

2015 Southern Wisconsin
Vegetable Production Workshop
Tomatoes



Tricia Bross
Luna Circle Farm

Jenny Bonde
Shooting Star Farm

Steve Pincus
Tipi Produce

Location	Rio	Mineral Point	Evansville, WI
Acres in vegetables	4	3	45
Acres in field tomato tomatoes	0.05	1/6 acre	1.7
Acres in hoophouse tomatoes	0.13	.03 acres	none
How these tasks are done for Tomatoes			
field prep/tillage	with a tractor	with a tractor	with a tractor
transplanting	by hand	by hand	with a tractor
cultivating	by hand	with a tractor	with a tractor
spreading amendments	with a tractor	with a tractor	with a tractor
mulch laying	with a tractor	by hand	with a tractor
laying irrigation lines	with a tractor	by hand	with a tractor
laying row cover	do not do this task for tomatoes	do not do this task for tomatoes	by hand
pruning	by hand	by hand	by hand
trellising	by hand	by hand	by hand
spraying for pests, diseases, or weeds	by hand	by hand	with a tractor
harvesting	by hand	by hand	by hand
hauling harvested crop from the field	by hand	with a tractor	with a tractor
mowing cover crops or crop residues	with a tractor	with a tractor	with a tractor
incorporating cover crops or residues	with a tractor	with a tractor	with a tractor
farming style	certified organic	certified organic	certified organic

Propagation

Varieties - Field	I only do paste types in the field. Varieties: Viva Italia, Roma, Paisano	Paste type: Monica Grenadero, Gilberte Red Slicer: Big Beef, BHN 1021, Cherry: Sakura, Sungold, Black Cherry Heirloom: Valencia, Pink Ping Pong, Green Zebra, Cherokee Green, Cosmonaut Volkov	Determinate Red Slicers: Rocky Top, Red Defender, BHN 1021, Early Planting Slicers: Valley Girl, Primo Red Indeterminate Slicers: Pink Beauty Colored Slicers: Sunkist, Lemon Boy, BHN 871 Cherry: Sunsugar, SuperSweet 100, Jazzy, Black Cherry Plums/Paste: Pony Express, BHN 685
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Varieties - Hoophouse	Hybrid slicers - Big Beef, Arbason, Estiva Heirlooms - Nepal, Eva Purple Ball, Yellow Perfection, Jaune Flamme, Valencia, Green Zebra, Paul Robeson, Nyagous, Japanese Black Trifele, Black Krim Indigo - Indigo Rose, Indigo Blue Beauty Cherries - Sungold, Black Cherry, Snow White, Peacevine, Sugary	Red Slicer : New Girl, Rebelski, BHN 1021 Paste: Grenadero, Striped Roman Cherry: Sungold, 5 Star Grape Heirloom: Striped German, Flamme', Rose, Green Zebra, Red Zebra, Black Prince	
Soil Mix	Purple Cow	Vermont Compost Fort V OR Purple Cow Seedling mix	We make our own mix with peat, perlite, vermiculite, Purple Cow compost, alfalfa meal, feather meal, Sustane 8-4-4, lime, soy meal, bone meal, kelp, pasteurized soil, Them-X 70.
Seedling Trays	Seeded in 6 lines in open black plastic 1020 flat. Up-potted to 50 cell square plug trays when first true leaves emerge.	Start seeds in either 3/4" soil blocks (mini blocks) OR Plantel tray with 3/4" cells (341 cell flat). At two true leaves, we pot up to either 3" pots with 4" depth. These are reusable containers Those for sale at farmers' market are planted to 2" round containers.	Start in 170's (10x20"), pot up to 3" plastic pots for early crop, to 40 cell 10x20" trays (2x2x3" cells, 120 cc) for main planting. 3rd planting is seeded and grown in 200 cell 13x26" trays (1x1x3" cells, 35 cc)
Propagation Schedule - Field	Seeding date March 15 Up-pot date about April 10 Transplant May 20 (depending on the weather and other crops to be transplanted). In 2014 not transplanted until May 30	Seed approximately April 7th Start potting up to 3" pots around 4/20 - 4/25 Transplant to field between May 20-25th (depending on weather).	1st planting seeded 3/20, repotted 3-4 weeks later, transplanted 5/6-10 2nd planting (our largest) seeded mid-April, repotted 3 weeks later, transplanted 5/20-30. 3rd planting (if made) seeded May 15-20, transplanted 4 weeks later; not repotted
Propagation Schedule - Hoophouse	Seeding date February 15 Up-pot date March 10 Transplant date April 15	We don't aim to have super early hoophouse tomatoes. No heat or extra frost protection efforts are used inside the hoophouse. Seed tomatoes 3/25 Pot up to 3" pots 4/10 Transplant to hoophouse about 5/10	

