UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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Welcome Spring

So far it has been an early, dry spring. The earliest sweet corn under plastic was seeded in late March, and more continues to go in, along with peas, salad greens and other cold-hardy crops. Greenhouses are filling up, and strong sunlight has been good for plants and for heating bills. Plowing is made easier by dry conditions, but growers are wary of turning under the cover crop too early, because of the risk of losing their soil to the winds.

In this issue: Frank Mangan, Maria Moreira, Raquel Uchôa de Mendonç and Thomas Brashear give perspectives and research results on growing and selling different varieties of eggplant in relation to immigrant communities in Massachusetts. A survey of soil qualities, taken by the Cornell Work Team on Soil Health on vegetable farms in New York, might alert us to some concerns about how our soil management practices affect the quality of our soils. And, Kim Stoner of the Connecticut Agricultural Experiment Station describes an early March farm tour at Tobacco Road Farm, where overwintered salad greens were ready to take off as spring weather arrived.

If you are looking for ideas on how to replace high-cost fuel and energy sources on your farm with alternative sources, watch for an upcoming series of twilight farm tours that will explore renewable energy options for farms and greenhouses. The series will run between July and October and focus on energy for heating greenhouses and powering farm operations such as irrigation, lights, pumps, or refrigeration. Participating farms will demonstrate working renewable energy systems, including growing and burning corn for heat, a solar awning to power a walk-in cooler, and wind for electricity generation. Stay tuned for more details!

Production and Marketing of Eggplant Varieties for New Markets

Eggplants are a member of the nightshade or solanaceous family along with tomatoes, peppers, and potatoes. They are more sensitive to low temperatures than either peppers or tomatoes. Eggplants originated in Asia and are now grown throughout the world where climatic conditions are suitable. Farmers in Massachusetts produce eggplants for both wholesale and retail markets.

In addition to traditional markets, markets for new eggplant varieties are increasing with the growth of immigrant communities in the state and region. From 2000 to 2005, almost 8 million immigrants entered the United States. This is more than any other 5-year period in the history of the United States (US Census). These immigrant communities want access to the fresh fruits and vegetables that are part of their cuisine. This matches the needs of local farmers who are searching for new market opportunities.

Classic eggplant varieties "Nadia" and "Black bell".

In order for farmers to take advantage of these opportunities, research needs to be implemented to quantify yields, develop production practices and marketing strategies for new varieties. This information is critical to farmers before they commit valuable land to these crops.

In 2005, seven eggplant varieties were evaluated at the UMass Research Farm in South Deerfield, MA. The trial included two varieties for traditional markets and five varieties popular in ethnic markets (Table 1).

Production

Eggplants were grown on black plastic with drip irrigation. Transplants were put in double rows six feet on center with two feet between plants in the row for a plant population of 7,200 per acre. Fertilizer and pest manage-

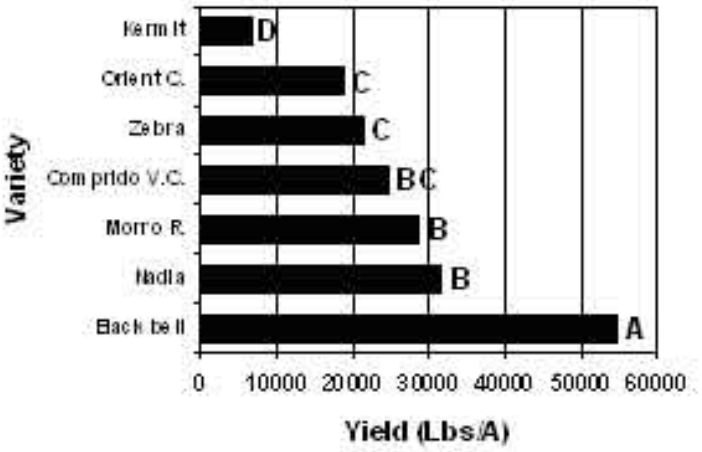

Figure 1. Yield of seven eggplant varieties grown at the UMass Research Farm in 2005.

ment were followed according to 2003-2005 New England Vegetable Management Guide for eggplant. Harvest took place twice per week starting on July 12 and finishing on September 12. At each harvest date, fruit was harvested when it reached the appropriate size required by the target market (see Table 1). The number of fruit was counted, weighed, and the length and diameter were taken.

