The Marquette Hoop House Pilot Project

Annual Report 2010

Prepared by Kelly Cantway
Hoop House Manager and
Special Projects Coordinator for
the Marquette Food Co-op

Supporting Local Food Systems

A partnership between Northern Initiatives, NMU's College of Professional Studies, and the Marquette Food Co-op.

NORTHERN INITIATIVES

Northern Michigan University

marquette food co-op

Table of Contents

The Crew

Kelly Cantway serves as the on site manager. She works at the Marquette Food Co-op as the Special Projects Coordinator in the Outreach Department. She is passionate about growing food and has been growing food on her small city plot in Marquette and volunteering at one of the local farms for the past three years.

Jeff Parks has been working as an intern with the project since May of 2010. He is retired from the military after twenty years and is taking classes in NMU's Hospitality Management Program.

Together, Kelly and Jeff have worked to create a successful first season. They are currently planning the next planting that will start at the end of January 2011.

Laying Ground Work

The Partnership

The Marquette Hoop House Pilot project was born in 2009. Northern Initiatives (NI), Northern Michigan University's (NMU) College of Professional Studies (CPS), and the Marquette Food Co-op (MFC) teamed up to provide a hoop house that will offer data and educational opportunities to existing farmers, potential farmers, and the greater community on the value of extending growing seasons with the use of hoop houses.

The grant that provided funding for the project was written by NI, a private nonprofit community development corporation that provides small rural businesses with access to capital, information and markets. The funding came from the Local Initiatives Support Corporation. The CPS at NMU is comprised of three schools, nine departments and the Seaborg Center that provide advancement of interdisciplinary study and promotion of intra-professional collaboration through innovative programs, instruction, scholarship and service. They have provided additional funding for tools, soil amendments, ongoing expenses, and an hourly wage for an NMU student intern to help with the project. The MFC provides the on site manager that oversees the day to day operations of the hoop house, supervision of the intern, and coordination of the educational workshops.

The Structure

The hoop house was purchased from Rimol Greenhouses. It is a 22' x 48' double walled gothic model, made to withstand snow loads in our area (average of 141 inches per year). The covering is made up of two layers of six millimeter clear poly carbonate, and the ends are made of an eight millimeter poly weave material.

The steel posts of the frame are cemented into the ground to hopefully prevent the strong NW winds from pulling them out of the sandy ground. The sides on the length of the structure roll up to allow sufficient ventilation during warm weather. Chicken wire has been placed along these sides to keep out wildlife.

The hoop house was placed in an East to West orientation to take full advantage of the low sun during the winter months. During the winter months (mid-November to mid-February) the Marquette area receives less than 10 hours of sunlight per day.

Creating Compost

Early in June a four-bin compost system was constructed to begin making compost out of produce waste from local businesses. The compost was turned every few days until the first snow fall. This will be the main source of compost that will be applied to the soil in between plantings to maintain soil fertility.

Nurturing the Soil

The Site

The location chosen for the placement of the hoop house is on the campus of Northern Michigan University. There is a large grassy area on the West side of the Jacobetti Center that was being used for storage of several semi trailers. This area had once been the location of a saw mill, so the soil is very compacted. The hoop house was placed roughly forty feet south of a large storage shed, the source of electricity to run the hoop house fans

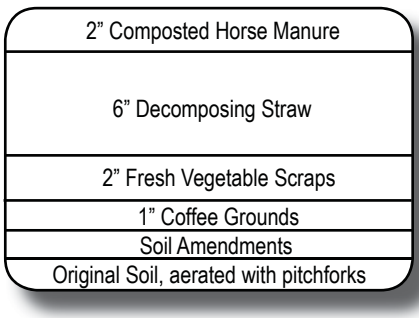
Soil Improvement

The soil test that was taken from the site revealed that the soil was of low fertility, lacking in potassium and organic matter. A visual observation would give the assumption of sand intermixed with gravel, similar to many areas in our region of Michigan's Upper Peninsula.

In the fall of 2009 the entire area was tilled with the addition of amendments recommended by our soil test. A decision was made to continue soil improvement for one year before planting. In May, two improvement methods were implemented. The soil was sectioned off into two halves, North and South.

