

Hoop Houses for Growing Winter Crops & Farm to School/Farm to College

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Project goal:

Produce winter salad crops in a cost effective and sustainable manner.

Reason:

Every five years Congress re-authorizes the Child Nutrition Act, which funds the National School Lunch and Breakfast Programs, Summer Food Service, and other nutrition programs that are a lifeline for millions of American children. Administered by the U.S. Dept. of Agriculture, these funds go through state departments of education to local school districts, which use the funds to purchase food for their meal programs. The proposal announced by the Community Food Security Coalition (<http://www.foodsecurity.org>) would provide grant funds of up to \$100,000 per school district to establish "farm to cafeteria" programs. Grants will be awarded only once and will help schools purchase equipment, provide staff training, conduct menu planning, locate sources of locally produced food, purchase food, and develop food and farm education programs such as farm visits and school gardens.

The Coalition's "Healthy Kids" initiative is currently part of two Congressional bills, one sponsored in the House of Representatives (H. 2626) by Representatives Fred Upton (R. MI) and Ron Kind (D. WI) and the other in the Senate (S. 995) sponsored by **Senator Patrick Leahy (D. VT)**. Rep. Upton declared that farm to school projects "will put farm fresh produce on the plates of youngsters while keeping our local farmers in business." Rep. Kind concurs, "Having our local farmers feeding our children in the local schools is a win for everyone."

Below is a list of sponsors of the House version of the bill, the Northeast members are in bold. There is a campaign underway to get the entire delegations from New England to sign on.

Rep. Rob Simmons (CT. 02) _ R

Rep. Vernon Ehlers (MI. 03) _ R

Rep. Danny K. Davis (IL. 07) _ D

Rep. Dale E. Kildee (MI. 05) _ D

Rep. James P. McGovern (MA. 03) D

Rep. Dennis Rehberg (MT. At Large) R

Rep. John Dingell (MI. 15) D

Rep. Tom Osborne (NE. 03) R

Rep. Mike Rogers (MI. 08) _ R

Rep. Ralph Regula (OH. 16) _ R

Rep. Rosa L. DeLauro (CT. 03) _ D

Rep. Barney Frank (MA. 04) _ D

Rep. Wayne T. Gilchrest (MD. 01) R

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Rep. Jack Quinn (NY. 27) R

A second proposal that is being considered is to attach reimbursement for the School Lunch Program to whether or not local food is served in the school. A higher reimbursement will go to school serving local food. This will probably not come up in this years re-authorization but may come up in the next. For more information and updates on Farm to School see

<http://www-unix.oit.umass.edu/~pvmafs03/>

What does this mean to our growers?

Increased markets for fresh meat, dairy and produce.

Many of the schools are requesting salad mixes, something which is a huge challenge to growers in the Northeast whose growing season is different from the school semester season, but salad bars which serve local food in other parts of the country are in high demand and very popular among students in all grades.

In order for farm to school programs to be successful a number of issues need to be addressed. One of them is the opportunity to offer more produce year-round. Heating crops in the winter months has always been a cost deterrent for vegetable growers. Coleman (1999) gives organic production methods in unheated hoops houses, or high tunnels, for many vegetables for a large part of the year, but his location in Maine is has somewhat milder

conditions than many other areas of the Northeast and not all of his methods have been tested scientifically. High tunnels have been used in New Hampshire (Wells, 2003, Wells and Loy, 1993) for tomatoes, peppers, and strawberries and in Connecticut (Gent, 1991) for tomato and peppers, but the tunnels have only been used to extend the normal growing season by a few weeks in the spring or fall. Some growers in Massachusetts are using high tunnels for year-round production of greens, but not for several other crops that are often found in salad bars, such as radishes, carrots, broccoli and cauliflower.

This project proposes to use various *non fuel methods for warming soils and air*. Some of the methods are discussed briefly below.

High tunnels

The greenhouse principle is the basis for the function of a high tunnel. However, unlike automated greenhouses, high tunnels have no external connections other than water for trickle irrigation, and no permanent heating systems or electrical fans for ventilation. They are stand-alone units constructed with metal bows (about 1 inch in diameter) connected to metal posts, which are driven into the ground 4 feet apart. They are covered with one or two layers of greenhouse grade (6-mil) polyethylene, which is left on year-round.

Size of the high tunnels can vary from 14 feet wide x 36 feet long, and 6.5 feet high, to 20 feet wide x 96 feet long. One grower in Massachusetts uses 14 ft. x 25 ft long tunnels as this is the shortest length that can be used without losing the efficiency of air movement within the tunnel. A 25 ft. long tunnel can be dragged by hand or with a tractor by one person (E. Stockman, personal communication). Tunnels are ventilated by rolling up the sides manually each morning and closed each evening, though some automated ventilation systems have been developed.

