2018 Organic Vegetable Production Conference

Strawberries

	Mike Noltnerwyss Crossroads Community Farm	Andy Cotter York Farm
Location	Cross Plains, WI	Hutchinson, MN
Acres in vegetables	20	5
Acres in FIELD Strawberries	0.4	0.25
Area in HOOPHOUSE Strawberries	0	2100 square feet
How these tasks are done for Strawberries		
field prep/tillage	with a tractor	with a tractor
transplanting	with a tractor	with a tractor
cultivating	with a tractor	with a tractor
spreading amendments	with a tractor	with a tractor
mulch laying	by hand	with a tractor
laying irrigation lines	with a tractor	do not do this task for strawberries
laying row cover	do not do this task for strawberries	do not do this task for strawberries
spraying for pests, diseases, or weeds	do not do this task for strawberries	with a tractor
harvesting	by hand	by hand
hauling harvested crop from the field	with a tractor	by hand
mowing residues	with a tractor	with a tractor
incorporating residues	with a tractor	with a tractor
farming style	certified organic	certified organic

Propagation

Varieties	Field: Jewel is the only variety that we grow.	In order best to worst. Field: Jewel (Mid), Annapolis (Early), Sonata (Mid), Itasca (Early), Mesabi (Mid) Hoophouse: Monterey, San Andreas, Albion, Evie (new), Verity (poor)
Starts	We buy bare root starts from Nourse Farms in Massachusetts and have them shipped the first week of May.	Bareroot from Nourse Nursery

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Field Prep		
Preceding Cash Crop	Field: we usually do greens block (head lettuce, bok, radish etc.) year 1, carrots year 2, onions year 3, and then strawberries year 4. the carrots and onions are both crops that get cultivated a lot which helps to reduce the presence of perennial weeds prior to strawberries.	Field: We did a biannual plan with our strawberries (plant them, harvest next summer, and then dig them up) with a rest season with cover crops. Hoophouse: We have eight rows in our 30X72 Hoophouse, we keep the strawberries for two years. One row is always in rotation and we will plant some vegetables (usually not for sale) in that row.
Preceding Cover Crop	Field: after onions we have done hairy vetch, oats, or a bare fallow and then winter rye. with a may planting date it is not necessary to have a winter killed cover crop, so having something like winter rye planted in early September can be nice to really smother any perennial weeds. we would usually take the rye down as soon as we can in the spring (early April) prior to planting the bare root plugs in early may.	Field: The best cover crop we found was oats and peas. Other cover crops (such as buckwheat) if went to seed became a pain to weed out. Typically we put pigs in after cover crop is matured. Hoophouse: Oats and peas are typically the favorite cover crop.
Replant Schedule	Field: we plant every two years, so we will pick off a patch for two seasons.	Field: We replanted after the first year of bearing. We only harvested for one year. Hoophouse: Every two years, expect to bear for two years. Although, the second year has been mixed, maybe plan on experimenting with that.
Soil Amendments	Field: we generally treat our strawberry field similar to many other crops. we usually apply around 1000 lbs per acre of composted dehydrated chicken manure (4-3-2) in the spring of each season. We also apply a base micronutrient package that we have custom blended through midwest bioag. we rent a large spreader cart for both the micro blend and the chicken manure crumbles and spread it ourselves. if soil test indicates the need for other nutrients we would apply them according to crop demands (we would look these up in uw extension publication a 2809). For small amounts of 0-0-50 or other supplemental fertilizers we usually use a small cone spreader.	Field: Our soil is pretty good so besides cover crop and pigs we didn't put any soil amendments before planting. During the late summer, we do fertilize with Sustane 5-2-4 or Sustane 8-2-4. Hoophouse: We have been adding potting soil to our Hoophouse to make the soil more organic (we have clay loam soil) and to make it easier to work. Plan on adding one more batch of the potting soil and then that will be the last time of adding. Other than that we haven't added any amendments. The soil tests for the Hoophouse have shown we have enough nutrients.