Method 1: Application of soil amendments as recommended from our soil test results. Tilled to a depth of 6-8". (2,850 lbs composted horse manure, 50 lbs blood meal, 100 lbs colloidal phosphate, and 100 lbs greensand.)

Method 2: Soil was aerated with pitch forks and then layered as shown to the right.



Soil Observations

Observations from the first year show the sheet compost method gave the plants more to thrive on. Seeds germinated much better with the added organic material, and the soil held the moisture longer than the tilled method. Seedlings that were transplanted showed no difference between the methods.

At the end of the first growing season, the soil composition for each method was visually apparent. Method 1 soil is still very sandy, while method 2 shows a significant increase in organic material. *(See photos to the left)*

The Vegetables

Bed Preparation

Preparation for planting began at the end of August. Eight beds 18' by 3.5' were created running perpendicular to the length of the hoop house. There is a 2.5' walking area around the outside and 1.5' between each bed. The top of the soil was raked from the aisles into the beds, and the aisles were covered with straw left over from the past winter's straw bale protective barrier (bales were placed around the outside of the structure to protect from wind and snow build-up). At the entrance side (the east side) there was six feet left open to accommodate tour groups and ease of movement with tools.

Total area of hoop house: 1,056 square feet
Total Planting space: 504 square feet
Total Walking space: 552 square feet

For a more intensive growing operation that is not concerned about tours, there is room for one more bed on the east end. The paths on the outer edges utilize the coldest area of the structure for walking. This also creates a buffer for the plants as there is a potential for the ground to freeze in these areas. A disadvantage, however, is that walking around the edge is a bit more challenging due to the slope of the roof.

Sowing the Seeds

The goal of this hoop house is to test the possibilities of harvesting produce year round. This has already been done in many parts of the United States and beyond, however the climate in Marquette has very harsh winters, making even the best season extension methods a challenge. As this structure is not heated, the most cold tolerant plants must be chosen for the fall planting. It is important to understand that most plants will not "grow" during the darkest days of the year (below ten hours of daylight), but will go into a hibernation mode until there is sufficient light to encourage photosynthesis.

Planting began at the end of August. Several plants that were not as tolerant to the high temperatures of the hoop house during the warm August and September days were started in trays outside of the structure. The rest were direct seeded into the soil of the hoop house. Volunteers helped with this process on two occasions.

See Appendix A for a detailed list of crop varieties used, and planting and harvesting dates.

Extending the Season

Primary Protection

The main structure of the hoop house is made with steel “hoops” covered in two layers of six millimeter poly carbonate plastic. Though the structure is not air-tight, the heat that is trapped inside from the sun escapes much more slowly than the decrease in outside temperatures. This enables the soil temperatures to stay warmer longer. The structure also protects plants from wind and early frosts.

A small fan fills the space between the two plastic layers with air. This helps to buffer the plants slightly more than having just one layer of plastic. On a sunny 20 degree day, temperatures inside the hoop house were sometimes recorded at more than 30 degrees warmer than outside temperatures. During windy and cloudy days, the temperature differences were much less, as the sun was not able to warm the interior.

Secondary Protection

Though the main structure of a hoop house extends the growing season considerably, adding a second layer of insulation just above the plants gives more protection to the crops and enables the warm air within the hoop house to stay as close as possible to the soil.

There are several methods to setting up the inner layer. One method is to use smaller hoops spaced evenly along each bed with a layer of fabric over the top anywhere from two to four feet above the plants. The fabric tends to be a breathable material to prevent condensation buildup. Removing the fabric can take more time, as you remove one row at a time, and the fabric can be easily damaged.

The method chosen for this hoop house makes it easier to remove the layer quickly over the entire area and is a bit more sturdy. Metal conduit cut into six foot pieces was pounded into the ground two feet deep. Four of these were placed evenly at each end of the hoop house with four placed in the center. Cables were attached to each post to provide support for three pieces of clear six millimeter plastic. The plastic is spread out over the cables and covers the entire growing area. See the picture to the left for reference. Cable connectors that can be tightened were attached to all four cables in order to make adjustments for potential stretching. This makes the process of uncovering the area very simple with two people bunching the plastic to each end. A disadvantage to this setup is the inability of the plastic to breath. More diligence is required in opening up this layer on warm sunny days as the temperature can get quite hot and damage plants.

