purified in the laboratory for production of a new antiserum.

Results

Deployment of antibodies for virus identification in nursery stock plants allows the New Jersey State Department of Agriculture to contain the extremely harmful Blueberry scorch virus to prevent further spread across the U.S. Identification of virus-susceptible, virus-resistant, and virus-tolerant plants allows for their immediate deployment to growers and their use as breeding stock for improvement of currently available blueberry varieties.

4. Associated Knowledge Areas

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Outcome #11

1. Outcome Measures

Long Term - New Jersey's agriculture will remain viable and important industry. - New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
2. Associated Institution Types
   • 1862 Extension
   • 1862 Research

3a. Outcome Type:
   Change in Condition Outcome Measure

3b. Quantitative Outcome
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3c. Qualitative Outcome or Impact Statement
   Issue (Who cares and Why)
   Weed Management Systems Intergrating the Use of the New Herbicide Flumioxazon in Field and Container Ornamental Production

   Weed management in field and container ornamental production represent one of the largest economic inputs in terms of labor and herbicides for ornamental producers. The development and integration of new, more effective herbicides will reduce these economic inputs and provide environmental benefits by decreasing herbicide use. In addition, glyphosate resistant marestail is rapidly spreading throughout New Jersey nursery operations. Alternatives strategies for the control of this weed need to be researched and identified.

   What has been done
   Research has assisted in the development and commercialization of the herbicide flumioxazon (Broadstar, SureGuard) for use in field and container grown ornamentals. Comprehensive field and container studies were conducted over seven years and recommendations delivered to the New Jersey ornamental production industry. This research has demonstrated that flumioxazon provides equal and in many cases superior weed control of broadleaf weeds then currently used products. We have also determined that flumioxazon provides excellent control of marestail and Asiatic dayflower, two weeds that have become increasingly problematic in field ornamental production. Research is currently being conducted to determine optimum application timing for control of these weeds. The determination that flumioxazon has the potential to control marestail is especially critical since we have now confirmed the spread of glyphosate resistant marestail into New Jersey nursery operations. In addition, the use rate of flumioxazon is 0.25 to 0.38 lbs ai/A, while currently used herbicides are used at 1.0 to 2.0 lbs ai/A.

   Results
   The proper integration of flumioxazon into an overall weed management program will provide superior broadleaf weed control for New Jersey producers compared with existing products. In field ornamental production, the price for flumioxazon will average approximately $75 per treated acre, while currently used broadleaf weed herbicides average approximately $100 per treated acre. In container production, the granular formulation of flumioxazon will average approximately $180 per treated acre while granular formulations of herbicides which provide comparable weed control average $240 per treated acre. Additionally, The effective use rate of flumioxazon is approximately 20-25% of existing herbicides resulting in a significant decrease in the total pounds of active herbicide used in field and container ornamental production. While it is difficult to estimate the impact glyphosate resistant marestail will have on New Jersey nursery operations in terms of weed competition, a nursery operation that becomes infested with glyphosate resistant marestail and must use an alternative non-selective herbicide will see increased costs of $60 to 80 dollars per treated acre. The use of flumioxizon as part of a fall preventative herbicide treatment shows a great deal of potential to control this weed.

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Outcome #12
1. Outcome Measures
Agricultural Viability

Long Term - New Jersey's agriculture will remain viable and important industry. New Jersey residents will recognize importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

• 1862 Extension
• 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantitative Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>(No Data Entered)</td>
<td>0</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Identification, Evaluation, and Intergration of New Herbicides for Selective Control of Annual and Roughstalk Bluegrass in Cool-Season Turfgrass.

Poa annua (annual bluegrass) and Poa trivialis (roughstalk bluegrass) are two of the most problematic and difficult to control weeds on golf courses, athletic fields and sod farms. Infestations of these weeds reduce playability of athletic fields because they will thin and die out under heavy traffic. The value of cultivated sod infested with these weeds is greatly reduced and may not even be able to be sold. Most importantly, golf course fairways, tees and putting greens infested with these weeds require greater fungicide and water inputs to maintain an acceptable playing surface during summer months. The identification and evaluation of potential new herbicides for selective control of Poa annua and Poa trivialis in cool-season turfgrass would be beneficial when integrated into an overall weed management plan.

