Organic Production in High Tunnels

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Introduction: Rules and Recommendations

High tunnels have several characteristics that make them ideal for growing organic vegetables and fruits. Many of the overall stresses associated with outdoor production are eliminated in a high tunnel. Plants grown in high tunnels are protected from rain and constant wet foliage caused by dew, which is often a major cause of disease problems. Daily water needs can be supplied by drip irrigation, which can prevent erratic soil moisture conditions that are often the cause of fruit cracking. Plants are also protected from high winds, which can cause micro-bruises of plant tissue and allow disease organisms to invade the plants.

The high tunnel structure can provide a safe haven for predatory insects to live and thrive, whether they are natural or introduced. This gives the organic high tunnel producer a major tool to control pest insects. In addition, in properly managed high tunnels there is little leaching of plant nutrients from the soil, giving the organic producer an opportunity to efficiently use organically approved soil fertility products that may be too costly or time-consuming to use in outside applications. Because of the increase in both growing days and heat units, producers have an opportunity to use cover crops and other methods to help comply with the national organic recommendations and requirements.

When high tunnels are used with good management, organic producers have an excellent opportunity to produce high quality produce at an economical cost, which will bring premium prices in the marketplace.

Organic Production

Organic growers are committed to using environmentally sound production practices and improving the quality of their land. This commitment, and the lack of synthetic inputs, is what draws consumers to organic products, and what brings premium prices for organics at the marketplace.

However, organic production involves intensive field monitoring and record-keeping, and a certification process is necessary to use the organic label. This is a management-intensive system of farming that relies on biology, timing, and ecological cycling to create vigorous crops and to manage insect pests, weeds, and disease. Organic is a regulated claim: there is a set of national standards, administered by the USDA National Organic Program, with which growers must comply in order to legally use the term "organic" for a product they sell.

Getting Started

The processes and regulations for organic certification of high tunnels are no different than certification of field production. The most basic requirements for certification are:
1. land must not have any prohibited materials applied for three years before harvest
   and
2. a written, comprehensive organic system plan that describes in detail the
   management of the land for which you are seeking certification.

Organic production at any level requires intensive record keeping so consumers can be
assured the product they are purchasing is truly organic.

Organic growers must understand that there are few, if any, controls for major outbreak of
production problems as with conventional production. Therefore it is of extreme importance
that organic producers fully understand insects, disease and weed cycles and implement
preventative strategies, anticipating problems before they happen.

Before you start organic production, think about the changes that you and your operation will
need to undergo. Talk with other successful organic producers. You may qualify for
exemption from certification if you grow less than $5,000 of organic product per year AND
farm in full compliance with the National Organic Standards. However, you should talk to
one or more accredited organic certifying agencies so that you get a complete
understanding of what organic production is really about. And remember that the $5,000
exemption does not exempt you from any organic requirements, only from inspection and
certification. Your produce must be as traceable through intensive record-keeping as
products grown by certified producers.

An excellent resource for a high tunnel grower thinking about, or currently in the process of,
transitioning to organic production is “Organic Certification of Vegetable Operations”
http://swroc.cfans.umn.edu/organic/vegetable.pdf. This comprehensive publication outlines
and explains all of the requirements for organic vegetable production. It includes, among
other things: the organic transition process, how to choose a certification agency, and
requirements and examples of record keeping.

What do you mean, “organic?”
“Organic” is a guarantee about how an
agricultural food or fiber product was
grown and handled before it reached the
consumer. It’s also a set of standards for farmers who grow plants and animals, and for
processors and handlers who turn it into food or clothing products.

Farmers and food processors that make organic claims must meet national organic
standards, maintain careful records, and be certified by a USDA-accredited organization, a
process that includes on-site inspection.* Certification assures consumers that the product
was grown and processed organically. There are stiff penalties for fraud, which means
representing a non-organic product as organic.

What do the standards require?

Organic crops must be grown on land managed to reduce erosion and
improve soil quality. The transition takes three years: no synthetic inputs
may be used for 36 months prior to harvest of the first organic crop.
Weeds, insects, and other pests are controlled using practices like crop rotation, mulching,
tillage, variety selection, and biological control. Most synthetic herbicides and pesticides are prohibited, although a few synthetic nutrients and soil additives appear on a special National List and are allowed. There are strict manure and compost guidelines. Sewage sludge is prohibited. Organic farmers may not use genetically modified seed.

