

Identifying Profitable Vegetable and Small Fruit Varieties for Maine Farmers—2014

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Program Justification and Objectives:

Maine has a large and diverse group of vegetable and berry growers that farm in excess of 11,000 acres and are responsible for over 20 million dollars in annual gross revenue. These farmers face considerable challenges to economically viable and sustainable crop production, including our short growing season, very cold winters and limited land and labor resources. Maine vegetable and berry growers are also confronted with a relatively small and rapidly declining number of suitable plant varieties developed for short, cool growing seasons. Surveys in 1999 (Handley) and 2001, 2007 (Hutton) indicated that the members of the Maine Vegetable and Small Fruit Growers Association rank varietal evaluation as one of their highest research priorities. In the research priority request submitted by the Association to the Agricultural Council of Maine, variety testing was ranked as the number one priority (Seaman, 2012)

Over the past three decades, the number of vegetable seed companies, nurseries and Land Grant Universities with active research and breeding programs has declined significantly. For economic reasons, the focus of remaining breeding programs is varietal development for the primary vegetable and berry production areas of the world. Unfortunately, Maine and other regions in northern latitudes are not part of these major production areas. Additionally, there is a rapid turnover in commercial vegetable varieties. Seminis, the largest vegetable seed company in the world, has a stated goal of 20% new product per year, or an average variety life expectancy of 5 years (Rucker per. communication). Consequently, the selection of varieties available to Maine growers is shrinking, and as new varieties become available they will not necessarily be well adapted to our northern environment. Identification of varieties that are both locally adapted and have acceptable horticultural qualities is becoming increasingly challenging. As a result, extensive testing of new varieties is essential before Maine farmers can be assured a reasonable chance of economic success with these crops in the future.

Maine vegetable and berry growers are consulted through discussions and formal surveys during annual meetings to determine priorities for the vegetable and berry species to be included in upcoming variety trials. Strawberries, sweet corn and pumpkins are always high priority crops due to their high value, customer popularity and rapidly changing variety selection. Other crops that are routinely requested include hoop house tomatoes, salad greens and raspberries. Recently, as winter markets have increased, there is tremendous interest in off-season production and variety recommendations for crops suited for this type of market, e.g. carrots, onions, cole crops, winter squash.

Evaluation of each crop should be conducted over a minimum of three growing seasons. While most entries will be included in each year of a trial, some varieties may be dropped based on poor performance or availability, and some may be added as new varieties become available.

Overall objectives:

- 1) New vegetable and berry varieties of various species will be rigorously evaluated in replicated trials at Highmoor Farm to determine:
 - a) Suitability for Maine climate (plant establishment, days to maturity, cold tolerance)
 - b) Potential commercial value (yield, quality, unique characteristics)
 - c) Pest tolerance (insect, disease resistance)
- 2) Trial results and subsequent variety recommendations will be shared with Maine farmers, agricultural educators, seed suppliers and nurseries to:
 - a) Improve Maine farmers decision making process for variety selection
 - b) Improve variety recommendations coming from agricultural educators, consultants, seed companies and nurseries
 - c) Enhance the availability of suitable varieties from seed companies and nurseries serving Maine farmers.

Crop Objectives for the 2014–2018 trials:

- 2014** Lettuce, bell pepper, sweet corn and butternut squash evaluation. Establish a new strawberry planting.
- 2015** Lettuce, bell pepper, sweet corn, butternut squash and strawberry evaluation.
- 2016** Lettuce, cabbage, table beet, sweet corn, butternut squash and strawberry evaluation.
- 2017** Cabbage, table beet, sweet corn, green bean and hoop house tomato.
- 2018** Cabbage, table beet, sweet corn, green bean and hoop house tomato. Establish a new strawberry planting.

Study Plan/Design and Activities 2014:

Lettuce Evaluation:

Objective: Determine the relative performance of eight Romaine lettuce cultivars and six multi-leaf lettuce cultivars through 5 successive plantings over an entire growing season; including growth rates, head weight, marketability and severity of insect and disease injury.

Romaine lettuce is commonly found growing on most Maine vegetable farms and is a staple for CSA's and farm market sales. Romaine can be grown as a baby leaf lettuce and, of the heading lettuces, is the more dependable type when compared to other heading lettuces. In the past year there have been several requests for information on slotting different varieties to planting dates and tolerance to Tarnished Plant Bug (TPB) injury. Feeding by TPB causes browning and raised corky spots of the mid-rib, making the head unmarketable or causing significant losses in fresh market weight after trimming off damaged portions. Multi-leaf lettuce represents a new way to grow baby leaf lettuce. The multi-leaf types have uniformly small leaves at the mature head stage which makes it possible to grow lettuce both as full heads, and sell the higher value baby leaf lettuce. We propose to evaluate up to 15 lettuce cultivars in replicated plantings using succession plantings at 20 day intervals beginning in June and continuing through September with a total of 5 plantings. Plots of 12 plants will be established in four replicated complete blocks for each planting date. Growth rate, marketability, weight insect and disease severity will be scored for the center ten plants of each plot.

