Description

Season extension is the production of horticultural crops beyond their traditional field season. This includes a suite of techniques and technologies that modify plant growth and maturity, soil and water temperature or post harvest techniques to prolong storage of the crop.

Examples of season extension include:

• Winter storage varieties such as beets, celeriac and turnips
• Greenhouse tomatoes, cucumbers or peppers
• High tunnel winter salad greens
• Low tunnels for frost protection of spring planted vegetables
• Plastic mulch for cooling the root zone of sweet onions
• Row cover on June bearing strawberries
• Early, late or everbearing varieties of raspberries
• Transplanting of sweet corn
• and much more...

Season extension has become essential for Northeastern U.S. fruit and vegetable growers to remain competitive in the face of import pressure from areas with climatic advantages. Season extension also plays to the growing demand for local produce. Locally grown product commands market premiums when sold during the 'off-season'.

The Cornell Vegetable Program's role in Season Extension is the research and evaluation of these techniques/technologies and education of growers as to the potential benefits and the practical points of implementation. To support these activities internal and external grant funds allow Specialists and Technicians to focus on Season Extension by developing on-farm research trials, demonstration plots, educational meetings and other forms of outreach. Ongoing professional development keeps the CVP at the forefront of a rapidly evolving production scene. Within the program Judson Reid is the specialist with primary responsibilities for research and outreach. Other contributors with individual strengths include Robert Hadad, Katie Klotzbach, Chuck Bornt and Laura McDermott. Exact figures on current usage of season extension technology is elusive, however the potential for adoption is high as the demand for local produce grows. The program will reach up to 150 growers in New York State.

Our performance target for the project is for 20 NYS winter greens growers to adopt sustainable pest management in their winter crops, resulting in an increase of $2000 per cropping cycle.

Mission: The Cornell Vegetable Program will develop and evaluate season extension techniques to achieve increased profitability and environmental stewardship for farmers while consumers enjoy improved access to healthy food.

Evaluation Purpose Statement

The purpose of this evaluation is to measure if our program, Sustainable Pest Management in High Tunnel Winter Grown Greens, is indeed associated with an increase in farmer's knowledge

base which then impacts their practices in a positive fashion. The funder is particularly interested in our impact on farmer's economic and social status. Thus we will examine changes in farmers' status in these areas. The project period is 3 years (2010-2012) and requires us to examine both pre and post-program economic and social measures for the farmers we work with. We would like this evaluation to not only contribute to requirements of funders, but provide information of value to other partners such as extension colleagues in other states.

Questions:

EQ1
Do farmers who attend on-farm demonstrations, winter meetings or receive other educational exposure to our program gain sufficient knowledge to:
• Choose from a range of pest resistant winter vegetable varieties,
• Procure and release appropriate arthropod species for succesful biological control,
• Select and apply efficacious biorational pesticides labeled for greenhouse vegetable application,
• Scout and assess warm season crop pest-contribution to winter vegetable production.

EQ2
Do these farmers apply the above knowledge?

EQ3
A. Among farmers who cooperated with us an on-farm trial is there reduced pest damage and hence increased economic returns in their winter production?
B. To what extent did those who applied these techniques report reduced pest damage and hence increased economic returns in their winter production?

EQ4
What social benefits (if any) do farmers from EQ3A and B report? These could include less time harvesting/sorting, more pleasant working conditions, increased retention of experienced employees, etc.

EQ 5 Among growers from EQ3A and B who have had success implementing these techniques what are the key factors in their success?

Sample
For this project there are two samples. The first addresses EQs 1,2,3B and 4. The second sample is for EQ3A.

For EQs 1,2 3B and 4 we will attempt to take our measures from all growers that attend a workshop or cooperate in one of our on-farm trials. The number of farmers that grow winter greens in New York is relatively small and we intend to have program contact (meeting attendance, or direct consultation) with150 growers in 2011. We anticipate a response rate of 15%, giving us actual sample size of about 22 people. We may choose to conduct further surveys in 2012 and/or 2013 . A contact list of attendees will be gathered at each educational meeting conducted by the program. The contact list will be maintained by project assistant Kathryn

Klotzbach. Surveys (see below) will be posted or emailed to the entire sample (around 150 people). The actual sample size will vary depending on program attendance an accuracy of contact sheets. We may choose to complete evaluations in-person.

The sample for EQ 3A will consist of approximately 15 on-farm trial plots where we will gather quantitative pest data from an on-farm demonstration trial over the course of the 3-year project. EQ5 will consist of a sample gleaned from survey respondents and on farm trial plots according to their successful adoption of techniques. The top 2-3 reporter (as gauged by level of pest control and/or economic gain) from each group will be used to create this sample.
For both samples information on grower and farm characteristics will be gathered to assess to what extent is our sample representative of the larger population.

