



Peppers

Chris McGuire
Two Onion Farm

Steve Pincus
Tipi Produce

Chris Upper
The Tree Farm

Location	Belmont	Evansville	Town of Berry
Acres in Vegetables	4	50	15
Acres in Peppers	0.15	2.2	1.5
How These Tasks are Done for Peppers			
field prep/tillage	with a tractor	with a tractor	with a tractor
transplanting	by hand	with a tractor	with a tractor
cultivating	do not do this task for peppers	with a tractor	with a tractor
spreading amendments	by hand	with a tractor	with a tractor
mulch laying	by hand	with a tractor	do not do this task for peppers
laying irrigation lines	with a tractor	with a tractor	by hand
laying row cover	do not do this task for peppers	by hand	do not do this task for peppers
trellising	by hand	do not do this task for peppers	do not do this task for peppers
spraying for pests, diseases, or weeds	do not do this task for peppers	with a tractor	with a tractor
harvesting	by hand	by hand	do not do this task for peppers
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	conventional

Propagation

Varieties	Sweet Bell: Bianca Sweet Italian: Carmen	Green/Red Bells: Red Knight, Socrates, Double Up, Karma Green/Yellow Bells: Flavorburst Green/Orange Bells: Milena Italian: Carmen Chilis: Masivo poblano; Hot Rod serrano; Jalafuego jalapeno	We raise about 25 different types of peppers (sweet and hot). Because seed companies frequently drop varieties with minimal notice, we plant more than one variety of many types of peppers. This gives us the opportunity to choose better varieties, and to respond easily when varieties disappear. In any given year we may have well over 50 types of peppers in our fields.
Soil Mix	Up to now we have used Johnny's 512 mix from Johnny's Selected Seeds. In 2014 we are switching to homemade mix with compost (from Purple Cow Organics), peat moss, vermiculite, kelp meal, soybean meal, rock phosphate.	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.	Redi-mix

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Seedling Trays	Seeded in 2" soil blocks grown on 1/2" plywood flats, 36 per flat; and potted on to 4" blocks, grown 6 per plywood flat.	We seed into T.O. Plastics 200 deep plug tray with shallow undertray w/drain holes, then potted up into either 3" plastic pot or Growing Systems 40 cell Rose Pot tray.	128 squares
Propagation Schedule	<p>First planting: Bianca+Carmen. Seeded 4/5, Pot on 5/5, Transplant 5/25</p> <p>Second planting: Carmen only, Seeded 4/24, Pot On 5/17, Transplant 6/6</p>	<p>We make three seedings and transplantings. First seeding March 10-15, move into 3" pots 4-5 weeks later, transplant May 7-10. Second (main) seeding April 5-8, move into rose pot flats 4-5 weeks later, transplant late May. Third seeding is small, 1400 plants, seeded into 13" x 26" 200 cell flats (35cc per cell) in mid-May, then transplanted directly 5 weeks later.</p>	Seed in the greenhouse the second week of April. Transplant when weather and soil conditions permit after about 20 May.
Germination	Place flats in 85 deg germination chamber until short radicals emerge from seeds (about 2-4 days; this seems to vary more with peppers than many other crops). Flats are bagged while in germ chamber.	After seeding, flats are watered moderately, then put into plastic trash bags to maintain moisture, then into a dark germination room at 80F for 5-6 days. Move to greenhouse on our warmest benches, cover with row cover to hold heat from hot air duct running below benches. Don't overwater. Protect against mice with traps or guards on bench legs.	N/A
Greenhouse Irrigation	Variable: 1x per day typically, but can skip several days in cool cloudy weather or do 2x per day in hot windy weather. Compared to other crops we are careful to avoid over-watering.	We water by hand, as needed.	Overhead by hand when trays are light, but before wilting. Water with appropriately dilute low phosphorous liquid fertilizer after seedling emergence.
Optimal Greenhouse Conditions	Our greenhouses and cold frames have minimal temperature control. We keep peppers as warm with bottom heat and by covering plants at night with row cover. When plants are small, we will only ventilate when daytime temps reach ~80 degrees.	80-85F days, 55-60F nights, lots of air movement. Young peppers stay in the warmest part of the greenhouse, until bumped out by cucurbits.	Little control is available.