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Bed Prep	Field: We would usually rotovate a standing cover crop very shallow in early April to kill it and incorporate the residue and get it to start breaking down. if any concern for compaction from previous seasons we would run a 3 shank yeoman subsoiler. then day of planting we would rotovate again to get a nice soft soil that allows for good soil contact of bare root plants with the waterwheel transplanter	Field: In the early spring put the pigs into the area to clean up and break up the soil. After moving out pigs, use a Yeoman plow (subsoiler) to break up soil (especially where compacted by the pigs). Disc. What has worked well is if I use the yeoman plow to go again where the strawberry rows are and disc, it creates a nice deep trench for the roots but that takes a lot of extra time and measuring/marking of the field. Hoophouse: In the fall before ground freezes up use a broad fork in the row. In the spring rake it smooth.
Pre-Planting Mulch	Field: we plant onto bare ground	Hoophouse: We lay our mulch after they have been planted, 4' DeWitt weed fabric. That way there is a row for the strawberries.
Other Notes on Bed Prep	Field: we use a finger weeder for in row cultivation, so with the bare root plugs that take awhile to actually set a firm root, we want to make sure we have a fine seed bed without chunks of rye that might dislodge strawberry plants if they get moved around by the fingers.	

Field Planting

Bed Width	Field: 60" center to center	Field: 18" Hoophouse: 4"
Plant Spacing	Field: 2 30" rows on a bed, place plants 12" apart.	Field: 18", 1 row per bed 48" between rows. Hoophouse: 8-12" plant spacing, bed is 6" wide, 1 row per bed, 48" between rows
Transplanting Process	Field: we use a waterwheel transplanter. it is one of the tougher crops for this machine, but it works well enough. we usually place the bare root plant horizontal in row then use our hand to bring over dry soil on top of the plant and push it down so the crown is at the surface and the roots are covered. the result is that the roots are usually in the ground at a 45 degree angle or so instead of straight down. literature from Nourse suggests that the roots should be straight down, but it has worked for us.	Field: Use a Mechanical Transplanter 1000B-3 that injects water and inserts the strawberry plant into the ground at the right interval. We do mark out ahead of time the rows with flags in order to keep the rows spaced right and straight. Takes three people to plant (1 on tractor, 2 on transplantor) Hoophouse: Plant by hand using a tape measure for spacing. The rows are already marked. After planted, water by hand until the drip irrigation is installed
Fertility at Planting	None	None

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Water at Planting	Field: water goes through the spike of the water wheel. similar to planting almost any crop with that transplanter we use as little water as possible to get each hole wet. this allows for a tank of water to last longer without refilling and keeps the peoples hands from getting too mucky and not being able to grab the next plant as quickly.	Field - water is injected into the ground with the trans planter. Use about 25 gal for 200 foot row. Hoophouse - Hand water after transplanting. If can plan ahead, try to water the soil a day before transplanting to make sure it is moist.
Mulch at Planting	None	Field - None Hoophouse - Use 5oz DeWitt 4' wide landscape fabric. Apply it soon after transplanting. Makes a big difference in weed management and water retention.
Row Cover	None	Field - None Hoophouse - Use a row cover to protect against frost for newly planted. Also use row cover to protect the flowers and berries from freezing in the early spring and late fall.
Crop Maintenance		NA
Irrigation	Field: we usually use a small water reel (kifco b140) to put down between 1/2" to 1 1/2" of water per week if we don't receive that amount in rainfall. after renovation strawberries do get irrigated but are not as high on the priority list during critical dry periods.	Field: We monitor the rain and if the average is less then 1 inch a week we overhead water. Hoophouse: Using UniRam 12" spacing drippers for 6 hours (less in spring/fall or after heavy rain). On a 4 day watering schedule.
Irrigation Modifications	Field: we don't follow a strict regime on this, but we do try to have adequate water available to a crop as they are flowering and setting fruit. and once fruit starts to ripen we dial back irrigation entirely unless it is drought like conditions.	Field - We haven't had to water in the spring for the bearing year. The mulch in the aisle helps retain moisture. We would not water once the berries size up, since that would reduce flavor. Hoophouse - The water is heavier in the summer months, less in the spring/fall. Have watered too much in fall and got mold issues. We try to harvest before irrigation as water will reduce flavor in the berries.
Pruning	Field: we don't do any pruning. the first year of planting we let the plants flower and we pick the fruit. this isn't necessarily recommended, but the berries that come off these plants are usually the best tasting berries you can get.	Field: All blooms are removed the first year. We cultivate only one way to help train the runners and if the plants get to aggressive and grow into the row, the cultivator will take them out. Hoophouse: Our goal is to trim runners once a week but we typically get behind schedule.

