

# Corn



**Extension**  
UNIVERSITY OF WISCONSIN-MADISON  
DANE COUNTY



**FAIRSHARE**  
CSA COALITION

**Bethanee Wright**

Winterfell Acres

**Tony Miller**

Whitefeather Organics llc.

**Ellen Russo**

Featherstone Fruits and Vegetables

Location	Brooklyn, WI	Custer, WI	Rushford, MN
Acres in Vegetables	0.8	6	135
Total Acres in Corn	0.01	1	13

**How these tasks are done for Corn:**

field prep/tillage	with a tractor	with a tractor	with a tractor
creating stale seed beds	with a tractor	do not do this task for corn	with a tractor
direct seeding	do not do this task for corn	do not do this task for corn	with a tractor
transplanting	by hand	with a walking tractor	with a tractor
cultivating	by hand	with a tractor	with a tractor
spreading amendments	by hand	with a tractor	with a tractor
laying irrigation lines	by hand	by hand	with a tractor
laying row cover	do not do this task for corn	do not do this task for corn	do not do this task for corn
spraying for pests, diseases, weeds	by hand	with a tractor	do not do this task for corn
harvesting	by hand	by hand	by hand
farming style	certified organic	certified organic	certified organic

## Propagation

TRANSPLANTED Varieties	Main variety since 2016: Trinity (great bicolor, non organic) Organic varieties I have tried but discontinued: Luscious, Who Gets Kissed	Espresso - early cobs bicolor a synergistic, allure main season bicolor synergistic Illusion - white later cobs great flavor (syn) popping corn Dakota Black	Kickoff XR (sh2) - strong germination in greenhouse, reliable, pulls well from trays. American Dream (sh2) - okay germination in greenhouse, plants revive well from transplant shock, don't pull from trays as well as Kickoff XR.
Soil Mix	Purple Cow mix	Custom blend from HSU growing supply	Vermont Compost Fort Light
Seedling Trays	Paperpot transplanter: 264 cells/tray with 6" spacing on paper chains. Previously used black plastic 200 trays with great success	6" paper pot system.	Seeded in black plastic new or sterile 128 trays - two seeds per cell.



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DIRECT SEEDED Varieties			Allure (se) - used for cool soil germination, first direct seed succession. Kickoff XR (sh2) - consistent germination in the field. American Dream (sh2) - hardy plants, strong producer.
TRANSPLANTED Propagation Schedule	One succession seeded May 13th and transplanted May 27th (only needs 2 weeks in the greenhouse, 3 weeks MAX!)	espresso 5/13ish, allure and popcorn 5/28ish, illusion 6/17ish. transplanted at 3-4th true leaf, roughly 2.5 weeks later.	#1 - seeding 4/12 transplanting 5/3 #2 - seeding 4/21 transplanting 5/12 #3 - seeding 4/28 transplanting 5/19
DIRECT SEEDED Propagation Schedule			We aim for a seven day gap between sowings, and use an SE variety (cold soil emergence) for our first direct seed succession. #4 - planned for 5/20 #5 - planned for 5/27 #6 - planned for 6/3
Germination	<u>Greenhouse:</u> Germination chamber (thermostat with a bucket heater) set at 75 degrees for 3-4 days	<u>Greenhouse:</u> Very easy, first 2 runs in greenhouse cool benches, last planting outside.	<u>Field:</u> keep soil wet until first emergence so no crust forms, if crust does form we use a rotary hoe to break it apart. <u>Greenhouse:</u> we germinate on unheated benches in the greenhouse and have no issues with germination.
Greenhouse Irrigation	Paper pot cells needs to stay moist as they are not very deep (best for shallow rooted, quick growing crops) so I water 2-4 times/day depending on the weather	Dramm, 1050 rose when needed by hand.	Water daily as needed by hand with Wonder Waterer wand.
Greenhouse Conditions	Corn seedlings are pretty low maintenance and only need 2-3 weeks in the greenhouse before planting. I turn trays once, one week in.	Very easy not picky.	We aim for a air temperature of 75 degrees during the day. Our greenhouses are controlled on a thermostat with a gas heater that will turn on and off as needed. We vent the houses with hand-crank roll down sides, open doors, and thermostat controlled louvers that open automatically at 80 degrees. Greenhouses are closed overnight to stay warm and heat is supplemented with a wood stove. Early spring greenhouse temperatures can fluctuate from 45 degrees at night to 80 degrees during the day but we don't notice any poor effect on germination.