See Appendix B for a graph of the inside temperatures (soil and air) of the hoop house during the month of November. You will see how little the soil temperatures change compared with the air temperatures.

Bringing in the Bounty

The Harvest

Once the crops were in, it was exciting to watch the seedlings sprout and grow into recognizable vegetables. The faster growing varieties took off and were ready to harvest in only a few weeks. The harvested produce was taken to Deb Pearce and the Culinary students at NMU once a week during the semester and then taken to the Harbor House, in Marquette. 120 total pounds were harvested as of December 31st, 2010.

Plant Observations

As mentioned earlier, most plants that were direct seeded germinated less in the tilled soil than the sheet composted soil. Seedlings that were transplanted into the soil seemed to have equal success in both soils. There were, however, specific plant observations that we would like to share.

The 2010 fall season had very warm temperatures through the end of October. This was challenging for those plants that tolerate extremely cold temperatures. As soil temperatures remained quite warm, some plants had very poor germination. Examples of these are claytonia and mache. These Asian greens can handle temperatures below zero, but cannot tolerate warm temperatures. The seeds that were sewn in August did not germinate until mid-November when the soil temperatures cooled. Due to such a delay, spinach was planted in the bed to utilize the space, which now has a mix of the two plants.

The carrots had very poor germination with both soil methods. The few that did germinate never grew large enough to harvest. The beets were beautiful and grew to 4” in diameter. They were planted in the farthest west bed, which received the brunt of the cold temperatures during days with a NW wind. This caused the beet greens to freeze and wilt, so they were pulled in the beginning of December to prevent them from rotting.

Lettuce is a bit more sensitive to the cold temperatures. The Rouge De Hiver romaine had grown to roughly 8” to 10” in height, and froze in the first week of December without recovering. The Salad Bowl lettuce was transplanted into the soil later in the fall. Though it is not quite at a harvestable height, it has not shown any signs of stress in the cold temperatures as it is closer to the ground.

Education

Workshops

Four educational workshops were held at the hoop house. Attendance varied by topic. Overall attendance was good.

As the growing season was not yet underway, the topics surrounded food and agriculture in general. The workshops for 2011 will be focused more on the hoop house and methods used in the structure.

Our first workshop was a tour of the hoop house and a discussion about the structure and its purpose. We had a small attendance, nine people, mostly community members with back yard gardens.

In July we held a permaculture workshop with two certified permaculture designers. Attendance was high at forty individuals.

In August we held a composting workshop that included a discussion on various composting methods as well as the construction of a worm composting bin (Vermicompost Method). Fifteen individuals went home with bins.

In July we held a season extension workshop. A local community member presented on backyard extension methods, and all attendees toured the hoop house and recieved information on large and small scale techniques. Twenty individuals attended the workshop.

Hoop House Herald

To keep everyone up to date on the project, a monthly e-newsletter was sent out with crop updates, volunteer opportunities, and educational workshops. To be included in our mailing list go to www.marquettefood.coop and click on E-mail Updates under the Contact Us tab.

Tours

The hoop house has been a point of interest for many local farmers, community members and school groups. On several occasions passers-by stopped in to ask about the project and were given a brochure and tour of the operation. There were also many school groups that came out to learn about the project and see how the food is grown, as well as to try a bit of fresh produce right from the ground.

A Big Thanks To...

NMU Constructors

Students from the Northern Michigan University Constructors student group volunteered their time to erect the hoop house. Though no one in the group had put up a structure like this before, they did a fabulous job.

NMU Construction Students

For storage, another group of students in the construction program at NMU built a 10' x 8' storage shed for a class project led by Daryl Delongchamp. They built the structure to our specifications and offered suggestions for what would be beneficial based on our usage of the shed. The shed has been a great addition, housing tools, soil amendments, and seedlings.