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Renovating	Field: after the first picking year (year 2) we will mow off the leaves of the plants and then rotovate the field we take off 6 tiller tines for each row and that leaves a narrow band of strawberry plants to grow for the following season.	Field: We don't renovate. Hoophouse: We renovate the bed, cut back the row width using a weed whipper.
Weeding	Field: Weed control the planting year is critical, intense and costly. we do a basket weeding or two within 10-20 days after setting the bare root plants. after that we move to the kress finger weeder for another 2 or 3 cultivations, at which point a pretty thick stand of runners usually prevents the fingers from being a good choice. after that we use a super c 2 row cultivator or a offset kubota cultivator, setup with sweeps, and cultivate every 1-2 weeks until it freezes. we also do 2-4 clean hand weedings during that period to get any weeds missed by the tractor cultivations.	Field: For newly planted: Cultivate and then use scuffle and hand hoes with someone going along and weeding right next to plant. Now have a Buddingh Finger Weeder but haven't had a chance to try it. For more established: Cultivate and then hand weed. Hoophouse: Spot weed by hand, usually doesn't take too long due to the weed fabric.
Insects & Pests	Field: we get some damage from thrips, and tarnished plant bug, but we have never done anything to control them.	Field: Tarnish Plant Bug and Thrips. We spray in the spring based on monitoring. Use Pyganic spray with Therm X-70 as a wetting agent. Hoophouse: Thrips is the biggest issue in the Hoophouse, plan on spraying Pyganic more this coming year on a regular schedule.
Diseases	Field: we do notice leaves that get diseased, but have never diagnosed a specific disease as a serious problem and have never done any controls outside of cultural prevention.	Field: No significant problems.
Other Notes on Crop Maintenance	Field: we get some catfacing which i think is caused by tarnished plant bug. we mulch the strawberries for protection over winter. we usually let them freeze and turn somewhat red before mulching. we try to mulch fairly thick to create an insulation layer but after it settles it is usually about 1-3 " thick. in the spring we pull the mulch off the row centers exposing a narrow 5" band and try to have thick enough weed suppressing mulch in between the rows. we may add more mulch at this time in spots that are a bit thin.	Hoophouse: Try to keep it as cool as possible in the summer and warm enough in spring and fall. That means opening and closing each morning/evening. Also will close if big storm is approaching. We do not heat the hoophouse and do not use shade cloth.

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Harvest and Yields		
Harvest Window	Field: june bearing, jewel is the variety. in 2017 we started harvest on june 12th and ended on july 1st. with our best yields coming out around the 16-17th. we usually plan to have them in the CSA for 3 weeks, some years we get a 4th week by picking off the new planting for the 4th week.	Field: June Bearing - 1st week in June to last week in June (plus or minus week) Hoophouse: Everberring in HH - Mid May to End of Oct (typically)
Harvest Procedure	we usually let our crew figure out how to pick fastest, but we recommend putting your container down and using two hands to brush the plants aside and allow visual of the berries below. once containers are filled they are placed in the aisles and every 30-45 minutes someone crates up the containers and runs them into the cooler. we use flags to mark rows that don't get finished.	Field - Try to harvest early in the morning with the calyx into gallon containers. At select intervals will time it takes to fill a pail. Each employee marks down the number of pails. From the a pail it goes into a cooler and then they are sorted to quart containers for the final customer.
Cleaning	we don't wash the berries at all.	Pails are washed between uses, employees wash hands before picking, and sorting area is washed down before use. Do not wash berries.
Packing	for CSA we use plastic clamshells, either quarts or pints, for market we use open quarts. once picked into a container the berries are not sorted so it is important to train and monitor the quality of the berries that are going into the containers in the field.	Sorting is in packing area and berries sort into 1st and 2nd category. 1st are sold as premium and 2nd are sold quite a bit cheaper.
Storage	we store them in a 35 -40 degree cooler, we rarely keep them for more then 3-4 days. if they are in clamshell containers we usually just put them into the cooler. if they are in open containers we may cover the stack with a large plastic pallet cover to keep them from drying too much in the cooler.	We store them in a freezer less fridge or walk in cooler. The goal is to have them all chilled before they are transported for sale but sometimes we end up going to the wire in getting the orders filled.
Yields	Field: We average around 2000 (range between 1400 and 2800) quarts per 1/3 acre (6000 quarts per acre). a quart is usually around 1 lb. 1/3 acre is 7 beds with 2 rows per bed, each bed is 360' long, that equals 5040 row feet, so we average around .4 qts/row foot over a 3 week picking season.	Field: June bearing. Assume a 50% marketable rate 2016 - .4 pounds/foot (marketable). Was hit in 2016 by a late frost losing a large percentage of the crop 2017 - .2 pounds/foot (marketable). Really bad thrip problem with a lot of strawberries not harvestable. Hoophouse: 1.39 pounds/foot (marketable). Assuming a 75% of strawberries picked were marketable.