*Farms that gross less than $5,000 in organic sales may be exempt from certification. Excerpted with permission of Minnesota Department of Agriculture, Feb. 2010

Organic High Tunnels at the University of Minnesota

The University of Minnesota is currently conducting organic high tunnel research in two locations: Crookston, at the Northwest Research and Outreach Center (NWROC), and Lamberton, at the Southwest Research and Outreach Center (SWROC).

NWROC - Crookston, MN

At Crookston, current research concerns fertility and fertilization of organic production in tunnels. A soluble fish-based solution (nutrient analysis 4-1-1) was tested in 2008 and 2009, and found to be compatible with drip tape. One-half of the tomato and cucumber plantings were fertigated on a continuous flow basis, using two fluid ounces of fish solution (0.09 ounces of N by weight) per 100 feet of tape early in the season, increasing to six fluid ounces (0.28 ounces of N by weight) per 100 feet as plants grew and their nutrient needs increased.

Manure-based compost was incorporated over the entire area before planting. Control plants received only water through the irrigation tubing, while test plants received the equivalent (over the entire season) of 280 lbs/acre N (41 oz N/100 linear ft of row), 70 lbs/acre P (10 oz P/100 linear ft of row), and 70 lbs/acre K (10 oz K/100 linear ft of row). Results in the following table show that fertigation increased tomato yields in both years and cucumber yields in one of the two years.

<table>
<thead>
<tr>
<th>Yield study using ‘Cobra’ tomato and ‘Sweet Success’ cucumber</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>Tomato</td>
<td>Cucumber*</td>
</tr>
<tr>
<td>Control</td>
<td>45</td>
<td>18</td>
</tr>
<tr>
<td>Fertigated</td>
<td>49</td>
<td>13</td>
</tr>
</tbody>
</table>

*Low cucumber yields in 2008 were due to early harvest.

For information and recommendations for preparing the soil and providing plant nutrients in organic systems, see the chapter, “Fertility and Fertigation Management.”

SWROC - Lamberton, MN

Introduction

The organic high tunnel vegetable project in Lamberton is still in its early stages. Our primary goal in managing an organic high tunnel over a number of years is to observe benefits and to troubleshoot problems a high tunnel operator in this region would likely
experience. With this information we hope to develop recommendations to alleviate some of
the risk associated with starting an organic high tunnel.

Our experimental trials at the SWROC high tunnel include:
• Comparison of harvest dates and yield and quality of produce to outdoor production.
• Optimal planting and harvest dates for extended season greens production, including
  using additional row covers inside the high tunnel.
• Fall planting of a leguminous green manure crop for soil-building and increased fertility.

The third point above addresses what may be the primary concern in organic verses
conventionally managed high tunnels—sufficient soil fertility. Due to the high production
rates achievable in high tunnels, fertility can be a major concern. This is especially true in
organic high tunnels, where synthetic fertilizers are prohibited. In organic high tunnels, pre-
plant compost addition is the primary source of plant nutrients. We are closely tracking soil
and plant tissue nutrients in our high tunnel.

Management

The first season of organic vegetable production in the Lamberton high tunnel was 2009.
Composted beef cattle bedding is our primary nutrient source. This is worked into each bed
in the high tunnel in the spring before planting, with application rates based on our soil and
compost nutrient test results. We use a drip irrigation system. After the beds are shaped and
drip lines put down, each bed is covered with black plastic mulch. Our vegetable plants are
started in a greenhouse and were transplanted into holes in the mulch in mid-April in 2009.

In 2010, transplants will be put in the high tunnel the first of April, two weeks earlier than last
year. In case of cool temperatures, especially at nighttime, we will test using a portable
propane heater in the high tunnel (L.B. White, Onalaska, WI, model CP155, 155,000 BTU
for our 48’ x 30’ high tunnel). This is a thermostatically controlled heater we will set to keep
temperatures in the high tunnel above 60ºF after transplanting. We are interested to see
how much propane this supplemental heating will consume, and if this additional cost pays
off with earlier and higher quality vegetables.