- The trial will require approximately 0.5 acres (\$700).
- Anticipated Completion Lettuce Evaluation: April 30, 2017

Bell Pepper Evaluation

Objective: Determine the relative yield, maturity and quality of 21 bell pepper cultivars.

Bell peppers are an important crop to direct market farmers (farm stand, farmer's market, CSA) and regional wholesale growers. The product requirements for these two markets can be quite different. Direct market peppers can have greater variation in fruit shape and size, while wholesale markets demand uniform, blocky, 3 to 4 lobe peppers. The widely fluctuating temperatures occurring in Maine during the growing season can negatively impact fruit set of bell pepper making it difficult to produce economically viable yields (Hutton, M.G. and D.T. Handley. 2006). Several new cultivars have been introduced since our last evaluation of the crop. Transplants will be grown in the greenhouse and then transplanted to the field. The experiment will be planted in four randomized complete blocks using plots of 16 pepper plants arranged in double rows of plastic mulched beds.

- The trial will require approximately 0.5 acres (\$700).
- Anticipated Completion of Pepper Evaluation: April 30, 2016

Sweet Corn Evaluation

Objective: Determine the relative performance of 18 super sweet type corn cultivars, including germination, maturity date, harvest ease, ear characteristics (color, uniformity, row number, kernel size), and stalk characteristics (height, lodging).

Sweet corn is grown on approximately 2,000 acres in the state of Maine and comprises approximately half of the acreage planted to retail vegetable production. In the last ten years development of synergistic and augmented sweet corn genetics has greatly increased the number of many new sweet corn varieties available. Most of these new varieties have not been extensively trialed under Maine growing conditions, where cold soil temperatures can significantly affect seed germination and early plant growth. Plant stand establishment, yield and ear quality characteristics of these new varieties need to be evaluated under Maine growing conditions. Approximately 18 super sweet and augmented super sweet corn varieties will be evaluated in replicated randomized complete blocks.

- This trial will require approximately 1 acre of land (\$1,400).
- Anticipated Completion Date: Continuous

Short-Day Strawberry Evaluation

Objective: Determine relative performance of 24 June-bearing strawberry varieties, including plant characteristics (vigor, hardiness, and disease tolerance), fruit characteristics (size, shape, color, firmness, and flavor) and yield, over three harvest seasons (2015, 2016, and 2017).

Strawberries are an important high value retail crop for many diversified farmers, with approximately 1000 acres harvested in Maine each season. A variety trial of new selections and established varieties will be established at Highmoor in 2014 under a conventional matted row system with 24 varieties in 20 foot long plots arranged in a randomized complete block plan with four replications. 2015 will be the first harvest year of the trial. Plots will be renovated following harvest in anticipation of two more harvest seasons.

- The trial will require approximately 0.5 acre of land (\$700).
- Anticipated Completion Date: April 30, 2018

Expected Outcomes and Impact Assessment

Data from these trials will establish a resource of scientifically-based, reliable information regarding variety performance under Maine growing conditions upon which farmers can base variety purchasing decisions. Improved variety decisions will lead to improved crop success, including higher yields, improved crop quality, reduced pest pressure, and/or expanded market opportunities. Specifically, varieties with proven local adaptation will be recommended in updated grower resources, including the New England Vegetable Management Guide, the Maine Vegetable Variety Recommendations Fact Sheet, and Extension vegetable growing web resources. Growers will also be informed of new variety recommendations through numerous presentations at meetings (see below), and through consultations. We expect that growers will use the trial results as a primary source of information when making variety purchasing decisions; that recommended varieties will be trialed by growers as a result; and, ultimately adopted to improve crop production and quality standards statewide. We expect this information to reach over 200 growers annually, and if only 25% initially adopt new variety recommendations, over 2500 acres of vegetable production could be influenced in a single year.

Grower surveys will be carried out annually at both the Maine Vegetable and Fruit School (approximately 190 farmers attend) and Maine Ag Trades Show (approximately 85 attendees) to determine levels of adoption of recommended varieties and sources of information farmers are using to make variety decisions economic impact of variety recommendations. Historically, attendance at these meetings provides an acceptable sample size and cross section of the industry, including small, mid-size and large business operators. We are in the process of developing online surveys for webpage visitors and blog followers to expand the reach of our assessments, and plan to initiate their use in 2013. Data from these sources combined with updated agricultural census data, and input from industry leaders (Maine Vegetable & Small Fruit Growers Association, Maine Organic Farmers and Gardeners, Maine Department of Agriculture) will provide the basis for assessing impacts on an industry level for the state, anticipated for 2015.