NMU Facilities

We worked very closely with the NMU facilities department. They provided ground maintenance around the hoop house (mowing, plowing), helped us with a variety of tasks (bringing in a water truck when the irrigation system was shut down) and placed a year round water hydrant inside the hoop house. Thanks to Jim Thams and his staff.

Volunteers

Several volunteers helped out with bed preparation and planting. We had a great time working in the early mornings before the temperatures got too warm. Their help was greatly appreciated!

Dead River Coffee

Dead River Coffee has been providing used coffee grounds that are added to our compost. They provide about three five gallon buckets per week. Thanks to Dead River and all of the coffee drinkers!

Border Grill

Border grill provided fresh produce waste early in the project for our soil building preparation. They were very gracious in setting aside scraps from their Third Street restaurant.

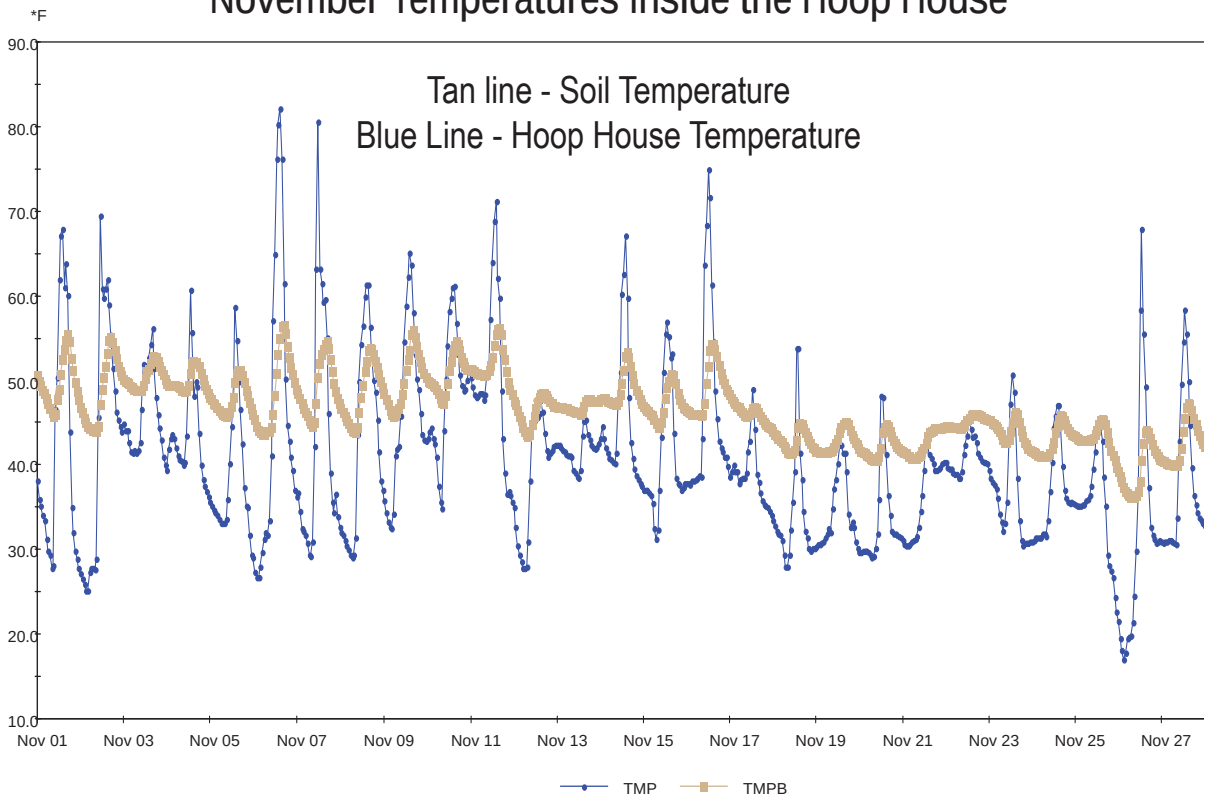
OG - Organic *HMS - High Mowing Seeds* *JSS - Johnnys Selected Seeds*