What has been done

Research has been conducted over the past 6 years to evaluate the potential of many herbicides, currently labeled for use in agronomic crops, for postemergence control of Poa annua and Poa trivialis in cool season turfgrasses. This work has led to the identification of four experimental herbicides; bispirbac-sodium, primisulfuron, sulfosulfuron, and mesotrione as having potential for selective use in cool-season turfgrass for Poa annua and Poa trivialis control. Past research studies have focused on seasonal and sequential application timing effects, soil residual properties and cool-season turfgrass tolerance. Currently we are conducting multi-year studies to determine the influence of golf course management practices (mowing height, fertility, use of plant growth regulators) on creeping bentgrass safety and Poa annua control. We have also determined that spray adjuvants, especially non-ionic surfactant increase the efficacy of bispirbac-sodium by enhancing foliar absorption. This may potentially allow application rates to be reduced by up to 50%.

Research has also determined that primisulfuron has the potential to control Poa annua and Poa trivialis in Kentucky bluegrass. We have determined optimum application timing, number of applications and rates. A 24c (special local needs) label was granted in Colorado, Minnesota, and Illinois based upon my research. A 24c label will be requested for New Jersey and Delaware in 2008.

In the fall of 2005 we initiated research to determine if mesotrione could control Poa annua at turfgrass seeding. To date we have determined that mesotrione can be safely used at seeding on Kentucky bluegrass, perennial ryegrass, and tall fescue. Substantial but not complete control of annual bluegrass was achieved. We are now conducting research to determine optimum application rates and regimes.

The results of bispirbac-sodium studies have been presented at scientific meetings and to the golf course industry at the New Jersey Turfgrass Expo and regional turfgrass meetings including the Maryland Turfgrass Conference, the Metropolitan Golf Course Superintendents Association Winter Seminar and the New York State Turfgrass Association Empire State Green Industry Show. They have also been disseminated at various industry sponsored seminars in New Jersey, Pennsylvania, Delaware, Maryland, and Virginia.

Results
Based upon recommendations provided to golf course superintendents 90 to 100% control of Poa annua and 70 to 80% control of Poa trivialis is achievable when Velocity is properly integrated into an overall Poa annua control program.

Results concerning the research with primisulfuron and mesotrione have yet to be disseminated because they are not yet labeled. Sulfosulfuron (Certainty) has been labeled for use in both warm and cool-season turfgrass species and can be safely and effectively used in Kentucky bluegrass and perennial ryegrass for control of Poa trivialis. Bispyriram (Velocity) received full federal registration from the EPA in the fall of 2004 and can be safely and effectively used for control of both weed species on all cool-season turfgrass species (including creeping bentgrass) except Kentucky bluegrass. Control of these weeds on golf courses will lead to reduced fungicide and water use, improve the quality of cultivated sod, and the playing surfaces of athletic fields.

It is estimated that there is approximately 250,000 to 300,000 acres of highly maintained fairways, tees and putting greens in the cool-season turfgrass growing region in the United States and at least 50% of these acres have significant infestations of Poa annua and/or Poa trivialis. It is estimated that golf courses could reduce fungicide use on these acres by approximately 30% if these two weeds were controlled resulting in an annual reduction of 700,000 pounds active ingredient of fungicides and saving approximately 8.0 million dollars annually. It is estimated that water use could be reduced by approximately 25% resulting in a reduction of 8.0 million gallons of water per golf course per year. Total water saved on an annual basis would be approximately 4.3 billion gallons of water per year.

Mesotrione and primisulfuron will have the greatest impact on cultivated sod production and possibly athletic fields. There are approximately 9000 acres of cultivated sod in New Jersey with about 66% dedicated to Kentucky bluegrass. Poa annua bluegrass infestations can reduce the value of Kentucky bluegrass sod by up to 50%. An acre of Kentucky bluegrass sod currently grosses $9000. This value may be reduced to as much as $4500 an acre if infested with Poa annua.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
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<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>601</td>
<td>Economics of Agricultural Production and Farm Management</td>
</tr>
<tr>
<td>215</td>
<td>Biological Control of Pests Affecting Plants</td>
</tr>
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Outcome #13