The traditional variety "Black bell" had the highest yield with almost 55,000 pounds/A; the variety "Kermit" had the lowest yield with 7,000 pounds/A (Figure 1). It is possible that the very low yield of "Kermit" was due to higher fertility requirements for this variety.

Table 1. Target market, fruit length, diameter and number of fruit per plant for seven varieties grown at the UMass Research Farm in 2005.

Variety name	Target markets	Length (inches)	Diameter (inches)	Fruit/ plant
Black bell	Traditional	7.7 c	4.1 a	4.8 cd
Nadia	Traditional	8.5 b	3.6 b	3.1 e
Orient charm	Asian	10.6 a	1.8 e	4.3 d
Kermit	Southeast Asian	2.1 e	2.2 d	6.0 c
Zebra	Latino, Traditional	7.7 c	3.4 c	2.7 e
Comprido verde claro	Brazilian, West African	3.1 d	1.9 e	26.4 b
Morro Redondo	Brazilian, West African	1.9 e	1.9 e	40.0 a

Cost of production

The cost of producing these eggplant varieties at the UMass Research Farm was estimated to be $6,000/acre (variable costs only). The one factor that will be different for each variety is the labor needed to harvest and pack due to the different sizes. For example, the variety "Nadia" and "Morro redondo" statistically had the same yields (Figure 1); however, "Nadia" had 3.1 fruit/plant compared to 40 fruit/plant for "Morro redondo" (Table 1). The labor costs to harvest and pack "Morro redondo" would be much higher due to the smaller size of the fruit.

Eggplant varieties "Kermit", Orient charm", and "Zebra".

The Importance of Market Research Prior to Production

It is critical to understand many factors about the target markets before producing vegetables, whether they are for ethnic or traditional markets. Perhaps most important is to understand the potential demand and the size of the market for a specific product.

•Size of market

A market analysis needs to include an examination of the demographics of the market where the produce will be sold, including the income levels, the buying behaviors and consumption of the target product. If one only focuses on the number of people in a particular market without considering the variables of income, age and food preference, it is easy to falsely over estimate consumption of a product. This in turn can have an effect on the price for the product. In the case of small or niche markets, it can be easy to flood the market causing a dramatic decrease in the product price.

Table 2. Sales of eggplant types at a produce store in metro Boston area. Varieties in parenthesis are the ones grown in this trial for each type.

Eggplant type	Amount boxes sold/week
Classic (Black bell, Nadia)	300
Chinese (Orient charm)	40
Dominican (Zebra)	40
Sicilian	20
White	5
Small Italian	5
Japanese	1
Thai (Kermit)	½

The size of the market in Massachusetts for the different types of eggplant grown in this trial varies tremendously. Table 2 lists the sales of different eggplant types at a produce market in the metro Boston area (name withheld at owners request). This market has a very diverse customer base representing many different ethnicities. It is easy to see that producing a large amount of "Kermit" could easily flood the market and bring down the price significantly. There are obviously other markets for "Kermit", but surveys implemented by the UMass Vegetable Team of Asian stores in Massachusetts have documented that sales of this

Brazilian eggplant variety "Comprido verde claro".

crop are moderate compared to other Asian vegetables. Thai eggplant ("Kermit") is not used by Chinese or Asian Indians, the two largest Asian groups in Massachusetts and the region.

•Price sensitivity of products

At the end of the harvest of this eggplant trial the price for Thai eggplant ("Kermit") at the New England Produce Center was $40 per box (30 pound box) compared to $9.00 per box for Classic eggplant (35 pounds/box). Based on this information, the total gross for "Kermit" grown at the UMass Research Farm would have been over $9,000/acre. This good return, despite the low yield and the high labor costs to harvest, would be attractive to local growers. However, it is easy to see that given the relatively small size of the market for this eggplant, the wholesale price would fall dramatically as supply surpasses demand.