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Hardening-off-off	After potting-on, and sometimes before potting on, we grow peppers in cold frames for 3 weeks and expose them to gradually cooler and windier conditions.	After repotting, peppers move into a cooler, more open, less humid greenhouse, which they share with many types of plants. The early planting often moves again into a roll-up side house for real hardening with a little night heat (40F), then outside on a wagon for 2-4 days before transplanting. Water just enough, but don't let plants wilt during windy hot weather. The second planting hardens outside, on the ground between greenhouses to shelter from wind. We cover with a tarp or a thick compost cover on frosty nights. The third planting is growing outside for 2-3 weeks and does not need hardening.	Cold frame when plants are large enough.
Pests or Diseases in the Greenhouse	Mice like pepper seedlings. Use snap traps with peanut butter to control.	Peppers can pick up virus diseases in the greenhouse. Keep the floor clear of all weeds- watch for growth along edges. Don't allow any aphids or leafhoppers to get started.	Minor or none.
Other Notes on Propagation	Potting on rate: 25-45 plants per person-hour (counting all time from setup to cleanup).	Flats must stay near 80F or above until fully emerged. 70F is too cool.	

Field Prep

Preceding Cash Crop	Squash > Brassicas > Pepper		Cole crops or cover crop.
Preceding Cover Crop	Sometimes winter rye.	Fall-planted oats, oats/peas, annual ryegrass work very well. Spring oats are often worthwhile. Rye/hairy vetch is fine, but can create such a large mass of residue that laying plastic mulch is a challenge.	Rye or sudan sorghum.
Soil Amendments	4 lb soy meal spread per 90' row in 2' band, for N. Sometimes broadcast Rock Phosphate or K-Sulfate, if required by soil test.	All pepper fields receive 1-1.5 T/A of dried chicken pellets before fitting. If no cover crop to turn under, we also spread 15-20 T/A of leaves. All our fields get 1000-1500 lb/A /year Organi-cal, from Midwestern Bio-Ag.	Fertilizer as per soil analysis and crop recommendations.

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Bed Prep	If preceding winter rye: till that in about May 1, then till again about 10 days later. If no winter rye, till about May 10. All tilling with 6' wide rotovator on tractor.	Live cover crops require chopping, then moldboard plowing. Sometimes a discing is necessary to break up clumps of roots. Winterkilled cc get chiseled. A finish pass with a Perfecta field cultivator, then lay plastic mulch.	Chisel + rotovate.
Mulch	IRT plastic mulch laid with plastic layer for warming soil and weed control. Straw mulch placed anytime from 1 week before transplanting to 2 weeks after to completely cover bare soil between plastic mulch. For weed control.	We lay 4' wide black plastic mulch on a slightly (3-4") raised bed. A single drip tape (10 mil, 12" emitter spacing) is laid down the middle of the bed. Mulch + drip creates excellent growing conditions for peppers, keeps fruit cleaner and dryer, allows irrigation on harvest days and during windy weather. Also eases weeding and cultivation. Raised beds make harvest easier.	N/A
Other Notes on Field Prep			

Transplanting

Bed Width	5' center to center	6 feet	2.5 feet between rows
Pepper Spacing	1 row per bed, 15" between plants.	2 rows of peppers per bed, 18-20" apart. Plants are 18" apart within each row.	17 inches
Transplanting Process	Lay tape measure alongside bed and punch holes in plastic and dig holes with post hole digger every 15". Water each hole to overflowing from hose. 0.75 oz Drammatic K Fish Fertilizer added to each hole (it is diluted in water in a large bucket and 6 oz of dilute is poured into each hole from a plastic cup). Water and surrounding soil mixed to make slurry. 4" soil block placed in slurry and covered with dry dirt.	We transplant with a Rainflo waterwheel. Spike size depends on the size of rootball we're handling.	Mechanical 5000 transplanter.
Water at Transplanting	See above.	Transplanter is set to fill the hole with water. Water is cheap, so we use a lot.	Water to settle soil around root ball from transplanter. Trickle soon after planting if soil is very dry.
Row Cover		We normally do not cover peppers, but we do keep some old covers available to protect during frosty nights.	N/A