1. Outcome Measures

- New Jersey's agriculture will remain viable and an important industry.
- New Jersey residents will recognize importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The development of fungicide resistance in important fungicide chemistries used in vegetable production has been documented in New Jersey and the mid-Atlantic region. A number of these commonly-used chemistries have a high-risk for resistance development if they are overused or used improperly. Vegetable growers in NJ, as well as, the rest of the mid-Atlantic region need more information on fungicide chemistries (FRAC codes) in order to manage fungicide resistance development properly. Once resistance has developed, the efficacy of the fungicide, in most cases, is greatly reduced or lost. A great emphasis has been put on teaching vegetable growers in the state the importance of knowing and understanding the importance of FRAC codes in fungicide resistance management in vegetable disease control. In 2007, fungicide resistance management guidelines were developed for all 30 crop groups listed in the 2007 commercial vegetable production recommendations guide for the five mid-Atlantic states (NJ, PA, VA, MD, DE) to help vegetable growers manage potential fungicide resistance development. This guide helps growers make decisions about which fungicides should be used to control specific diseases to help reduce the chances for fungicide resistance development.

What has been done

Over 2,500 A of pumpkin crops are grown annually in New Jersey with an estimated 7.5 M ($3,000 A) going towards production costs. Much of this cost is associated with fungicide applications for controlling important diseases. In previous years, FRAC code 11 fungicides were recommended to be applied every 14 days in rotation with a FRAC code 3 fungicides. Thus, 50% of the fungicides applied to pumpkin crops belonged to FRAC code 11 or FRAC code 3 fungicides. Reducing the use of fungicides no longer effective in controlling important diseases, such as cucurbit powdery mildew, will help growers save hundreds of thousands of dollars per year. From 2005 to 2007, a study was done to determine if fungicide resistance would develop to two commonly used fungicides (FRAC codes 3 and 11) in cucurbit powdery mildew production. Results of the study determined that fungicide resistance to the strobilurin (FRAC group 11) and DMI fungicides (FRAC code 3) could develop on an annual basis if either of these groups of fungicides were mis- or overused in cucurbit production. Additionally, in 2007, fungicide resistance management guidelines were developed for pumpkins, as well as, all other crop groups listed in the 2007 commercial vegetable production recommendations guide for the five mid-Atlantic states (NJ, PA, VA, MD, DE) to help vegetable growers manage fungicide resistance development on their farm. In 2007, a total of 561 fungicide resistance management guides were distributed to vegetable growers in the mid-Atlantic region representing over 42,000 A of vegetable production.

Results
The Fungicide Resistance Management Guide is targeted for commercial vegetable farmers in New Jersey and the other four mid-Atlantic states (PA, DE, VA, MD). Questionnaires were handed out when FRAC guides were distributed to growers at meetings throughout the region during the 2007 production season.

Of the questionnaires returned in the response to the FRAC guide:

Vegetable growers responded to the following questions:

How much more aware are you on the importance of understanding fungicide resistance development?
62% - more aware, 38% - highly aware

How useful was the guide?
43% said somewhat useful, 58% said highly useful

How easy is the guide to use?
54% - very easy, 46% somewhat easy, 0% difficult or very difficult

Would you use the guide to help make decisions?
24% - some of the time, 73% - always

The impact of this research helped determine that FRAC code 11 fungicides should no longer be used to control cucurbit powdery mildew, thereby greatly reducing the potential for fungicide resistance development and helping growers reduce costs by not applying ineffective fungicides. Research also determined that growers should also use FRAC code 3 fungicides in cucurbit production judiciously because the potential for resistance development exists.

Additionally, a fungicide resistance management guide was developed for commercial vegetable growers in the mid-Atlantic region. In total, 561 resistance management guides were distributed to vegetable growers in the region representing 42,000 of production. A new fungicide resistance management guidelines for 2008 has been developed and will be distributed to more vegetable growers in the mid-Atlantic region. The fungicide resistance management guide will help vegetable growers in New Jersey and the rest of the mid-Atlantic region reduce the chances for fungicide resistance development.

4. Associated Knowledge Areas

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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

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

1. Evaluation Studies Planned
Agricultural Viability

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results
Evaluation results are unique to each program. See Qualitative Outcome Statements.

Key Items of Evaluation