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<p>Germination</p>	<p>I have an insulated basement room equipped with lights and a heater. Tomatoes are the first crop started so I set the heat to about 82 degrees. I put the trays on the top shelves for more heat. Once the tomatoes germinate I turn on the lights (on timers) for 18 hours of light per day.</p> <p>The set up is not really a germ chamber. I use it to start plants early and delay opening the greenhouse for 3 more weeks. The humidity is lower than a germ chamber, there are lights and I have to remove the trays to water them (takes time and is a pain).</p>	<p>We use a small germination chamber within our greenhouse. The chamber is heated by a bucket heater placed in a tub of water. The bucket heater is plugged into a thermostat and a probe measures the air or soil temperature. Tomatoes are germinated at about 85 degrees air temperature in nearly complete darkness, and 100 percent humidity. Once the seeds germinate and radicle appears, we move flats to the greenhouse and place on a germination mat. Row cover helps keep heat around the flats. This allows for cooler greenhouse temps without slowing the growth of tomatoes.</p>	<p>Trays are lightly watered, then placed in plastic trash bags. 4-5 days In germination room at 75, then moved to heated benches in greenhouse.</p>
<p>Greenhouse Irrigation</p>	<p>In the basement room I need to water every other to every third day. Once the trays are in the hoophouse they are usually watered every day. The exception is when there have been too many cloudy days in a row.</p>	<p>Flats just removed from the germ box are kept constantly moist. We use a "fog-it" nozzle for seedlings. They may require 3 waterings per day or one - depending on sun. When cotyledons are fully open and true leaves start to appear, soil can dry out somewhat between waterings. A "red head" attachment is used at this point. Once potted up, plants are generally watered once per day. Soil is allowed to become fairly dry before watering.</p>	<p>As needed</p>
<p>Optimal Greenhouse Conditions</p>	<p>I set the heater temperature to 55 degrees. The greenhouse has shutters and exhaust fans that are set to 80 degrees to maintain a constant daytime temperature.</p> <p>When the tomatoes are moved to the greenhouse they are placed on benches on the south wall. When they are a little more mature (and when the peppers need the south bench) they move to benches in the middle of the greenhouse. This gives them air flow from both the door and the exhaust fans. Next they are moved to pallets on the floor.</p>	<p>Greenhouse is kept at 50 during the night and 60 - 65 during the day unless sun warms it. Then we vent at 80. Tomatoes are coddled on germ mats on center or north tables until true leaves appear. Once potted up, south tables are used. Fans circulate air in the greenhouse 24 hours per day.</p>	<p>Plug trays with young seedlings stay in warmer area on GH. Lots of air movement. After repotting, grow cooler with even more air flow.</p>

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<p>Hardening-off</p>	<p>After the tomatoes have been on the pallets on the floor, they move outside during the day and back inside at night. The first day or two, they go on the ground under some benches. This is to protect them from too much sunlight. Next they will move to the bench tops. I have some big trees nearby which shade the benches in the early morning. They spend about a week being protected. By then I feel they are ready to be out on the benches. If there are any late frosts predicted, I will move them back into the hoophouse.</p>	<p>We harden-off tomatoes for about 1 week prior to planting in field: Day one they are moved outdoors in the shade, protected from wind for just a few hours. Day two is similar but for a few hours longer. Some sun can hit leaves - maybe 20 minutes. Day three-five Time outdoors is increased & more exposure to breeze and sun. By days 6 or 7 plants are in direct sun and starting to be left out overnight.</p>	<p>Usually outdoors for about a week, with cover ready for cold nights. Keep sheltered from strong winds. 1st planting often is covered in field, so does not need so much hardening. We do give them less water.</p>
<p>Pests or Diseases in the Greenhouse</p>	<p>I have some issues with damping off. But usually I can avoid this by not over watering. It helps to pay attention to the weather. Don't water if there are cold and cloudy days ahead.</p>	<p>None in greenhouse.</p>	<p>No significant problems.</p>
<p>Other Notes on Propagation</p>			<p>Tomato transplants will quickly grow spindly and weak if too wet, warm or crowded. The best plants are grown with cool days/warm nights (low DIF), adequate space and lots of fresh air. Use sterilized or new planting trays. Tobacco smokers can transmit virus diseases to seedlings.</p>