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Hardening Off	If I harden them off, I will put them outside on a greenhouse bench for a few days (returning them inside at night) before transplanting.	A week before planting or second leaf, they are moved outside of greenhouse on hardening benches to stay.	Trays are moved outside onto hay wagons at least 1 week before transplant to harden off. The wagons can be pushed into an open greenhouse for protection if needed (cold, wind, heavy storms...) We can then easily move the wagon full of transplants into the field for planting.
Greenhouse Pests or Diseases	Low Nitrogen can be an issue as corn is a heavy N feeder. Depending on the cell size, I would recommend spraying with fish emulsion once a few days before transplanting to ensure a nice green seedling. When I used 200s, I sprayed 10 days in and I do the same for the paper pots. This is also why I also wait until later May to transplant for a high enough soil temperature to ensure adequate nitrogen availability.	None	No problems
Other Notes on Propagation	I also use a mycorrhizal inoculant in all my crops (except for brassicas) to help aid in nutrient uptake once transplanted. If you are at a scale, like me, that you need a really solid crop of sweet corn for your CSA members, it's definitely worth the time to transplant with limited planting space available.	Transplant time is very important in paper pots, also getting seed deep as possible in cell.	We trialed the Organic 1R seed treatment from Johnny's and had better consistent germination in the field for our direct seed successions.

**Bed Prep**

Preceding Cash Crop	Light N feeding greens and roots	potatoes, pigs, winter squash, sweetcorn; popcorn is usual far away.	We do not have a set rotation that would dictate a particular preceding cash crop. We aim for a five year rotation with corn typically following a winter rye cover crop.
Preceding Cover Crop	Ideally a clover or vetch to N fixation	Usually winter rye this year Austrian winter pea.	Corn often follows a fall seeded rye or rye/vetch, or for later successions, a spring seeded oats/peas.

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**Featherstone Fruits and Vegetables**

<p>Soil Amendments</p>	<p>Every year: Midwestern Bio Ag products: Chicken Crumbles (1000#/ac), Feather Meal (500#/ac), Veggies Plus (250#/ac) and Veggies NKO (500#/ac) EOY: Purple Cow Compost (25 tons/ac)</p>	<p>Farm based compost on sandy ridge locations. We have rolling moraine, some fields produce very differently so potential yields are assessed yearly and compost is added to areas to help maintain congruent yields.</p>	<p>All corn will get either turkey litter in the fall or Chick Magic in the spring before planting, and Midwest BioAg General Blend: Analysis=1-2-6-6S. 300# per acre applied as beds are being shaped. We work with an independent soil consultant to analyze soil tests before and after each season to make amendment decisions. We put down different amounts of turkey litter, macro and micro nutrients based on his recommendations to balance soil for optimum growing conditions.</p>
<p>Bed Prep</p>	<p>Late April: primary tillage with rotovator on tractor to incorporate winter killed pea/oat cover crop Mid and Late May: 2-3" depth tillage to kill small weeds (or deeper if necessary due to a lot of soil debris as the paper pot transplanter needs very clean soil to work)</p>	<p>Low till 3" at 3mph ground speed to knock back cover, but not over thrash soil, then spread compost, about a week later s-tine 9-11" deep at slow at 1.5 mph to not throw soil around, and a day before finish till 3" at 1.5 mph. Paper pots require that the field be as trash free as possible.</p>	<p>4 weeks before planting: mow down cover crop with flail mower. 3-4 weeks: Chisel plow field perpendicular to the orientation of the beds. 3 weeks: Disc/finish disc field depending on level of vegetation or if many clumps exist. 2 weeks: Create beds using Rainflo 2600 bed shaper using plastic mulch for successions 1 and 2. Succession 3 beds are made with the bed shaper and no plastic mulch and then rotovated to create better soil texture and wider bed tops (35"-40") We do not pull raised beds for successions 4-6. 0-2 weeks: We stale bed succession 3 beds with belly mounted Budding Basket Weeder, ideally 2-3 times before transplanting. For direct seed corn we follow the same chisel/disc schedule and then rotterra the field the day before planting. We have experimented with using the rotary hoe as a form of "stale bedding" to eliminate the use of the rotterra in the direct seed field prep, but if weeds get slightly too big the rotary hoe doesn't eliminate them.</p>
<p>Stale bed, Occultation, or Tarping</p>	<p>1-2 times minimal depth tillage to kill small weeds before transplanting in to clean soil</p>		