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Marketing

Markets	CSA, farmers market	Direct to restaurant (main), CSA, Direct sales.
CSA	most seasons regular weekly share gets strawberries 3 weeks. usually a total between 2.5 and 3.5 quarts. every other week share gets strawberries once or twice and a total of 1.5 quarts	For our summer bearing strawberries, we had a lot of strawberries to move and utilized a CSA. We sold through other local vegetable CSAs, through a local coop (they advertised and handled pick up), and off farm. The cost is $60 for 8 quarts. For those shares sold through COOP or vegetable CSA we made $56 per share and $4/share the COOP or vegetable CSA kept for administrative cost.
Farmers Market Prices	$5 per quart. when we have a lot we do 2 quarts for $8.	
Direct to Grocery Prices		
Direct to Restaurant Prices		$8/quart. 10% discount for over $500 order. Resturants get free delivery (for a minimum of $100/order). We haven't changed our price throughout the season even though we have talked about it.
Other Markets		We also use strawberries as barter for employees. Some employees we only pay in produce (work share) and they take strawberries as payment. Tried PYO in 2016 but realized that a field row can't be both PYO and pre-picked as picking quality for PYO can vary greatly from individual to individual and is not efficient for employees to go in after a PYO.

Mike Noltnerwyss

Crossroads Community Farm

Profit Calculation on .35 Acre of Strawberries

Average of 2049 qts on .35 acres
Labor cost = $13 per hour
Farm average profit across all crops = $11,000/acre

Costs for .35 Acre

	Profit / .35 Acre	Profit/Acre		Harvest Labor Cost	Total Pre-Harvest Cost	Total Cost	Total Sales
price $4.50 qt, pick speed 10 qts/hr	$ 4,598	$ 13,136		$ 2,663	$ 1,960	$ 4,623	$ 9,221
price $5qt, pick speed 10 qts/hr	$ 5,622	$ 16,063		$ 2,663	$ 1,960	$ 4,623	$ 10,245
price $4.50 qt, pick speed 8 qts/hr	$ 3,327	$ 9,505		$ 3,934	$ 1,960	$ 5,894	$ 9,221
price $5 qt, pick speed 8 qts/hr	$ 4,351	$ 12,432		$ 3,934	$ 1,960	$ 5,894	$ 10,245
price $4.50 qt, pick speed 5 qts/hr	$ 1,934	$ 5,525		$ 5,327	$ 1,960	$ 7,287	$ 9,221
price $5 qt, pick speed 5 qts/hr	$ 2,958	$ 8,452		$ 5,327	$ 1,960	$ 7,287	$ 10,245

Activity	**Labor Hours**
Field Prep	1.0
Transplant (3 people)	12.0
Cultivate with Tractor	6.6
Hand Weed	60.0
Lay Mulch in Fall (3 people)	17.0
Remove Mulch in Spring	8.0
Total Pre-Harvest Hours	104.6
Total Pre-Harvest Labor Cost	**$ 1,359.80**

Pre-Harvest Cost Breakdown

Total Pre-Harvest Labor	$ 1,359.80
Plant Material Cost	$ 350.00
Mulch Cost	$ 250.00
Total Pre-Harvest Costs	**$ 1,959.80**

Weeding Labor Cost for .35 Acre	$865.80