Field Prep - Field Grown Tomatoes

<p>Preceding Cash Crop - Field</p>	<p>Year 1 - direct seeded crops - radishes, beets, cilantro, salad mix, etc. Year 2 - peas and onions Year 3 - tomatoes and peppers</p>	<p>Year 1: Fallow with cover crops Year 2 Lettuce followed with winter cover crop Year 3: Tomatoes</p>	<p>At least 3 years between solanaceous crops. We don't have a specified rotation leading into tomatoes; less than 15% of our crop land is used for tomatoes and related crops, so we can be flexible.</p>
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Preceding Cover Crop - Field	It varies. I have lots of quack grass so I've been trying different crops to smother quack. I've used winter rye, and sorghum sudan. I've tried vetch for some fertility issues. Recently, I've tried to use a summer fallow program to beat back the quack grass.	Most years we follow head lettuce with winter wheat and vetch. The wheat/vetch is incorporated in early May prior to tomatoes.	Often overwintered rye/hairy vetch, sometimes a spring-planted cover of oats/field peas/chickling vetch.
Soil Amendments - Field	I use composted poultry manure. I have tried spreading the CPM with a 3 point spreader prior to laying plastic. But I prefer to put a handful of CPM in each hole as the tomatoes are transplanted.	Midwest Bio-Ag vegetable specific fertilizers are used: Veggies Plus (general fertilizer) 400 lb / acre Veggies SOL (specific for solanaceous crops) 600 lb / acre	1-1.5 ton/A dried chicken pellets/crumbles. Last year we applied 500 lb/A Veggies Sol for MBA (4-1-12) If no CC, we spread tree leaves, 15-20T/A 1000-1500 lbs/A/year Organi-cal from MBA on all fields Fall 2011,12 &13.
Bed Prep - Field	If the spring is not to wet I like to use my single shank subsoiler on the whole farm. Then in mid-May I use a moldboard plow followed by a rotovator. I would love a spader, but it is not in the budget.	Winter cover crop is either disked or mowed, allowed to break down some for several days and then rototilled with a tractor mounted rotovator. Fertilizer is banded on the beds. A final, finish till is done to incorporate fertilizer and prepare a finished bed.	1st planting goes into field that was bare over winter, so a pass with Perfecta field cultivator is usually enough. Fields with rye/vetch get flail chopped, moldboard plowed, rototilled. If there's too much residue, laying plastic mulch is difficult (or impossible).
Mulch - Field	I lay black plastic mulch with a mulch layer pulled by the tractor. While I hate using plastic, quack grass is such a problem that I fell that plastic is my only defense in my cash crops.	We use green or black IRT plastic on tomato beds. It's used to increase temperature and to minimize soil splash on plants. Beds are also mulched with straw or grass hay to minimize rain and soil splash.	Black plastic, 4' wide, laid with a single line of drip tape, using a Rainflow 2550 layer. Bed is raised 3-4 ".

Field Prep - Hoophouse Grown Tomatoes

Preceding Cash Crop - Hoophouse	I have 5 hoophouse. These are the crops I grew in them in 2014. HH1 - misc. crops - carrots, radishes, beets, greens, peas HH2 - tomatoes HH3 - basil and other herbs HH4 - cukes HH5 - tomatoes In 2015 every crop moves down one house and the crop in HH5 moves to HH1. So tomatoes will be in HH1 and HH3.	A mix of radish, chard, beets, basil, mustard family crops and lettuces are planted in the hoophouse one season prior to tomatoes.	
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Preceding Cover Crop- Hoophouse	Not really doing any cover crops in the hoophouse	We try to follow greens crops with oats or wheat. Doesn't happen every year.	
Soil Amendments - Hoophouse	I use either CPM or compost from Purple Cow. I prefer the compost. I use 2 gallons per 25x4 ft bed.	Midwest Bio-Ag vegetable specific fertilizers are used: Veggies Plus (general fertilizer) 400 lb / acre Veggies SOL (specific for solanaceous crops) 600 lb / acre	
Bed Prep - Hoophouse	My preference is to use a broadfork to dig the beds. When I am running late, I use a walk behind tiller. I prefer the broadfork as the soil structure seems to be better. The broadfork takes time, so it is best to start it early. For me that would be January or February. If I need to use a tiller, that would be in April.	The cover crop or old crop residue is incorporated with a rototiller.	
Mulch - Hoophouse	I use plastic mulch to keep down the quack grass. Plastic is laid by hand. I use landscape fabric for the aisles. I use metal ground staples to hold it all down.	None used.	