**Planting**

Bed Width	<b>Transplanted:</b> 2' on center (all my other beds are 4')	<b>Transplanted:</b> 5' bed 7' wheel center to wheel center	<b>Transplanted:</b> 5.75' <b>Direct Seeded:</b> 5.75'
Plant Spacing	<b>Transplanted:</b> Single rows of corn, 2 feet apart, 6" between plants	<b>Transplanted:</b> rows 3' apart 6" in row spacing	<b>Transplanted:</b> 2 rows per bed, spaced 30" apart, 14" between plants, ideally 2 plants per hole. <b>Direct Seeded:</b> 2 rows per "bed" 30" between rows, plants spaced 5.5" in-row
Transplanting Process	<b>Transplanted: Paper pot system</b> - Lay tape measure out and place flags every 2 feet. Set paper pot transplanter on center of 1st row with 1 flat on the tray holder. Pull out the chain of pots and stake to end of bed. Pull transplanter as straight as possible (each 6" chain fits 264 cells and goes 132' so about 1 1/3 bed for my system) for 1 full bed (100') and continue down 2nd row. Replace trays as they run out. (~1 hour per 1000') <b>Black 200 tray system:</b> Lay tape measure out and place flags every 2 feet. Then run tape measure down bed. One person pulls and drops one corn seedling every 6 inches. Another person follows behind, pulls soil back and places seedling in the soil quickly (ideally this should take 2 seconds per plant). Continue until all the trays are planted (~4 hours per 1000').	<b>Transplanted:</b> Final till has mounted line markers for pulling paper pots down fallow transplant with hoe to make sure properly buried.	<b>Transplanted:</b> We use a Rainflo water wheel to transplant successions 1 and 2 in plastic, plants are put in by hand being sure to cover root ball. We use a 5000 Mechanical Transplanter carousel for succession 3 for bare ground transplanting.
Fertility at Transplant	n/a	Spray transplants with trace mineral mix, calcium carbonate, and a soluble 12-0-0, and soluble 0-0-15.	5 gallons per acre fish emulsion mixed with the transplant water.
Water at Transplant	Wobbler overhead irrigation (reaches 24' wide x 100' long) immediately after transplanting	Well watered flats	Water is applied through the transplanter. We can adjust how much flows out depending on soil moisture or how much water we need to make a complete down and back pass before refilling the tank.

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**Featherstone Fruits and Vegetables**

Seeding Process			<p><b>Direct Seeded:</b> We use a MaterMacc MSO vacuum precision seeder hooked up to 3-point and run off the pto. Spacing is set at 30" and we use plate 36x4.5 with gear A set at 12 and gear B set at 20 to get 1.76 seeds per foot. We made shoe extenders to get the depth we need for corn. After first 2 rows are seeded driver gets off and measures the distance you need between next 2 rows to get a 5.75' bed and continues on from there.</p>
Field Germination			<p><b>Direct Seeded:</b> We measure soil temperatures once a week the month leading up to direct seeding and then every day the final week leading up to our first direct seed succession. We do not direct seed until the soil has reached a minimum of 65 degrees. After seeding we keep the soil moist until first emergence to avoid any crusting over. If soil does crust over we have used the rotary hoe to break it apart.</p>

**Crop Maintenance**

Irrigation	<p>I usually only irrigate corn 2-3 times. 1st always after transplanting. 2-3 times during establishment until corn is too tall to water overhead. Corn is pretty tolerant to less-than-optimal irrigation.</p>	<p>Push plants the first week for root growth, then about 1' every other week if lacking rain</p>	<p>We don't have a set irrigation schedule for corn, successions 1 and 2 are irrigated with drip under black plastic. Successions 3-6 are watered with a water reel as needed. We make sure to put down 2 inches of water during pollination.</p>
Changes to Irrigation	<p>Only once plants are too tall to irrigate with my 4' overhead system</p>	<p>Once tasseled a good watering 1' a week if lacking</p>	