Measurement
There will be several measurements used.

1. At cooperating farms where there is a demonstration/trial Judson and Kathryn will collect data on pest damage in various treatment and control plots. This data can then be translated into economic impact for those individual farms (EQs 3A and 4)

2. Surveys of farmers on our program-contact list (see drafts below) (EQs 1,2,3A, 3B,4). These surveys will cover knowledge gained. One-on-one interviews will be conducted with the same survey when the opportunity arises.

3.In-depth partially structured interviews will be conducted with an additional 5 growers (EQ 5)

A survey (required and approved by an external funder) is attached as Appendix 1.

Design
As there are three principle measures in this project we can look now at the design for each 3. Each measure is designed to answer, in part, at least one evaluation question (EQ).

The design for evaluation of Sustainable Pest Management in High Tunnel Winter Greens will consist of
• trial plot data collection of control vs. treated plots where:

X= treatment
O=plot data collection tool

The exact measure will vary depending on pest (aphids, slugs, etc.) and crop (lettuce, spinach, etc). This will help to answer EQ 3A

This design represented thus:

O X O
O O

X O

• Post program-exposure surveys where farmer provide information.
X= program contact and O=increased knowledge on winter pest management via survey, techniques growers have implemented, cconomic gains reported on survey, survey data indicated increased CSA share, employees, CSA duration, number of markets attended, weeks at market, etc.

Represented:
X O

This measure is designed to answer EQs 1,2,4B and 4.

• One-on-one interviews will answer EQ5
X=post- program contact
O=In-depth partially structured interview

Represented:
XO

Analysis
Data will be analyzed by several methods in this project.

For on-farm demonstration or trial plots, pest damage data will be recorded weekly or biweekly, both pre and post treatment(s) by Judson and Kathryn. Pest damage will be recorded differently depending on site variables. Some examples could include number of aphids per plant, ten plants per plot; or percentage of turnip roots with slug holes per 10 row-feet. Where possible treatment plots will be replicated and randomized in complete blocks to allow for Analysis of Variance (ANOVA) procedure, and treatment means to be separated using Fishers Protected Least Significant Difference Test ($p<0.05$). Data will be entered in Excel and then transferred to Statistix software for ANOVA. Where space constrains plots to side-by-side, non replicated, or non-control, simple means will be calculated without a p test.

Economic data provided by farmers in surveys or interviews will be reported as stand-alone case studies (with names kept in confidence) in addition to a grand mean to demonstrate economic impact of the project. Other hard data such as number of employees, CSA shares or weeks at market will also be presented on a case-by-case basis via narratives accompanied by charts, tables, and photos. Data will also be reported as an aggregate mean. However, these means will be restricted to those farms offering data in those categories. For these data statistical analysis will not be used. This same approach will be used as a simple measure of adoption (yes vs. no) and enhanced knowledge.

Farmers will be asked to share other social impacts of the project which will be included as quotations or narratives in print and presentation materials generated by the project.

Reporting
Reporting for this project will meet the requirements of various stakeholders.

The external funder requires annual and final reports which include progress towards milestones and performance targets. Where applicable, success stories will be used for CCE quarterly and annual reports. Reporting also will take place in the form of project updates (handouts) to be distributed at on-farm meetings as well as PowerPoint presentations at industry conferences such as the Empire Fruit and Vegetable Expo or New England Fruit and Vegetable Conference. Journal and other press opportunities are likely. Reports will be published in the Cornell Vegetable Program VedgeEdge newsletter as well as posted to the CVP webpage. Our data will also be shared internally via Team Meetings as well as professional development events such as the Ag Inservice

Timeline for Sep 2010-Mar 2012

Task	**Dates**	**Who is responsible?**
Develop Year 1 survey	start Sep 2010 end Feb 2011	Judson
Mail Year 1 survey	Feb 2011	Katie
Recruit growers for on-farm trials	Sep 2010	Judson
Implement trials (data collection and treatment)	Sep-Nov 2010	Katie, Judson and farmers
Enter data	Mar 2010	Katie
Analyze data	Mar-Jun 2010	Katie and Judson
Creation of internal quarterly reports	quarters 1 and 2 2010	Judson
Recruitment of Year 2 farmer cooperators,	Ongoing 2010	Judson, Katie and CCE collaborators
Implement YR 2 trials (data collection and treatment)	Sep 2011-Mar 2012	Judson, Katie and farmers
Develop in-depth partially structured interviews protocols	Jan-Feb 2011	Judson and Katie
Practice and revise in-depth partially structured interviews	Feb 2011	Judson and Katie
Conduct in-depth partially structured interviews	March 2011	Judson and Katie
Annual report to funder with data to include charts, tables, photos and narrative	start Nov 2011 end Dec 2011	Katie and Judson