Planting

Bed Width	<u>Field:</u> 3.5 ft <u>Hoophouse:</u> 4 ft	<u>Field:</u> about 30" with plastic <u>Hoophouse:</u> about 30"	<u>Field:</u> 6 ft
Plant Spacing	<u>Field:</u> 1 row/,18" between plants, 4.5 ft between rows <u>Hoophouse:</u> 2 rows/bed, 18" between plants, plants are staggered. 5' between beds	<u>Field:</u> 1 row per bed; 2 ft between plants, 6 ft between rows for indeterminates Determinates are placed 12-18" between plants. <u>Hoophouse:</u> 1 row per bed; 18" between plants. Six rows total in a 30' wide hoophouse.	<u>Field:</u> 18" for plum types, 24" for all others

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Transplanting Process	<p>We have drip tape under our plastic. I like to irrigate the night before transplanting so the beds are very wet. Lay down a measuring rope that has knots tied every 18". Use a dibbler to poke holes in the plastic. If we are doing 2 rows in the hoophouse, 1 row of holes is poked on the knots. The other row is poked halfway between the knots to stagger the plants. Then we use watering cans to dump compost or CPM in each hole. (The spouts on the watering cans have a few inches cut off to allow more product to come out). Plants are dropped at each hole (usually by me because I can judge which plants should be planted and which should be tossed aside). The crew is behind me pushing the plants through the plastic and into the mud. If the soil is dry, the crew needs to put their fingers under the plastic and make sure the plug is covered with soil. We try to do this without tearing large holes in the plastic as weeds will come through the holes. Mud is much easier to plant into.</p>	<p>Fertilizer is spread with a drop spreader attached to tractor or lawn mower. Bed is given a final til. Furrows are made on either side of bed with a furrow attachment on a walk-behind rototiller. Drip tape is laid: One person monitors smooth unspooling of row while second person pulls tape. Black plastic is laid by hand: one or two people pull plastic along bed with a rope threaded through the roll, while one or two rake soil into furrows to secure plastic. Plants are dropped on plastic at 18" apart. A knife is used to cut plastic at each plant. Use hands to scoop a hole under plastic and firm plant into soil. Process for hoophouse is the same except, but no plastic used.</p>	<p>Waterwheel transplanter, plain water. Tall plants get buried deeply.</p>
Compost or Amendments at Planting	<p>CPM or compost applied with the cut off watering cans. About 1 cup per transplant.</p>	<p>n/a</p>	
Water at Planting	<p>Drip tape - watered before transplanting. If it wasn't possible to irrigate before transplanting, I water right after transplanting is finished.</p>	<p>Drip tape is turned on immediately once all plants are in. We adjust drip to be sure plants receive water right on the root area.</p>	
Mulch	<p><u>Field</u> - prefer to use straw between plastic beds. Lay this down a week or two after transplanting. But lately, straw has become too expensive. So now I am cultivating between beds. <u>Hoophouse</u>- plastic on beds, landscape fabric between beds. Plastic laid before transplanting. Landscape fabric is permanent.</p>	<p>Straw or grass hay is used to mulch the edges of plastic, extending a foot or so into the pathways. This is done about 2 weeks after transplanting. We hoe plastic edges once or twice prior to mulching. Remainder of pathways are usually planted to wheat or some other living material (we have very wide pathways).</p>	

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Row cover	<p><u>Hoophouse</u> - floating row cover used with hoops after transplanting to retain heat. Use black plastic sandbags to hold down edges.</p> <p><u>Field</u>- usually not used, but I would put out row cover if we had frost warnings after transplanting.</p>	n/a	<p><u>Field</u>: 1st planting usually gets covered with AG-19, held up by wire hoops every 3-4 plants. Usually a 30-35' wide cover</p>