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<p>Weed Control BARE GROUND</p>	<p>I usually get 2-3 cultivations in before the plants are big enough to mostly shade the weeds out. My goal is to never get down on my knees to weed... Get the weeds at the thread stage!          1, 2 and 3 weeks after transplanting with the wheel hoe in-between beds          I will also scuffle hoe in-between the plants in row once weeds are tiny but visible.          Lastly, I will walk through by hand and pull any decently sized up weeds that I missed with the scuffle hoe as needed.</p>	<p>C-tines on Allis -G until bending corn over usually twice. Then sometimes one last time at 3 feet with pull behind 2 row deerborn cultivator with a slight hilling action.</p>	<ol style="list-style-type: none"> <li>1. The first cultivation is done 3-5 days after emergence, I use 30" baskets and lely tines when weeds are at white thread stage. I will do this at least one more time, or until the plants are too big for baskets.</li> <li>2. When the plants are too big for baskets I use what we refer to as "alloyways" - a lot like the KULT Kress Duos. These are a heavy duty telescoping knife/disc assemblies that we can adjust for many different uses. I do not use the discs for corn which allows me to get really close to the plant base with the knife of the set-up. I use 3-point wheel track shovels with this set-up. If weeds are small enough I have used the rotary hoe in place of alloyways during this period which is ideal because it covers 3 beds and is extremely fast.</li> <li>3. When the plants are too tall for alloyways I use a 3 shovel set-up on the belly of the tractor, first on the Kubota and then the taller Ford tractor as needed.</li> <li>4. The final cultivation is done with a high crop McCormick using a 3 shovel horseshoe set-up attached to the 3-point right before plants are too tall.</li> </ol>
<p>Weed Control PLASTIC MULCH</p>			<p>We rotate between shovels, and knives and discs mounted to the belly of the tractor to cultivate plastic bed edges, aiming for one cultivation a week. I start with a Kubota 245 and switch to a Ford 1710 once the plants require more clearance. A final cultivation is done with a high crop McCormick and horseshoe with 2 shovels right before the plants will be too tall to continue cultivation.</p>

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<p>Insects and Pests</p>	<p>Corn borer and earworm... I add bT to my biweekly fish and beneficial spray tank during the kernel development stage. Never had an issue with raccoons but I also have two roaming large white Pyrenees farm dogs</p>	<p>Corn borer and Corn earworm. Monitor with pheromone traps, once present spray with airblast mister. CitriSan (PH), Entrust, neem or suffix oil, 01-YS (adjuvant) Also trace mineral mixed with Si flip flopped with Ca with K input 0-0-15. Raccoons at times, baited dog proof leg traps. If corn is closer to farm center dogs keep raccoons off also.</p>	<p>Our main insect problems are the European Corn Borer and Corn Earworm. We place cards of Trichogramma wasps in the corn once a week beginning when the corn is 10" tall. This is an effective solution for the Corn Borer but is not effective on the Earworm. We source the wasps from IPM Laboratories, Inc. They will ask for your planting schedule and then will tell you exactly how and when to place your wasps. We also occasionally have issues with deer depending on the field. We have an electric fence we will set-up if the deer pressure is high.</p>
<p>Other Notes on Crop Maintenance</p>	<p>As long as I am spraying with fish every other week, that seems to take care of any low N issues.</p>	<p>To maintain strong plants to the end we add Sustane at half suggest rate at knee (18") high before second c-tine cultivation. Then when possible another 1/2-1/4 suggested rate Sustane at 32" before last cultivation, if did not on last cultivation run I'll add N&amp;K inputs to spray program and or with pest management.</p>	

**Harvest and Yields**

<p>Harvest Window</p>	<p>Late July/Early August is my ideal (CSA box 9, 10 or 11) before tomatoes peak. At least two boxes worth is wonderful too.</p>	<p>First harvest usually first week in august sometimes last week in July until last week in September or first week in October. May have a week with no harvest, but rare.</p>	<p>We aim for first harvest around the end of June, last harvest is around the middle of August.</p>
<p>Harvest Frequency</p>	<p>Weekly</p>	<p>Once a week at the front and back end of patch, twice a week at main season patch.</p>	<p>Ideally twice a week, sometimes more.</p>