Crop	Cultivar	Vendor	Bed #	Direct Seed (DS) or Transplant (TP)	Seed Date	Transplant Date	Comments	Harvest Start Date	Harvest End Date
Beets	Touchstone Gold, OG	HMS - 2010	8	DS	8.5.2010, 8.24.2010		Germinated poorly on tilled side	10.18.2010	12.8.2010
Beets	Chioggia Guardsmark, OG	HMS - 2010	8	DS	8.5.2010, 8.24.2010		Germinated poorly on tilled side	10.18.2010	12.8.2010
Chard	Ruby Red, OG	HMS - 2009	7	TP	8.19.2010	10.1.2010	Transplanted well, though not as healthy as golden	12.8.2010	
Chard	Golden, OG	HMS - 2009	7	TP	8.19.2010	10.1.2010	Transplanted well	12.8.2010	
Kale	Red Russian, OG	HMS - 2010	6	TP	7.27.2010, 8.3.2010	8.24.2010	Transplanted well	9.20.2010	12.30.2010
Claytonia		JSS - 2010	5	DS	8.5.2010, 8.24.2010, 9.17.2010		Did not germinate. Temperatures were above average. Finally germinated in mid-Nov./Dec.	12.8.2010	
Mache		JSS - 2010	5	DS	8.5.2010, 8.24.2010, 9.17.2010		Did not germinate. Temperatures were above average. Sparce germination in mid-Nov.		
Scallions	Evergreen Hardy, OG	HMS - 2009	4	DS	8.5.2010, 8.30.2010		Germintated poorly, roughly 25%	12.20.2010	
Cilantro	Santo, OG	HMS - 2010	4	DS	8.24.2010, 9.20.2010		Germinated 70%, replanted gaps, less germination on tilled side	10.25.2010	
Radish	French Breakfast, OG	HMS - 2009	3	DS	8.24.2010, 10.8.2010		Germinated 60%, less germination on tilled side.	9.27.2010	
Tatsoi	OG	HMS - 2010	3	TP	8.19.2010, 8.24.2010	10.1.2010	Transplanted well. A favorite snack for our chipmunk	11.1.2010	
Carrots	Napoli, OG	HMS - 2009, 2010	2	DS	8.10.2010, 8.24.2010, 9.17.2010		Poor germination, 20%, replanted with no improvement		
Arugula	Astro, OG	HMS - 2010	2	DS	8.12.2010, 8.24.2010		Less germination on tilled side, overall 85%	9.20.2010	11.18.2010
Lettuce	Salad Bowl	HMS - 2009	1	TP	8.12.2010	10.22.2010	Transplanted well. A favorite snack for our chipmunk		
Lettuce	Rouge De Hiver Romaine, OG	HMS - 2009	1	DS	8.24.2010		Germination 85%, less on tilled side.	9.27.2010	12.20.2010
Spinach	Space F1	JSS - 2010	2,5	DS	10.22.2010, 11.18.2010		Germination 90%, growing slowly		

Appendix A

Appendix B

November Temperatures Inside the Hoop House



Hoop House Expenses 2010

Description	Vendor	Price
Bags of Peat Moss (6)	Mares Z Doats	$76.26
Soil Amendments	Seeds and Spores	$120.00
Manure, 5 pick-up loads	Willow Farms	$100.00
Stakes to mark off quadrants of Hoop House (10)	Mares Z Doats	$8.37
Seeds	High Mowing And Johnny's Seeds	$101.30
5 Seed Starting Trays	Mares-Z-Doats	$26.45
Worm Castings (fertilizer for seedlings)	MFC	$6.36
Supplies for interior plastic layer (plastic, pipes, cables, etc.)	Menards	$296.11
Diatamaceous Earth (to eliminate worms)	MFC	$6.36
Supplies for Compost bins (chicken wire, metal plates for attaching wooden pallets together, staples)	Menards	$77.57
(6) 5 gallon buckets for compost pickup from local businesses	Menards	$25.76
50 Straw Bales to surround structure in winter	Cesario Farm	$150.00
Miscellaneous Supplies	Various	$89.09
	Total	$1,083.63

For more information on the project contact Kelly Cantway at 906-225-0671 ext. 26 or at services@marquettefood.coop

NORTHERN INITIATIVES

Northern Michigan University

marquette food co-op