Crop Maintenance

Irrigation	<p><u>Field</u>: Drip irrigation used. Usually one night per week (8 to 10 hours). I have sandy soil so unless we are getting lots of rain this schedule is followed all season.</p> <p><u>Hoophouse</u>: Hoophouse - irrigated once daily for about an hour. In 2012 needed to water twice a day for one hour.</p>	<p><u>Field</u>: Field tomatoes are irrigated for several hours at a time when plants are young. Soil never really dries out under the mulch. We don't monitor equivalent rain inches.</p> <p><u>Hoophouse</u>: Hoophouse tomatoes are watered deeply with drip once or twice per week when young.</p>	<p><u>Field</u>: Just enough water is best for tomatoes. About 1"/week is usually adequate. All plastic mulched fields are drip irrigated; bare ground fields overhead.</p>
Irrigation Modifications	<p><u>Field</u> - once the fruits start to ripen the irrigation slows so there is no splitting</p> <p><u>Hoophouse</u> - no change until about fall equinox. At fall equinox I start to water every other day. If we have a hot spell I will go back to every day. But as we have less sunlight, I reduce the water to prevent some of the disease issues.</p>	<p><u>Field</u>: When tomatoes begin to ripen, irrigation is scheduled. Aim for one hour every other day in field, 2 hours every other day in hoophouse.</p> <p><u>Hoophouse</u>: Once fruits have set, irrigation is scheduled every two to three days for 2 hours. We aim to keep a bit of moisture in the soil so plants are not wet then very dry.</p>	<p><u>Field</u>: Once a good crop is sizing up and the first set is ripening, we are stingy with water. Quality is more important than highest yields. Steady water supply minimizes blossom end rot.</p>
Trellising	<p><u>Field</u> romas - bamboo posts placed every 2 plants and then a basket weave. Done ideally when plants are 6-8 inches tall and then every 6 inches of growth.</p> <p><u>Hoophouse</u>: Beds run the width of the hoophouse, using crossbars for trellis. I attach sisal to a plant using a tomato clip, then throw the ball of string over the crossbar. In the past I have then clipped the sisal to the tomato in the other row. I had too many problems with clips and strings breaking so this year, each plant will have its own string. I use a couple of tomato clips for each plant. After that I use the Duratool from Johnny's to 'tape" the plants to the string.</p>	<p><u>Field</u>: All field tomatoes are trellised with basket weave. 5'-6' metal T posts are driven in after every 4th plant. Start basket weave before plants topple over. Weave once per week for six to seven weeks.</p> <p>Determinates: 4' wooden stakes are driven every second plant. Same schedule for weaving. Usually 4 or 5 weeks.</p> <p><u>Hoophouse</u>: Drop two strings per plant from supports. Red slicers and some heirlooms are trained to two leaders and attached to strings as they grow. Others are pruned less and tend to outgrow the string method. When this happens, we drive tall fenceposts every 15' or so, and run strings from post to post to "sandwich" unruly growth.</p>	<p><u>Field</u>: Indeterminate types- basket weave w/ 6-7' metal t-posts every 2nd plant; 4-5 strings</p> <p>Determinate Slicers- basket weave w/ 4-5' wood stakes every 2nd plant; usually 3 strings</p> <p>Plum types- usually not supported; short wood stakes every 3rd plant and basket weave</p>

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<p>Pruning</p>	<p><u>Field:</u> Field tomatoes are all determinate types so no pruning. <u>Hoophouse:</u> Indeterminates are pruned to two stems - the main leader and the sucker under the first fruit cluster. All other suckers are removed. I do this until about mid-July. I don't prune my cherry tomatoes quite as hard. Usually I prune off the root suckers and then let the rest go. Also, some of the heirloom varieties like Paul Robeson don't need to be pruned as hard. They just don't develop the plant mass of some of the other varieties. In 2014 I experimented with removing all the lower leaves to see if that helps lessen disease issues. The results were inconclusive so I will try it for another year. I started using a small and very sharp pair of scissors to prune. It prevents any tearing of the skin.</p>	<p><u>Field:</u> Remove lower leaves below first flower cluster. Otherwise they are not pruned. <u>Hoophouse:</u> All plants (excepts determinates) are pruned to the main stem plus the sucker under the first fruit cluster. Suckers are removed on hybrids every week or two until harvest. Cherry tomatoes are pruned only once or twice. Less productive heirlooms are two 2 leaders initially, but later 4 or 5 suckers are allowed to grow. Determinates are trellised with basket weave; one stake every 2 plants.</p>	<p><u>Field:</u> Indeterminates have all suckers below the 1st cluster removed just before transplanting, while still in trays. No other pruning.</p>
<p>Weeding</p>	<p><u>Field:</u> Some weeds will come through the same hole as the tomatoes. We do some careful hand pulling. Some wheel hoeing in the aisles. <u>Hoophouse:</u> Any weeds that come up through the plastic or at the edges are pulled by hand.</p>	<p><u>Field:</u> edges of plastic are weeded with hand hoes - trapezoid or scuffle - until mulched. Tall weeds that get through mulch are pulled by hand. Wide pathways are mowed once cover crop is established. <u>Hoophouse:</u> We simply hoe around each plant and in the pathway on a weekly basis until plant canopy shades out weeds. Pathways may need additional touch-ups, but foot traffic usually keeps weeds down.</p>	<p><u>Field:</u> Plastic mulch edges and middles are tractor cultivated 2-3 times before staking. Weeds are hand pulled from holes. After staking, weeds are tolerated, or mowed or chopped up with a BCS rototiller. And hoeing, of course. Bare ground fields are tractor cultivated and hoed, just like any other crop.</p>
<p>Insect Pests</p>	<p><u>Field:</u> A few hornworms that we pick by hand. <u>Hoophouse:</u> Hornworms are a big problem. We hand pick them. I have tried Bt, but it doesn't seem to work very well. I think it is hard to get good coverage given all the plant mass.</p>	<p><u>Field:</u> Tomato hornworms appear in late July. We treat with Dipel DF. A fine mist and fairly quick walk through is sufficient. No other pest problems. <u>Hoophouse:</u> Tomato hornworms arrive in July. Also sometimes fruitworm (corn earworm). Dipel DF is used once or twice per season.</p>	<p><u>Field:</u> No real insect problems</p>