•Access to Markets

How accessible these markets are is an important consideration. For example many Asian markets buy a large percentage of their produce from Asian-owned wholesale operations based in New York City. In surveys implemented with Asian markets in Massachusetts in 2004, many store owners are receptive to buying locally-produced vegetables, but are concerned about alienating the wholesalers that provide them with produce year-round. These store owners feel pressure to buy from these wholesalers even when locally-grown produce is available.

Assimilation of ethnic markets

The United States is a country of immigrants and our

Brazilian eggplant variety "Morro Redondo".

history is one of assimilation. The size of the immigrant populations, and their level of assimilation, have a tremendous impact on the demand for specific agricultural products.

With the arrival of these immigrant groups, they are looking for products to make their traditional dishes – this creates demand. With time these immigrant groups will become more accustomed to "American" culture, including "American" food. This process is called "assimilation".

An example of this level of assimilation is found among the Portuguese-speaking population in Massachusetts. We have the largest Portuguese-speaking population in the United States and a larger number of Portuguese-speakers than Spanish-speakers. There are three main Portuguese-speaking groups in Massachusetts: Portuguese, Brazilian and Cape Verdean. The Portuguese started to immigrate to Massachusetts in the early 1800's with the advent of the whaling industry. There are now generations of Portuguese descendents who no longer speak Portuguese and have lost many of the cultural aspects of their country of origin, including an affinity for certain foods.

This contrasts greatly with the Brazilian population in Massachusetts; the majority arrived in the last 15 years. Portuguese is the first language of almost all Brazilians in Massachusetts and they have a much stronger affinity for the cuisine of Brazil. In Massachusetts, the Portuguese population is more assimilated than the Brazilian population.

It is important for a producer who wants to target a specific immigrant group that they understand not only the different types of produce used by that group, but also their level of assimilation.

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HARVESTING SALAD GREENS THROUGH THE FALL AND SPRING AT TOBACCO ROAD FARM

Many New Englanders revel in getting fresh, local salad greens from their local farmstand, farmer's market, or Community Supported Agriculture (CSA) farm during "the season" – from June to Halloween or maybe Thanksgiving. But what about the rest of the year? Are we in condemned by our winters to buying greens from California or the south for the other six months?

Not necessarily! There are a few creative growers in our region who are, as Eliot Coleman says, "farming the back side of the calendar." Bryan O'Hara, of Tobacco Road Farm in Lebanon, led a tour of 35 people on his farm on March 10, demonstrating his methods of producing, harvesting, and selling salad greens and other winter vegetables through as much of the fall, winter, and spring as possible. Bryan says that he can depend every year on harvesting salad greens through Thanksgiving, and then starting again in March. This year, he was able to harvest through December and in much of January (remember that long January thaw?), and was about to gear up harvesting again in early March.

Bryan is a master of farming and living lightly on the land, using his creativity and skills to find low-cost and low-input ways to accomplish his goals. Like many growers who want to get a jump on the season, Bryan has a couple of high-tunnel greenhouses. But he didn't buy the set-up from a greenhouse supply company – he figured out how to build high tunnels at much lower cost using PVC pipe (instead of steel) for the supporting hoops and building the end walls out of plywood and scrounged storm windows. Even as unheated high tunnels made with inexpensive materials, the area under these tunnels is limited and relatively expensive, so in March, when we toured the farm, they were mainly being used to start seedlings – onion and leek seedlings seeded in the ground the previous fall, and other seedlings in flats in the spring.

Bryan Ohara uncovers beds of greens that overwintered under a double layer of 1.5 ml clear plastic on 3/16 inch wire hoops, March 10, 2006.

Close-up of Bryan Ohara's Tatsoi-mizuna cross, selected at his farm for winter hardiness and quality.

