

Cauliflower



Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieEarth Farm

Abby Benson
Featherstone Farm

Location	Custer, WI	Atlanta, IL	Rushford, MN
Acres in vegetables	6	20	135
Acres in Cauliflower	0.2	0.5	2

How these tasks are done for Cauliflower

field prep/tillage	with a tractor	with a tractor	with a tractor
transplanting	with a tractor	with a tractor	with a tractor
cultivating	with a tractor	with a tractor	with a tractor
spreading amendments	with a tractor	with a tractor	with a tractor
mulch laying	do not do this task for cauliflower	do not do this task for cauliflower	with a tractor
laying irrigation lines	by hand	by hand	do not do this task for cauliflower
laying row cover	do not do this task for cauliflower	do not do this task for cauliflower	do not do this task for cauliflower
blanching	by hand	do not do this task for cauliflower	do not do this task for cauliflower
spraying for pests, diseases, or weeds	with a tractor	with a tractor	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 residues	with a tractor	with a tractor	with a tractor
incorporating residues	with a tractor	with a tractor	with a tractor
farming style	certified organic	certified organic	certified organic

Propagation

Varieties	Bishop (early self blanching), Amazing (fall, self blanching even yield), Cheddar, (easy to grow)	Bishop (wonder why??) (late), Celeritas (Early), Synergy (mid)	Denali and Skywalker are our main varieties. Both have shown resistance to black rot. Planted together in each succession, they seem to come on one after the other for a staggered harvest without a gap in production. This year we also grew cheddar, which DID get black rot, but because blanching is less important with colored cauli, we were still able to get a couple nice harvests for CSA despite diseased leaves.
-----------	---	--	---

Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieEarth Farm

Abby Benson
Featherstone Farm

			Used in hopes of preventing black rot. I put each seed lot in it's own mesh bag and submerge them in an insulated water jug for the proper amount of time. Cauliflower seed should soak for 20 minutes in 122 degree water. It's very important that the temperature is stable and stays as close to 122 as possible for the entire soak time. To ensure this, I use a large container of water (5 gallons) that steadily holds temp. I also keep containers of cold and hot water on hand to adjust if needed. A very precise thermometer is important. As soon as the time is up, seeds are removed and submerged in cool water. Once cool, a quick dry is important. I place the bags in a dehydrator overnight to ensure they are dry enough, then transfer to clean coin envelopes with the relevant information written on the outside.
Seed Treatment	None	None	
Soil Mix	HSU and or Vermont fort vee	CowsMo Double Green	Vermont Compost Fort Light
Seedling Trays	128 speedling	98's single seed per cell	standard 128 cell trays- new or sterilized
Planting Schedule	Bishop & Cheddar early seeded 4/17 and transplanted to field after 5/20. Amazing & Romo seeded for fall 6/12 and transplanted to field before 7/12.	All 3 varieties are seeded with a vacuum seeder from Carolina Greenhouse into 98's with one seed per cell and covered with potting soil. We only grow cauliflower in the fall and start planting all 3 varieties the last week of May. Then early and mid varieties again 14 days later.	Because of disease pressure, we eliminated spring/summer cauliflower. For the last two years we have focused on two fall plantings seeded May 5 and May 21 and transplanted one month later- approx June 5 and June 21. We vacuum seed directly into 128 flats.
Germination	Early planting in greenhouse on heated tables, 65° soil temp 55° air temp. Fall planting in greenhouse off heated tables, low air temp of 55°.	Set it in the vented greenhouse.	We germinate right on greenhouse benches. Not a fussy crop for germination.
Greenhouse Irrigation	As needed with dramm 1050 rose, then when hardening off dramm 750 rose when needed/daily.	By hand with a dramm color storm rectangular wand	By hand, as needed.

Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieEarth Farm

Abby Benson
Featherstone Farm

Greenhouse Conditions	Greenhouse has hydronic heated tables (solar/wood gasifier/lp hot water heater), and cool tables with high efficiency lp air heater. Maintain low 55° air and 65-69° table/ soil temp. Maintain high temps of 79° with gable peak louver vents that are automated to open with circulation fans coupled with manual door opening. Trays germinate on heated tables then move to unheated tables then rotate outside to harden off. In the fall on cool tables.	Leave the greenhouse sides rolled up and fans on to keep air moving and temps down. If hot weather is predicted we'll move them outside on a hay rack.	All brassica transplants are grown in the cooler of our two greenhouses which we aim to keep below 85 degrees during the day. We vent the house with hand-crank roll up sides, open doors, and thermostat controlled louvers that open automatically at 80 degrees. All greenhouses are closed overnight to stay warm.
Hardening Off	One week or more outside in micro climate between greenhouse and barn on tables made of hog panels.	We don't	At least 1 week before transplant, trays are moved outside onto hay wagons to harden off. The wagons can be pushed into an open greenhouse for protection if needed (cold, wind, storms...) With a truck or tractor we can quickly move transplants out to the field for planting.
Pests or Diseases in Greenhouse		Sometimes loopers are a problem. We spray dipel only if necessary.	Hot spots in the greenhouse lead to stunted, unhealthy plants. Fans and ventilation helps. We also got a black 30% shade cloth this year to help with heat. During the summer, flea beetles can be a problem in our brassica house. 1 - 2 sprays with Entrust usually takes care of them.
Other Notes on Propagation	At hardening time we use fish emulsion to keep vigor (drammatic o). Also use soil drench of nematodes (nemashield HB) before transplanting.		