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Diseases	<p><u>Field:</u> Mostly septoria leaf spot. Usually the majority of the crop is harvested before it does too much damage. Mulch (either plastic or straw) will delay the onset of the disease.</p> <p><u>Hoophouse:</u> Leaf spot, grey mold, and septoria leaf spot.</p> <p>The first step is to try to have good air flow. Roll up sides and circulation fans help. Also, make sure the plants have enough water, but not too much. Fix leaky irrigation that may leave puddles.</p> <p>I have tried various products. One year I tried copper fungicide and hated the blue spots that had to be washed off my tomatoes for the next 2 months. I felt that the copper product, even though it is allowed for certified organic production, has too many risk factors for me. Oxidate works okay to push back the onset of the diseases. I have also tried EM (Effective microorganisms). This works well with my loose philosophy of disease control by trying to promote the biological health of the soil and plants.</p>	<p><u>Field:</u> Septoria leaf spot: try to remove infected leaves. Have tried Oxidate, Actinovate. No real success with these since not used as a preventative.</p> <p>Alternaria (early blight) Have tried Oxidate, Actinovate, and Zonix products, Some success when used as preventative.</p> <p><u>Hoophouse:</u> Very little disease issues.</p>	<p><u>Field:</u> Foliar disease control is the biggest challenge in growing excellent tomatoes outdoors. Septoria Leaf Spot and Early Blight (Alternaria) are our main fungal diseases, kept in check with sprays of copper fungicides (Champ WG). Bacterial Speck and Bacterial Spot show up frequently, minimized by hot water seed treatment (see Jan 2015 GFM), also controlled by Cu sprays. Anthracnose is a yearly fungal pest on ripe fruit as plants decline. Late blight gets a lot of press, but is actually a rare problem.</p> <p>Most Cu-containing protectants leave a blue residue on fruit; to avoid this we move to Double Nickel or Cueva as harvest begins. Full leaf coverage is important- use high pressure, drop nozzles, or air blast sprayers. All these diseases are worse during warm, humid/wet weather. Wet foliage promotes disease; trellising and mulching helps. Don't crowd plants- they need air movement to dry quickly.</p>
Hoophouse Environmental Control	<p>Roll up sides and fans for air circulation.</p> <p>Heat for cool weather at each end of the season.</p>	<p>Hoophouses have roll-up or roll-down sides plus peak vents and doors to prevent overheating. One house has circulating fans as well.</p>	
Hoophouse Heat	<p>I have a Modine heater in each hoophouse. I use it in the spring and fall, but mostly to keep the plants from freezing. The temperature is set to 40 degrees.</p>	<p>No heat. Just monitor with thermostat. Plants are rarely put in prior to May 5th. Row cover is loosely thrown over crop if an unusually cold night is forecast. No loss to frost/freeze.</p>	
Hoophouse Shade Cloth	<p>I use a 40% white shade cloth. I attach it with rope to eyebolts screwed into the base boards. Usually it goes on in early to mid June depending on the weather. It comes off around labor day.</p>	<p>n/a</p>	

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Other Notes on Crop Maintenance		<p><u>Hoophouse:</u> Potassium and magnesium deficiencies have been identified. Working with better fertilization program to alleviate these.</p>	<p><u>Field:</u> When needed, we spray Surround (kaolin clay) an 25-50 lb/A to minimize sun scald. When growing without plastic mulch, we usually spread a 2-3" layer of leaves as mulch, using a modified self-unloading chopper box or a side-delivery manure spreader.</p>
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Harvest and Yields