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Harvest Procedure	Harvested first thing in the morning, day before CSA delivery. I look for a dry silk, filled out husk and nice, full, sweet kernels. I periodically check every 10 ears or so to maintain my standard. Since my spacing is tight, I walk down the aisles with a large black procana box and just pull as I go. Then I walk back to the truck or cart, dump out the ears, chop the ends off of the ears (so they fit in the CSA boxes better), counting and placing in storage crates as I go. Storage crates go straight into the cooler to get any field heat out.	First half of day on the day of sale, feel cobs open several until a consensus of size then snap down and twist by hand. and toss to windrow mowed area. Few trusted to do this job. Popcorn is harvest field dry and dried in barn.	We usually harvest first thing in the morning because we aren't worried about spreading disease if harvesting while still wet. Harvester gently feels each ear to make sure it is filled out, snaps it from the stalk and places on the belt that is pulled by a tractor moving alongside harvesters. The belt can reach 4 beds at a time so we always plant in 8 blocks with a road between for the tractor to drive down. The corn is then placed in a bin on a trailer behind the belt.
Cleaning Procedure	Use a knife to cut the bottom off to reduce length for ease of CSA box packing		We chop the remaining stalk off the corn before packing for wholesale or CSA.
Packing Procedure	Large black procana for harvest Blue flip top crate for storage in cooler (I don't like to pack these too tight as it increases the time it takes for the cobs to cool down in the cooler. The faster it cools down, the sweeter it will keep).	For whole sale pack right into boxes 15/9bu or crates 13/4Bu in field then right to delivery van or to cool for later delivery. For CSA into 13/4 bushel crates at 65 to a crate in field or if low on crates pallet boxes then to shed on pallet will cooler if resting more then an hour.	Corn comes into the warehouse in macro bins and then is cleaned by removing excess stalk and put into 48 count cases, 800 count bins, or back into macro bins for CSA.
Storage	CoolBot cooler set at 40 degrees	A pallet stacking of 1.75bu crates or pallet box in walk in with gaylord liner over at 33-39°.	When they come in from the field bins are stacked in a cooler we use specifically for quickly cooling product coming in from the field. This cooler has a high horsepower compressor and fans that allow for high cooling capacity and air movement relative to the size of the space. Once bins are down below 40 degrees they are either packed out in cases to be shipped right away, or stored in another 36 degree cooler until packing.
Maximum Storage Time	Ideally 1 day for CSA. 4 days at the most.	3-4 days, could do more, fresh eating quality is down, but preserving is still a good use until one week.	We will store corn for 7-10 days before we see appreciable loss of quality.
Yields	1-1.5 ear per bed foot	When planting 6" in row spacing usually one get one cob per plant. I estimate 25% over all loss. 100 row feet 150 ears	2019 marketable yield was 1.35 ears per bed foot.

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**Equipment**

General	Paper pot transplanter system \$3200 Wheel hoe \$400	Field tractor 5000\$ used tiller 1200\$ s-tine lower soil prep 300\$ used Paper pot transplanter (much Less now) 949\$ crates 27\$ funnel spreader 200\$ used g cultivator 3000\$ used Dearborn pull behind cultivator 50\$ used Air blast mister 3700\$	Harvest belt: \$3,500 used Water reel: \$10,000 new MaterMacc: \$16,000 new Macro bin: \$200 new
Biggest Impact	The paper pot transplanter takes an onerous task of transplanting 1000 seedlings by hand over 4 hours of work and makes it into an easy 1 hour task in the busiest time of the year. I only grow sweet corn for my CSA members and this makes it much more palatable to keep doing for a not very profitable crop at my scale.	Field tractor and tiller for prep Air blast mister pests could ruin most of the patch	The MaterMacc seeder has the biggest impact on the profitability of our corn. It allows us to seed quickly with precision which generally results in good stands of corn.

**Marketing**

Markets	CSA, direct to restaurant	CSA, farmers market, processor	CSA, direct to grocery, wholesale through a distributor
CSA	4-8 ears per share (depending share size) for 1-3 weeks during late July and early August	This varies a lot with other market demands and yield spikes. Usually between 3-7 ears weekly from August to end of September.	Our "base" amount is 4 ears of corn, because our CSA can be customized, customers can choose whatever amount they would like. Many people double or triple the amount of sweet corn in their box. We aim to have corn in 6-8 weeks of boxes July-August.
Farmers Market		\$.50 per ear. Most of our sweetcorn doesn't make farmers market lately. If it does it's mishaps or older stock.	
Direct to Grocery		\$.60 per ear	\$31 per 48 count case, \$490 per 800 count bin.
Direct to Restaurant	\$8/doz		
Wholesale to Distributor			\$25 per 48 count case
Other Outlets		\$.55 per ear Frozen Assets value added food processor	