

Growing Great Tomatoes All Winter in Minnesota

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When we decided to build our geo-thermal greenhouse, we chose to grow tomatoes because of the high value of the crop. We also chose to grow these tomatoes in the ground to aid in as much flavor and nutrition as possible. Growing tomatoes in the ground in the winter is not easy and we were warned away from this decision, but chose to do so anyway. It has been an adventure to say the least!

Our greenhouse is a 46' x 126' gutter-connect. The ground is heated with a geo-thermal ground source heat pump system and up until this winter ambient air was heated with two 300,000 btu propane heaters. This year we have in place a Log Boiler which is a very large gasification unit. Because it supplies up to 2,500,000 btu's it not only heats the geo-thermal house, but two smaller greenhouses as well.

Each bay consists of 4 beds 108' long, each containing 2 rows of tomatoes (or cucumbers, beans, etc) 18" apart. Tomatoes are also planted 18" apart in row. Beds are approx. 3' apart. The wide spacing of the tomato plants aids in air flow.

Plants are trained up tomato twine held on tomahooks. We usually wind at least 30' of twine per hook because the plants are in place for up to 10 months and will use all of that length. Tomahooks are hooked onto cable held at a height of 9'. Tomatoes are pruned and clipped weekly and usually hooks are unwound and tomatoes dropped every two weeks, or whenever they reach the cable.

Our original plan was to plant the tomatoes in August and hopefully harvest tomatoes by Thanksgiving. This rarely happened because of heating and light issues. This year we planted the tomatoes in July and they have been producing steady since September.

The beds were prepared with the addition of 1 inch of compost, Sustain fertilizer and dry kelp. Sheets of white ground fabric were placed over the entire bay with holes cut every 18" down the double rows on the beds. Tomatoes were planted directly into the ground through the holes and 1 gallon pots with the bottoms cut out were placed around the tomato plants. These pots are later filled with more compost and fertilizer as the plants grow and serve to hold the stems off the floor as they are dropped during the year.

Fertilizer, either Sustain or Midwest Bio Ag Veggie Sol, along with kelp, some molasses and Soil Set will be added approx. every six weeks.

We monitor closely for disease and pest issues. We didn't have the roof panels in place right away during part of this last summer so the plants got rained on and developed some septoria. After closing in the greenhouse and with careful pruning we have mostly eliminated that threat. Pests were not much of a problem during the warm months but as cold set in we did have some mildew problems. This we treated with spraying sulfur potash and Serenade.

The biggest pest issue that we normally have are thrips and aphids. We have used in the past, and will use again, biological controls such as beneficial mites, pirate bugs, midges and parasitic wasps.

We also have additional lighting in place. Each bed has 18-400 watt HID lights. Lights are on automatic timers, one bay turning on at 4 o'clock in the morning and turning off again at about 8 o'clock. The other bay turns on at 4 o'clock in the afternoon and off again at 9 pm. Lights are manually turned on all day when days are dark and cloudy.

Water is set up with orchard tubing and spikes. These ensure even water pressure all the way to the end of the rows. An automatic timer is used on individual rows, usually set at one hour giving about a half gallon of water to each plant.

After trialing many different varieties of tomatoes, we have settled on a couple of favorites as well as continuing to trial more. Our main slicing tomato is Rebelski purchased from Johnnys Selected Seeds. For cherry tomatoes we like Favorita and Sun Peach, also from Johnnys. Currently we are also growing Bigdena and Frederik, both from Johnnys, and Caiman from High Mowing Seeds.

Since we have not been able to use the greenhouse up to its full potential until this year, yields have been spotty and low. This year, with better heating and greenhouse film in place, we anticipate yields up to or surpassing original projections.

This is the projected production for the 2015/2016 season (September to June). This year we planted only 5 of the 8 double rows in tomatoes. Cucumbers were planted in 2 of the beds and pole beans in one of the beds for the first planting in July. Another planting of cucumbers was planted in one of the beds and beans in another in November, as well as a bed of San Marzano tomatoes in the third. We do not have an estimate on production for the San Marzanos cucumbers or beans. If the entire greenhouse was planted to tomatoes the numbers below could be extrapolated out accordingly.

Cherry tomatoes, 1 ½ beds:	2700 pints @ average \$2.50 per pint =	\$ 6750.00
Slicing tomatoes, 3 ½ beds:	12,960 lbs @ average \$2.50 per lb =	<u>\$32400.00</u>
	Total	\$39150.00