Harvest Dates	<p><u>Field:</u> Romas - August 4 to September 20 <u>Hoophouse:</u> Cherry - July 1st to December 1st Heirlooms July 20 to December 1st Hybrid slicers - August 4 to December 1st Note: Hybrid slicers were later than heirlooms because of wind damage to the hoophouse where they were planted. The hybrids and some heirlooms were planted 3 weeks later because there was no plastic on that hoophouse.</p>	<p><u>Field:</u> Cherries 7/15 to frost Reds 8/5 to frost Romas 8/15 to frost Heirlooms 8/5 to frost <u>Hoophouse:</u> Cherries 7/5 to late October (approx. 3rd week on average) Reds 7/20 to (approx. 3rd week on average) Heirlooms 7/15 to late October (approx. 3rd week on average)</p>	<p><u>Field:</u> Cherries- mid-late July- early October Slicers- Late July- late September Plums- early/mid August-early October</p>
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<p>Harvest Procedure</p>	<p>Harvest when plants are dry. Always remove the calyx. We pick into 2 gallon buckets. For slicers and romas we fill the buckets. When 2 buckets are full we carry the buckets to a nearby cart that has shallow black bulb trays on it. The bulb trays have towels in the bottom to cushion the tomatoes. Buckets are carefully emptied into the trays. 4 trays fit on the cart. When all 4 are filled but still stackable, the cart is pushed to the pack shed. Trays are stacked in the shade. Cherry tomatoes are also picked into 2 gallon buckets, but the buckets are only filled halfway. Buckets are carried down to the pack shed. It is important to point out that I harvest tomatoes under ripe. Then I let them ripen off the vine. This avoids lots of damage from critters and splitting from excess moisture. For a red tomato I pick them in the yellow/orange stage. Sungolds are picked when they are yellow. With the various heirloom tomatoes, it is important to learn the right time to harvest.</p>	<p>Tomatoes are harvested when plants are dry - usually noon or later. We aim to harvest 3 or 4 days from ripe, In field: plastic bread flat trays are lined with bubble wrap for large heirlooms. Tomatoes are picked and placed on flats in a single layer. Reds and romas are harvested into black bulb crates (sometimes lined with a towel). Reds are harvested 2 or 3 deep; romas 4 or 5 deep. Cherry tomatoes are harvested into 10# tomato boxes. Damaged fruit is left in the field. Crates, boxes, bread flats are stacked in the vehicle and driven back to the packing shed for sorting. All calyxes are removed from all tomatoes except in rare cases.</p>	<p>Usually harvest in afternoon, remove calyx from slicers. Plums into 5 gallon pails, full; slicers into 5 gal pails, 2/3 full; cherries into 4-5 qt ice cream pails.</p>
<p>Cleaning</p>	<p>Since most of the fruits are off the ground, very little cleaning is needed. If needed tomatoes are wiped with a damp cloth.</p>	<p>Fruits are not cleaned except in rare cases. A damp cloth may be used to remove dried leaf debris. A dry cloth if fruits are damp or dusty.</p>	<p>Plums go through brusher-washer. Slicers usually hand wiped with soft cloth, sometimes go through a small brusher-washer with very soft bristles. Cherries usually not washed.</p>
<p>Packing: Slicing/Salad Tomatoes</p>	<p>Tomatoes are graded in the shade of the pack shed. First quality tomatoes for farmers market and CSA are packed stem side down into black bulb crates lined with a dry towel. Usually I do 2 layers in the crate, but some small varieties are 3 layers in the crate. Second quality tomatoes are packed into 5/9 bushel boxes for sale as canners.</p>	<p>In packing shed, fruits are sorted crates by quality: #1 and #2, and unsaleable. 1's and 2's are also sorted by ripeness. Unsaleables are left in black crates for farm use. 1's and 2's are packed into 10# or 20# tomato boxes and labeled with grade, weight, date, and ripeness level. If there are orders that day, we pack boxes for sale while sorting.</p>	<p>Slicers sorted into ripe and less ripe. True unripes are discarded. Both types usually moved into 60F cooler to slow ripening. #2 grades are set aside for crew/farm use, or for sale as canners, if good enough. We place clean graded tomatoes in black bulb crates with a paper liner, stem side down, 30 lbs/crate of slicers.</p>