Outreach and Publication Plan

Data resulting from these trials will be statistically analyzed, interpreted and summarized for distribution to growers, Extension educators, consultants, seed companies and nurseries. We anticipate presentation of the data to growers

at meetings including the Maine Vegetable and Small Fruit Growers Association Meeting (Jan. 2015), the Maine Vegetable and Fruit School (March 2015), the New England Vegetable and Berry Growers Winter Meeting (Feb. 2015) and the New England Vegetable and Berry Conference (December 2015). The results will also be presented in the statewide Extension Vegetable Newsletter, and the Maine Vegetable and Small Fruit Growers Association Newsletter. Reports and data from previous trials are currently posted on our Extension web page, (<https://extension.umaine.edu/highmoor/research/>) and we will expand and enhance these presentations to increase their use by growers. The page will allow visitors to view results by crop and chronologically. Growers will be notified of additions to the trial information and variety recommendations on the page through our blog. We anticipate trial results and recommendations will be shared with regional horticultural educators and researchers through poster and oral presentations at regional and national meetings of the American Society for Horticultural Science, leading to publications in *HortTechnology*. The results of the vegetable variety trials also provide the basis for making appropriate variety recommendations in the *New England Vegetable Management Guide*, a regional publication of cooperating state Extension specialists distributed to more than 1500 vegetable growers throughout New England. Growers and Master Gardeners will be provided with opportunities to view the trials first-hand and discuss the varieties during summer field days and twilight meetings.

Budget Justification

Funds from the Maine Agricultural Center are needed to offset MAFES service fees and support temporary labor to establish and maintain the trial plots during the growing season and to help with data collection.

Hatch funds will be used to pay for soil testing and growing media and replacement hand tools.

Gifts from The Maine Vegetable and Small Fruit Growers Association (MVSFGA), The New England Vegetable and Berry Growers Association (NEVBG) will be used to support travel to regional and national meetings to present findings of this research.

The following seed companies: Seedway (Elizabethtown, PA), Siegers Seed Co (Holland, MI), Rupps (Wauseon, OH), Stokes (Buffalo, NY), Harris (Rochester, NY), and Johnny's Selected Seeds (Albion, ME) will provide support through donations of seed and some supplies.

It is anticipated that Cooperative Extension will meet the costs of printing, copying and mailing reports, newsletters and surveys associated with this study, as the distribution of information will be managed through established Extension channels.

2014 Progress Report

Original project objectives that were met and significant findings:



Bell Pepper:

New Ace produced the greatest yield. New Ace, Ace, JPR 632, JPR 1124, and JPR 1127 tended to produce mostly medium size fruit having irregular shapes and thin walls. Declaration, Revolution, and Vanguard produced greater numbers of jumbo and extra large fruit. Several varieties performed consistently well over the two years averaging

greater than 1000 boxes per acre in each year. Aristotle X3R, Currier, Revolution and Karma each did well in both 2013 and 2014.

- <https://extension.umaine.edu/highmoor/research/evaluation-of-sweet-pepper-varieties-2014/>

Sweet Corn:

Highmoor Farm crew favorites for overall best growth habit and ear quality this year, listed in order of maturity (earliest to latest) were: Stellar, 7112R, and Higlow 8902 MR. Other varieties that performed very well include: XTH20173, Awesome XR, Multiglow 7002R, Allure, Essence, and Multisweet 2340.



- <https://extension.umaine.edu/highmoor/research/supersweet-and-augmented-supersweet-corn-variety-trial/>

Butternut Squash:

Based on the results of this trial, Avalon preformed among the best of the larger-fruited varieties (4 lbs.), having good yields and the most uniform size and shape. For medium-sized fruit (3+ lbs.), XRB4757A performed very well, having good yields and very attractive fruit, although perhaps a little too large for some customers (3.8 lbs.). Waltham and Butterfly produced good yields with attractive 3+ lb. fruit. For smaller fruited varieties (2+ lbs.), Metro PMR and Chieftain produced attractive, uniform fruit in good numbers, but total yield by weight was relatively low.



- <https://extension.umaine.edu/highmoor/research/butternut-squash-variety-trial-2014/>

Original project objectives that were not met:

Objective: Strawberry evaluation. The strawberry planting that was started in 2013 was not harvested. Crown establishment was unsatisfactory due to poor quality crowns which suffered herbicide damage and ‘cultivator blight’. Crowns have been ordered to establish a new planting in 2015.

Objective: Lettuce Evaluation. Three lettuce plantings were planted, observations made on head quality, days to maturity and bolting. Stands were extremely variable and the data not usable.

Educational material, publications, and programs:

Reports were sent to industry partners.

The results of the determinate high tunnel tomato, butternut squash, sweet corn and pepper trials were reported at the Annual Meeting of the Maine Vegetable & Small Fruit Growers Association at the Maine Agricultural Trades Show in Augusta on January 14, 2015. In addition to an illustrated talk, participants were given handouts with the results for later reference.

The forthcoming edition (2015-2016) of the New England Vegetable Management Guide is extensively revised in regards to vegetable variety recommendations. Much of the new information was directly adapted from the results of recent vegetable trials at Highmoor Farm, including sweet corn.

Research reports are being added to the Highmoor Farm website: <https://extension.umaine.edu/highmoor/research/>

Evaluation of project impacts:

Eighty percent of the attendees completing our survey at the annual meeting of the Maine Vegetable and Small Fruit Growers Association indicated the variety trials conducted at Highmoor Farm to be important or highly important. A phone survey of 20 growers indicated information provided from the Highmoor Farm vegetable cultivar trials is being used to make decisions on which cultivars to plant and estimated the economic value of good variety selection to be between \$400 to \$600 per crop. Of the growers consulted, the economic benefit ranged from \$500 to \$2500 per farm.