Plastic Mulches

Plastic mulches have been used commercially on vegetables since the early 1960's. Most of the plastic mulches used in the U.S. are 1.0-1.25 mil thick and 48 inches wide. Plastic is laid over a soil bed generally 4-6 inches high and 30 inches wide, with a slope of 1.25 inches from the center to the edge. The raised bed will warm up the soil quicker in the spring and also will shed excess water off the bed into the middle, thus keeping the crop drier and preventing deterioration in quality of the product.

The color of a mulch determines its energy-radiating behavior and its influence on the microclimate around the plant. Color affects the surface temperature of the mulch and the underlying soil temperature. Black is the most commonly used color of polyethylene mulch. Soil temperatures under black plastic mulch during the daytime are generally 5°F higher at a 2 inch depth and 3°F higher at a 4 inch depth compared to that of bare soil. Daytime soil temperatures under clear plastic mulch during the daytime are generally 8° to 14°F higher at a 2 inch depth and 6° to 9°F higher at a 4 inch depth compared to that of bare soil. However, the use of clear plastic mulch requires the use of a herbicide or fumigant to control weeds.

The use of plastic mulch provides the following advantages: 1) By raising the soil temperature in the planting bed, plant growth is accelerated, producing earlier yields. Black plastic mulch can result in 7-14 days earlier harvest while clear plastic accelerates harvest by 21 days in many conditions. 2). Mulch reduces soil water loss. Because more uniform soil moisture is maintained, the frequency of irrigation may be reduced. 3) Black and white-on-black plastic, which block the transmission of most of the photosynthetically active radiation, reduce or eliminate weed problems. 4) Soil under the plastic mulch remains loose, friable, and well-aerated.

Row covers

Row cover is used in combination with high tunnels to warm the air around crops an additional 2 to 5 degrees. Rowcovers provide a system whereby crops can be protected against an adverse environment for at least one month after planting (seeds or transplants). Not only do crops mature earlier but total production is also increased, justifying the added expense of row cover materials and installation labor.

A row cover is a lightweight, flexible and transparent material applied over single or multiple rows of crops. The primary materials used for covers are clear polythene (nonporous), spunbonded polyester, and spunbonded polypropylene (porous). When using clear polythene, rowcovers are usually slitted, with a series of short, cross-wise slits which provide ventilation on sunny days. Without these slits, the covers would have to be manually

opened and closed daily to provide ventilation during the day and protection from the cold at night. The spunbonded covers are fabric-like materials consisting of fibers arranged in random order in contrast to a woven pattern. Except for heavy-weight freeze protection covers, light transmission through spunbonded materials is adequate for crop growth.

Rowcover materials are relatively lightweight (0.3 to 1.75 oz/yd²) (1 oz/yd² = 34 g/m²). The lightest covers (0.3 oz/yd²) are used primarily for insect control, the medium weight covers (0.5 to 0.6 oz/yd²) for growth enhancement and freeze protection (down to about 28°F) and the heaviest covers (1.0 to 1.75 oz/yd²) for freeze and winter injury protection. Other uses include wind protection and animal deterrent. It can be either supported with hoops or not supported (floating).

Objectives

1. Determine which salad crops and varieties grow well in high tunnels in Massachusetts.
2. Determine which combinations of plastics and row covers, raised beds and other methods can be used with high tunnels to warm the soil and air sufficiently to grow salad crops in from October to April in Massachusetts.

Approach

Salad vegetables will be grown under the following treatments:

1. Black horticulture matting (BHM)
2. Black plastic (BP)
3. Clear plastic (CP)
4. Raised beds (RB)
5. BHM + slitted row cover
6. BP + slitted row cover
7. CP + slitted row cover
8. RB + slitted row cover
9. BHM + spun-bond polyester row cover
10. BP + spun-bond polyester row cover
11. CP + spun-bond polyester row cover
12. RB + spun-bond polyester row cover
13. All of the above treatments will be repeated with transplants of the appropriate crops and compared to direct seeded treatments.

Treatments will be planted every two weeks between October and April. Soil and air temperatures readings will be monitored regularly. Germination and stand establishment will be evaluated as well as yield and quality at the end of the normal days to harvest for that crop. Data will be summarized according to the month of the year. Based on data, hypothetical salad mixes will be created to determine what combinations of salad mixes would be available for weekly deliveries to restaurants.

Why Organic?

Just as the pesticides used to combat insect pests in schools in becoming highly regulated, it naturally follows that school food will soon come under the same regulations. Italy has banned all GMO crops from schools. Irradiated meats are on the target list. Princeton and Yale are battling to be the first schools that are all organic and some schools in Massachusetts are making this request as well. Thus to be ready for the likely regulation, the study will be done using only organic methods of control.