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<p>Packing: Heirloom Tomatoes</p>	<p>Same as slicers</p>	<p>In the packing shed, heirlooms are sorted into #1's and #2's and unsaleables, just like reds. However, we store all heirlooms in 10# tomato boxes, sorted by color and/or variety for market. Mixed cases are packed for restaurant customers. Whole boxes are labeled for sale. Others are labeled with grade, date harvested, variety, and ripeness level.</p>	
<p>Packing: Romas</p>	<p>Romas are graded in the shade of the pack shed. First quality tomatoes are packed into a towel lined bulb crate. Usually they are layered 3 deep. Second quality fruits are packed into 5/9 bushel boxes for sale as canners. During peak roma season I will sort out 2 trays (about 50 pounds) for sale at farmers market. After that I just pack everything into canner boxes.</p>	<p>In the packing shed, romas are sorted into #1's and #2's. Wholesale orders are packed into 20# tomato boxes. Others are packed into black crates, 4 or 5 deep. Crates are labeled with grade, and date harvested.</p>	<p>After cleaning in brusher-washer, plums are packed in black bulb crates, 35 lbs. Or into 20 lb 5/9 bu. waxed boxes for wholesale. Or into 4 mil plastic bag lining a 5/9 bu box for freezing.</p>
<p>Packing: Cherry Tomatoes</p>	<p>Cherry tomatoes come into the pack shed in buckets. I put 15 pint baskets into a bulb tray. Then I carefully and very slowly pour them into the pints looking for damage and split tomatoes. We try to cull the split tomatoes when picking, but it isn't possible to catch them all.</p>	<p>In the packing shed, cherry tomatoes are re-packed into plastic pint containers for farmers' market or wholesale. Any splits or overripe fruits are discarded. Extra cherries are stored loose in 10# tomato boxes, labeled with variety, date harvested, and weight.</p>	<p>Flip-top pint clamshells are set up 10 at a time in a home-made rack, cherries are slowly poured from small harvest pails into pints, inspected and sorted. Don't overfill- one smashed tomato will draw fruit flies and degrade the entire pint. Filled clamshells are packed into bulb crates for CSA, into waxed boxes for wholesale. Stack only 2 high, or risk damage to bottom layer.</p>
<p>Storage</p>	<p>I have a room next to my cooler which does not have any temperature controls, but some of the cool air from the cooler spills over into this space. It does keep the rodents from getting to the tomatoes. I try to move tomatoes within a week of harvest. Some fruits that were picked a little green may last longer than that.</p>	<p>All tomatoes are stored on metal metro shelves in the packing shed. The shelf is near the cooler (an attempt to keep the temp down in the summer). No special room or climate control is used.</p>	<p>At 60F slicers store for 3-5 days, plums for up to a week, when harvested from healthy plants. Later in the season, storage is less successful. Cherries are kept at 46-48F; they are picked ripe and ready to eat. Can store up to one week. We recommend that our wholesale customers refrigerate these until displayed for sale.</p>

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Yields	<p><u>Field:</u> Romas - 1.6# per bed foot. 2014 was not the best field tomato season. <u>Hoophouse:</u> Hybrid slicers - 7.4# per bed foot. Heirlooms - 4.1# per bed foot Cherry - 5.4 pints per bed foot</p>	Don't have this info accessible.	<p><u>Field:</u> Very hard to know this- we leave a lot of good tomatoes in the field during peak ripening times. Weekly CSA members receive 25-30 lbs of slicers and plums during a full season, plus 2-3 pints of cherries. We do not have wholesale outlets for slicers and only modest sales of plums. We do sell 8-9000 lbs of plums bagged and boxed for whole fruit freezing each year.</p>
Other Notes on Harvest and Yields			<p>We harvest slicers only once a week for CSA, leaving too many to get a little too ripe, but hard to resist by the next harvest. We tend to run a day or 2 too ripe at peak season. We have started to have about 1600 lbs of red slicers crushed and canned for us, for CSA use the next year (about 600 qts).</p>

Markets

Markets	CSA, farmers market	farmers market, direct to restaurant	CSA, direct to grocery
CSA	<p>For the Season: Cherry - 21 pints Heirlooms - 25 lbs Hybrid Slicers - 4 lbs Roma - 2 lbs</p>		<p>Weekly CSA members receive 25-30 lbs of slicers and plums during a full season, plus 2-3 pints of cherries.</p>
Farmers Market Prices	<p>Cherry \$5/pint in July, \$4 in August and September, \$5 in October, \$6 in November Heirlooms \$5/lb in July, \$4 in August and September \$5 in October and November Slicing Hybrids and Romas - \$3 all season</p>	<p>Cherry tomatoes: \$4.00/pint; \$3.50/ pint or 2 for \$6.00 if overwhelmed. Red Slicers: \$3.00/pound; \$2.50 later in season Heirlooms: \$4.00/ pound; \$3.50 at lowest Romas: \$2.50/pound 20pounds #2's or romas for 1.50/pound if excellent crop.</p>	
Direct to Grocery Prices		n/a	<p>Plums- \$1.45/lb Cherries \$30.00/doz</p>
Direct to Restaurant Prices		<p>Red Slicers: \$2.50 to \$2.00/lb Heirlooms: \$3.00 - \$2.50 Cherry: \$3.00-\$2.50/ pint</p>	
Wholesale Prices		n/a	