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Other Notes on Transplanting	<p>Transplanting done usually shortly before first blossom opens.</p> <p>Peppers alternated with tomatoes in field: 2 rows peppers, 1 row tomatoes, 2 rows peppers, 1 row tomatoes, etc. Tomatoes provide windbreak for peppers; peppers allow air circulation for tomatoes.</p> <p>Transplanting usually done with members not very fast workers - plant about 25-30 plants per person-hour (counting all time from prep to cleanup)</p>	Irrigate soon after transplanting.	

Crop Maintenance

Irrigation	If <1" rain, drip every 5-7 days to simulate 1"-1.5" rain. Less during cool/cloudy weather.	Drip irrigation, mostly. Most pepper fields do get some overhead irrigation in late summer as a side effect of watering adjacent fields. We try to maintain 1-1.5" of rain equivalent per week.	Trickle to supply an average of 0.1 inch per day as needed.
Irrigation Modification	Irrigate a bit heavier during flowering and fruitset. Stop irrigation once main flush of fruits is sized up.	Because peppers set in spurts, we keep irrigating steadily through the season.	In response to evapotranspiration models for the area.
Trellising	<p>Only for Carmen, because plants are taller and weaker than Bianca. 4' oak posts from Nolt's. A pair of posts every 16' along row. In each pair, one post is on each side of row, with about 8" between them. Red baling twine strung between posts: start at one end of row on one side, run down entire length of row on that side; at last post cross to other side of row, return down entire length of row on second side, at last post, cross back to starting post. Wrap twine 3x around each post as you. Repeat this 2-3x per season as needed/time permits as plants grow to keep them upright and contained.</p> <p>Prevents plants from falling over, reduces fruit rot and sunburn dramatically.</p>	No supports necessary, except for poblanos.	N/A

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Weeding	Hand weed ~3x per season paying attention to holes in plastic and any weeds coming through gaps in straw mulch.	Tractor cultivate plastic edges with belly-mounted danish shank and disk (disk rolls dirt back onto edge) and rear gangs of 4-5 shanks and sweeps. High-clearance tractor and cultivator is great, allowing later-season work. Hoe edge weeds that are missed. Weeds in mulch holes are pulled by hand, sometimes scratched with a small hand hoe. Sometimes we mulch holes with leaves. Very large weeds in holes are clipped, not pulled.	Trifluralin PPI preplant. Cultivate and hoe as needed and soil conditions and time permit.
Insects	Basically none.	European corn borer can ruin fruits by tunneling in near stem, but BT corn has reduced this pest. Tarnished plant bug may be responsible for blossom drop ?? Thrips can cause fruit discoloration, young leaf deformation and also spread virus.	White tailed deer are the single most important pest we have on peppers. We encourage hunting, and have resorted to damage tags on occasion. Flea beetles can be a problem shortly after transplanting. Controlled by insecticide spray.
Diseases	Virus? Sometimes see a few seedlings with mosaic on younger leaves - cull them out at transplanting. Mosaic sometimes reoccurs near end of summer, coupled with rough brownish patches on fruit. Never a big problem.	Bacterial speck and spot are somewhat common; growing BLS-resistant cultivars helps. We see virus problems at time; severe in 2013. Some genetic resistance is available. Good greenhouse sanitation can prevent early infection.	Rare and usually unimportant.
Other Notes on Crop Maintenance		Blossom end rot is common on our sandier soils- frequent moderate irrigation helps, also increasing available Ca. Sunscald can be a big problem, especially on 1st planting, which produces smaller plants. 2+ applications of Surround @ 25lb/A gives some protection.	