Most of his off-season production happens in an even lower-cost system – low tunnels. Bryan has 1 acre of low tunnels (on his 3 acre farm), laid out as beds 36" wide with wire hoops (3/16" diameter, 6'8" long) holding up two layers of 1.5 mil plastic. These two layers of plastic (8'4" wide) raise the temperature under the covers by 30 degrees F. It is not something you have to order from special suppliers – Bryan gets it from his local paint or hardware stores – and it is not expensive. Bryan says the cost has doubled in recent years, so that it now costs $6 - $8 to cover a 40-foot bed, but that's a lot cheaper than the agricultural row cover (Agribon®) that he buys to cover the beds once the snow melts and it gets warmer in the spring.

These beds are highly fertile – Bryan started with poor soil, but has been adding dairy manure and compost liberally for several years. He seeds his fall and winter salad crops from October to the beginning of December, as beds become available, coming out of their summer crops in the rotation. For some crops, Bryan has been selecting his own seed for winter hardiness, including arugula, mixed populations of greens in the species *Brassica rapa* (the Asian greens like tatsoi and mizuna), and mixed populations of mustards (another species, *Brassica juncea*). He offered seed packets to the participants on the farm tour to try. He also grows other green crops, like spinach, lettuce, chervil, and mache. Spinach is his most important green, because he sells it on its own as well as in salad mixes, the flavor is so much improved by growing it through the winter, and it can be harvested over and over again – sometimes 3-4 times in the fall and then 4 more times in the spring.

The tour was part of a project funded by the Northeast Sustainable Agriculture Research and Education program

(NE SARE). The project is called "Achieving High Quality Brassica Crops on Diversified Vegetable Farms" and is and joint project of UMass Extension and the Connecticut Agricultural Experiment Station. I am collaborating with Ruth Hazzard, and the project is continuing, so look for additional farm tours and twilight meetings this summer and fall at Upper Forty Farm in Cromwell, CT; Holcomb Farm in Granby, CT; Twin Oaks Farm in Hadley, MA, and Sidehill Farm in Ashfield MA. The project will culminate in a one-day Brassica School next winter.

-- Kim Stoner, CT Agricultural Experiment Station

COMPARING SOIL HEALTH ON NEW YORK VEGETABLE FARMS

Over the past three years Cornell and Cooperative Extension staff have sampled and tested many dozens of fields all across New York. The data from all the farms has not yet been summarized but we can learn some things comparing the preliminary results from these farms in our area. The farms range from a small, organic farm to mid-sized conventional fresh market farms, to large processing vegetable farms.

Farm Soil type Rotation/tillage	*Bulk density*	*Agg. stability*	*Meso-porosity*
A Ontario loam veg/cover crops	*1.4*	*29.4*	*14.6*
A Pal grav. loam sweetcorn/ covers*	*1.4*	*27.7*	*14.4*
B Pal grav. loam veg/covers/composted manure	*1.2*	*51.5*	*32.7*
*B Ph** grav. loam veg/covers/composted manure*	*1.2*	*45.4*	*20.7*
C Pal grav. loam veg/field crops/covers/ zone till	*1.2*	*45.4*	*20.7*
C Pal grav. loam sweet/field corn/covers/ zone till	*1.5*	*52.8*	*16.0*
D Pal grav. loam veg/field crops/ covers/ zone till	*1.4*	*48.9*	*19.0*
E Odessa silt loam veg/corn silage/slurry manure	*1.5*	*40.7*	*15.7*
E Lima silt loam veg/alfalfa for dairy	*1.6*	*42.6*	*15.3*
F Lima silt loam veg/field crops/covers	*1.4*	*22.4*	*17.6*
G Ovid silt loam veg/field crops	*1.5*	*10.5*	*11.5*

*** Pal – Palmyra gravelly loam; ** Ph – Phelps gravelly loam**
***** Bulk density – Ratio of the weight to volume of soil**
Aggregate stability – The % of soil aggregates (crumbs) remaining intact after rainfall
Meso-porosity – The % of soil pores that are intermediate in size