Figure 1. Organic high tunnel and outdoor plot in Lamberton, MN, 2009.
In our high tunnel we are growing determinate tomatoes, indeterminate tomatoes, cucumbers, and peppers, each in their own bed. We also have one bed dedicated to early and late season greens (lettuces, spinach, arugula, etc.). Crops are rotated among beds each year. Indeterminate tomatoes and cucumbers are trellised and pruned as in greenhouse production. A beneficial flower mix is planted along the edges of the high tunnel to attract pollinator and predator insects.

In 2009 we began fall planting a leguminous green manure crop, on half of each bed, for spring incorporation. This should add additional nitrogen and improve soil structure in the high tunnel beds, compared to compost only. However, because of the season extension capabilities of high tunnels, post-harvest and pre-plant windows for establishing and cultivating a green manure crop are limited. In addition to soil amending, we will observe if any fertility benefit is desirable given the potential cost increase of the salable product.

First Year Results

In 2009, as expected, our high tunnel extended the harvest season, ranging from six weeks (lettuces, tomatoes) to ten weeks (red bell peppers) earlier than outdoors. More produce was harvested from the high tunnel compared to outside (some of the largest differences were approximately two times as many Diva cucumbers and Ace peppers). Fall greens were harvested into the last week of November. The use of the drip irrigation and mulch effectively eliminated weeds in the high tunnel.

In this first year, we should note that the setbacks we encountered were not related to growing organically, but to chance occurrences and general management practices. First, we encountered a virus which forced us to pull some tomato and pepper plants. Luckily the disease did not spread far. Second, as we did not use supplemental heat or shading this year, our temperatures inside the high tunnel fell low in the spring and climbed high in the summer. We believe this especially affected our tomato production with much of the determinate and indeterminate tomatoes showing “green shoulders.” Thus lessons from our first year included the importance of continuously scouting for diseases and pests and the need for close temperature regulation.

In 2010 we are building two additional high tunnels at the SWROC, for production in 2011. We are also holding our first Season Extension Day in May. As more growers in Southwest Minnesota, around the state, and in the Upper Midwest construct high tunnels, we hope to build a knowledge base of information to share at field days and in publications such as this. We will continue to update this section of the manual as we gain more information.

Figure 2. Organic ‘Diva’ cucumbers, ‘Cobra’ tomatoes, and ‘Carmen’ sweet Italian peppers from the SWROC high tunnel in 2009.
Resources

In addition to the “Organic Certification of Vegetable Operations” http://swrocf.cfans.umn.edu/organic/vegetable.pdf cited above, each year there are more good informational resources for high tunnel growers. The National Sustainable Agriculture Information Service has a publication called Organic System Plans: Market Farms and Greenhouses, which is clear, concise and relevant to high tunnels and others about managing insects in and producing specific crops. You can get a copy at www.attra.org or by calling 1-800-346-9140 (800-411-3222 Español).

Where can I get a copy of the national organic standards? www.ams.usda.gov/nop (under NOP Regulations)

Where can I find a list of certifiers that operate in Minnesota? www.mda.state.mn.us/news/publications/food/organicgrowing/usdaaccredited.pdf

Where can I contact a real, live certified organic farmer for information and advice? http://mofie.coafes.umn.edu

Where can I find information about inputs that are allowed (or prohibited) in organic production? www.ams.usda.gov/nop and www.omri.org

Where can I get information about being exempt from certification? http://www.mda.state.mn.us/en/food/organic/exemptions.aspx

Where can I find information about current organic vegetable, fruit, and crop prices? http://www.rodaleinstitute.org/Organic-Price-Report

Where can I find sound, reliable organic production information for various crops? http://www.attra.org/organic.html


Are there loans available for organic growers? http://www.mda.state.mn.us/grants.aspx also, contact your local USDA Farm Service Agency (FSA) office and local lenders.


What are some other good sources of information about organic agriculture?
Midwest Organic and Sustainable Education Services www.mosesorganic.org
Northern Plains Sustainable Agriculture Society www.npsas.org
Organic Ag Info www.organicaginfo.org/
Organic Farming Research Foundation www.ofrf.org
Organic Research at University of Minnesota http://organicecology.umn.edu
Organic Trade Association http://www.ota.com/index.html
Rodale Institute http://www.rodaleinstitute.org