Harvest and Yields

Harvest Window for Green	Bianca: picked immature when white. Start when first fruits are full sized (7/15-7/25). Continue until entire first flush of fruits is harvested or we have sufficient red Carmen peppers for our boxes. Once Carmen harvest begins, we usually ignore Bianca, even though there may be some fruits on plants.	Green bells- mid July until solid frost.	Mid to late July to killing frost.
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Harvest Window for Mature	Carmen: picked when fully red, starting around 8/15, until all fruits picked or frost.	Red Bells- early August until frost. Yellow and Orange Bells- mid-late August until frost Red Italians- early-mid August until frost	Late August to killing frost.
Harvest Procedure	Late AM/early PM: clip fruits with felco. Blemished fruits go on ground next to plants. Good fruits > vented harvest crates, (two crates are nested inside one another so that fruits in top crate are protected from pokey straw by empty crate underneath). Crates dragged by hand down row. Count fruits while harvesting. Full crates stacked in covered (shaded) bin until hauled to pack shed.	All peppers hand harvested. We just twist off, into 5 gal pails. We bring in good #2 grade ripe fruits, but only #1 green peppers. Greens are harvested as needed, reds/yellows/orange when ripe, at least every 14 days; every week at peak season. We define ripe as 90% color.	Pick-your-own
Cleaning	Crates hauled to packing shed inside large bin and stacked inside to await washing. Washed briefly under running water 1 by 1 and checked again for blemishes.	All peppers cleaned through a 14 roll brusher-washer, medium stiff bristles.	N/A
Packing	Washed peppers placed in clean crates like those used at harvest.	Peppers are graded and packed directly from the drying rollers at the outlet of the brusher-washer. One person loading the washer, two people sorting, one on each side of the machine, and a person weighing, stacking and labeling boxes. Pack bells into 1 1/9 bu, 25 lbs. Italians sold as 15 lbs, chilies 10 lbs. Count for CSA with approximate weights. Csa ripers are separated into #1's and #2's.	N/A
Storage	Stacked in 50 degree cooler on pallets overnight and covered by plastic to retain moisture. Packed into CSA boxes in AM.	Greens held at 48F for up to 10 days. Reds at either 48F or 36F, depending on where space is available, for 5-7 days max. #2 ripers are regraded before using for CSA.	N/A
Yields	Bianca: we have harvested about 3.75-4.5 fruits per plant. Actual production of harvestable fruit has probably been as high as 6-7 in good years but we have not picked all fruit. Carmen: has been 10-12 fruits per plant with trellis. Was 6-9 before we trellised.	Averages of 2011 and 2012 seasons: Bells- Green, Purple & Ripe combined- 2.1 lbs/plant Italian- Green & Ripe combined- 1.7 lbs/plant Jalapeno- 2.1 lbs/plant Poblano- 0.65 lbs/plant Serrano- 1.2 lbs/plant Anaheim- 1.8 lbs/plant	N/A

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Marketing

Markets	CSA	CSA; direct to grocery	pick-your-own
CSA Peppers - quantity delivered per share	<p>Per week: Bianca: 1-2/small box, 2-3/large box Carmen: 1-4/small box, 2-7/large box; usually 2-3 per small box and 3-5 per large box. About 4-5 weeks of each variety, sometimes 6.</p>	<p>2012 numbers, a very productive pepper year: Green, purple, suntan- 16 peppers Red/yellow/orange #1- 5 Red/yellow/orange #2- 17 Italian #1 & #2- 19 Chilies- 6 Oranos (small orange)- 6</p>	
Direct to Grocery Prices		<p>Green bells- \$1.25/lb Purple and Ivory Bells- \$1.40/lb Red Bells-\$2.40/lb Green Italians- \$1.60/lb (few sold) Red Italians- \$3.10/lb Jalapeno-\$2.60/lb Serrano- \$4.40/lb Anaheim- \$2.40/lb Poblano- \$2.30/lb</p>	
Pick-your-own			<p>Sweet, all kinds \$1.05/lb Hot, large fruit (e.g. jalapeno, Hungarian wax, poblano, etc.) \$1.20/lb Hot, small fruit (e.g. Lao hot, hot cherry, pepperoncini, etc.) \$2.40/lb</p>