Bulk density is a straightforward, inexpensive measure. Soil cores in 3" x 3" metal rings are dug up and batched for each field. The soil is weighed after drying and the weight to volume ratio is the bulk density. A bulk density of 1.2 or less indicates that a soil has lots of pore space for air, water and plant root growth. A bulk density of 1.4 or greater, which was common for vegetable soils, indicates that the soil is compacted and the pore space reduced. Of the three fields with a bulk density of 1.2, two are on a farm where there are heavy organic matter additions, a spader is used for tillage, and wheel traffic doesn't occur in the crop row. The third field with a bulk density of 1.2 has been in zone tillage with deep ripping in the row for a number of years, a practice which reduces the burning up of organic matter and also keeps wheel traffic out of the crop row. The use of a disc for secondary tillage has been common until recently on the other farms. On Farm E, with a heavier silt loam soil, the heavy equipment used for slurry manure application and traffic in wet weather to cut alfalfa probably contributed to the high bulk density.

Testing soils for water-stable aggregates is a more time-consuming test done in the lab but it is a good measure of soil physical health. Loose aggregates are collected from several places in a field and are dried in the lab. Subsamples are weighed and placed on a sieve. The weight of (re-dried) soil aggregates remaining after simulated rainfall gives the % aggregate stability. Farms B, C, D and E all have better than average percentages of water-stable aggregates. This is likely due to their additions of fresh organic matter or to the reduced burning up of organic matter with their zone/reduced tillage. Fresh organic matter is necessary for soil aggregates to be stable. Sticky polysaccharides, waxy glomalin and webs of fungal strands, all produced when soil microbes feed on fresh organic matter, are the "glue" that hold soil aggregates together. Such soils are likely to have less ponding after heavy rain, less crusting, and less erosion. On Farm G most of the aggregates disintegrated. Rainfall on this soil would leave it with little structure.

Determining the size distribution of the soil pores is a more time-consuming test done on intact soil cores in their metal rings. It involves applying increasing amounts of suction to moist soil and measuring the amount of water extracted. The more suction needed the smaller the pores being emptied. Farm B was the only one with a high percentage of meso(intermediate)-sized pores. The heavy ad-

ditions of organic matter, gentle tillage, and lack of wheel traffic in the crop row are likely the reason.

These tests and more detailed interpretation will soon be available for a fee, along with tests of soil biological health, through the Cornell Nutrient Analysis Lab. But there's something all farmers can do right now to measure an important aspect of their soils' physical health – compaction testing! Springtime, before tillage and while there's good (not excess) soil moisture, is the ideal time. As soil dries compaction readings increase. If you're interested in comparing soils between fields or against established thresholds for compaction you'll need a penetrometer. This unit measures the amount of force it takes, in pounds/sq inch, to push the probe into the soil.

A force between 200 - 300 psi is considered the caution zone, while 300+ psi signals real compaction. To check out a commercially available penetrometer go to http://www.dickeyjohn.com/index.php and click on soil compaction testers.

Or you can do what some area growers are doing and just use a metal rod marked every 4 inches, with one end sharpened, and with a handle welded across the other end. By probing different fields, undisturbed hedgerows, etc. you can get a "feel" for how compacted your soil is at different depths. This can help you decide on the type and depth of tillage for this spring, and for your overall soil management in the longer term.

A note on zone tillage: This reduced tillage practice has been tried on some vegetable farms in NYS for large seeded crops and transplants. Where a comparison was possible zone till crop yields have been equal or occasionally better than adjacent conventionally tilled crops. Lynn Fish, Ontario Co. fresh market grower, is successfully using zone tillage for his tomatoes and peppers, and is experimenting with equipment for his larger acreage of sweet corn. The deep ripping done when building the zone has been especially helpful on his compacted soils. In trials on Donn Branton's farm in Genesee Co. deep ripping as part of zone tillage has resulted in significant yield benefit in processing sweet corn one out of two years even after using zone tillage on the farm for several years. Contact Carol MacNeil at 585-394-3977 or crm6@cornell.edu for more details.

--Carol MacNeil and John Gibbons, Cornell Vegetable Program

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