Field Prep

Preceding Cash Crop	Winter squash, sweet corn, garlic, fallow.	Potatoes usually	With a land base (mostly rented) that has seen a lot of change over the past years, and a crop plan heavy in brassicas, we do not have a set rotation that would dictate a particular preceding cash crop. We aim for a 5 year rotation with fall brassicas often following a rye/vetch cover crop.
---------------------	--	------------------	---

Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieEarth Farm

Abby Benson
Featherstone Farm

Preceding Cover Crop	Oats/buckwheat, winter rye	Rye	Fall brassicas often follow fall seeded rye or rye/vetch, or spring seeded oats/peas.
Soil Amendments	1/2 inch compost, grassing laying hens, New this year main stay calcium & triplex micros by Redox	We spread chick magic in 2 bands where the rows will be after forming beds that is worked in as we stale seedbed	All brassicas get turkey litter the fall or spring before planting, and Midwest BioAg General Blend: Analysis=1-2-6-4S. 300# per acre applied as beds are being shaped. Since noticing black rot becoming a serious problem on the farm, we've refocused our efforts on balancing our soils though micronutrient management and mineralization, particularly in brassica fields. We've been working 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 micronutrients based on his recommendations to balance soil for optimum growing conditions.
Bed Prep & Shaping	Shallow 3" "lowtill" to work cover residue, may mow cover first if needed. 2 week prior to planting in a dry spell. 10"-12" s-tine after spreading compost 7-5 days prior to planting in dry spell. Final shallow till 3" 1 day prior to planting.	We use a buckeye bed shaper. We shape beds to get them to dry out faster in the event of heavy rains or narrow transplanting windows. It also gets tractor transplanter driver to drive straighter. We stale seedbed at least twice after beds are formed	4 weeks before planting: Mow down cover crop with flail mower. (If a lot of debris remains, an additional discing is done before chiseling) 3-4 weeks: Chisel Plow field perpendicular to the orientation of beds 3 weeks: Disc/Finish disc field depending on level of vegetation or if many clumps exist 2 weeks: Create beds using Rainfly 2600 bed shaper. Rot ovate tops of beds to create better texture and widen bed tops to approx. 34-40" 0-2 weeks: Stale bed with belly mounted Budding Basket Weeder and 3 point Lely tine weeder, ideally done 2-3 times, with the final pass happening the day of transplant.

Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieEarth Farm

Abby Benson
Featherstone Farm

Pre-Planting Mulch	Nope		For fall cauliflower I prefer not to use plastic mulch as I am more confident in our ability to control weeds on bare ground compared to plastic beds.
Other Notes on Field Prep		We till in a cover crop in early May, rototill again to break down residue and then form beds after that. We then stale bed hopefully twice after beds are formed to reduce weed pressure after crop is transplanted. We either use a basket weeder or a tine weeder for stale bedding	

Field Planting

Bed Width	5'	7' centers	5.75'
Plant Spacing	3 rows 18" apart, staggered 24" in row spacing	2 rows 30" apart per bed, 18" in row spacing	2 rows per bed spaced 22" between rows, plants spaced 14" in-row
Transplanting Process	Water wheel transplanter, with water when needed. Firm plants in by hand being sure to cover root ball.	Pull flats from greenhouse and lay on a hayrack. Water if necessary and run plants through a mechanical transplanter 5000 model	We use a 5000 Mechanical Transplanter carousel for bare-ground transplanting. This is usually a 4 person job. One person drives the tractor, two people ride the machine, dropping plants into the carousel, and one person walks along for quality control and to keep the operation moving. The walker makes machine adjustments, keeps fresh plants at hands reach, and makes sure the transplants go in upright with buried root balls.
Fertility at Planting	Fish emulsion before transplanting, with nemashield HB (especially spring) to flats. If loopers and temps are high a Bt/surround application to flats.		5 gal per acre fish solution mixed with the transplant water
Water at Planting	Waterwheel, flow rate adjusted to fill hole and keep spikes from clogging.	Transplanter puts down about 5 oz of water with plant. We add 2 oz of fish per 50 gallons of water	Water is applied through the transplanter. We can adjust how much flows out depending on soil moisture or how much we water we need to make a complete down and back pass before having to refill the tank.
Mulch at Planting	None	None	We do not mulch cauliflower.
Row Cover	None	None	We do not use row cover on cauliflower.

Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieEarth Farm

Abby Benson
Featherstone Farm

Other Notes on Planting		We sometimes will spray or dip plants in Surround to protect from flea beetles. If dipped we will dip a whole flat at a time with solution in stock tank.	
-------------------------	--	---	--

Crop Maintenance

Irrigation	Try not to but, if dry spell over 2 weeks. Waterreel, to equal 1.5-2".	<p>No set schedule, I regularly scout for pest pressure and also monitor soil moisture. Early on we will use sprinklers on 2" aluminum pipe because its quick to pull out of the field and cultivate after irrigating. After we can't pass through the field any more with a tractor to cultivate we will use drip tape.</p> <p>We try to irrigate overnight when watering overhead. Running overnight (12 hours) will put down a little over an inch equivalent of rain. If we are stretched too thin for our water availability in extreme drought or prolonged dry conditions we will switch to drip tape earlier. Our well won't run dry but we only have 30 gal a minute capabilities. We can irrigate during the day when using drip tape.</p>	As part of our disease prevention plan on the farm, we generally do not overhead irrigate any brassicas. In fields where we have the irrigation capacity, we may use plastic mulch with drip tape to irrigate- aiming for about 1" per week. Currently, we do most our fall brassicas dry. We have had good luck with this, but I'm sure we could increase cauliflower yield with properly timed irrigation. I would like to work towards a buried drip system that would allow us to efficiently drip-irrigate bare ground plantings without interfering with cultivation.
Irrigation Modifications	With the fall planting we will use less water close to heading.	In mid September as days get shorter and we get closer to harvest we will stop irrigating, unless conditions are really dry. There is less evaporation with the shorter days.	

Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieEarth Farm

Abby Benson
Featherstone Farm

Weeding	C-tines on allis -G, in row by with hoe/hand pulling once before canopy	<ol style="list-style-type: none"> 1. We start with uniform beds, stale seedbedding to reduce weed pressure after the crop is planted. 2. 5-7 days after transplanting we finger weed (cultivating between rows at the same time) 3. 14 days after transplanting we will finger weed again 4. 21 days we will use a lilliston to throw soil into the row to cover up any weeds the fingers didn't get while side dressing 1000 lb of chick magic to the acre. 5. If necessary we will use aggressive sweeps mounted on spring trip shanks to cultivate between rows later if more weeds come up. 6. if weeds are missed during these cultivations we will come thru with hoes and hoe any remaining weeds. We also have a hydro weeder (eco weeder) that we can take thru and be more aggressive with larger weeds too in emergency situations. 	<p>1) stale bedding with baskets and tines on the Super C two times before planting. After transplant I aim to cultivate approx once a week or as needed until plants are too big. We use a Kubota 245 and then switch to a Ford 1710 when taller plants call for more clearance. 2) My first cultivation is with 22" spaced baskets and tines 3-7 days after transplant, when weeds are at white thread stage. If the root balls are well buried, I can be pretty aggressive with the tines, allowing for good in-row weed control. I will do this at least one more time until the plants are too big for baskets. 3) I may also use what we refer to as "alloways"- a lot like the KULT Kress Duos. These are a heavy duty telescoping knife/disc assemblies that we can adjust for many different uses. As the plants get larger, I like to take the discs off for small/medium sized brassicas, allowing me to get under the leaves, as close as possible to the plant with the flat knife part of the setup. I pair these with 3-pt wheel track shovels. 4) As plants get larger, I use sweeps and shovels as needed until plants are too big. 5) Hand weed as needed.</p>
Blanching	Self blanching/ by hand snapping leaves over head.	We don't	We use self-wrapping varieties Denali and Skywalker and do not take any other measures to protect heads from the sun.
Insects & Pests	Loppers - air blast mister with a mix of suffix oil and entrust. Cutworm - nematodes soil drench of transplants.	Cabbage loopers - we spray Dipel when necessary Flea beetles - we spray pyganic/surround early to set them back a bit until the plants are more established, again if necessary	Cabbage worms are our main pest for cauliflower. We use Dipel (Bt) to control worms as needed, applying 1#/acre with a boom sprayer which can cover 4 beds at a time. If flea beetles become a problem I will use Entrust, however we don't usually have issues with flea beetles on cauliflower.

Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieEarth Farm

Abby Benson
Featherstone Farm

Diseases		<p>Alternaria Black Rot</p> <p>Long rotations is what is recommended, we try to have at least 3 years time between brassica crops. We are going to try some preventative fungicide applications in the future.</p>	<p>At Featherstone, cauliflower seems to be one of the most susceptible to black rot. Because of this, we really backed off cauli production until we are more confident in our ability to control this devastating disease. Cauli always seems to get sick first, increasing the risk of spread to other important brassica crops. We have taken a whole farm approach to black rot management including: hot water seed treatment, trials with disease resistant varieties, roguing diseased plants, sanitation, avoiding moving through plants when wet (8 block field configuration helps with this), improving soil and crop health for more resilient plants, high standards for weed control to allow for good air flow and drying, some experiments with spray.</p>
----------	--	--	---

Harvest and Yields

Harvest Window	<p>Spring planting, early July, peak through July. Fall planting late September peak to mid-October. In general 2-3ish week pick window.</p>	<p>We usually start seeing cauliflower mature in late September or early October. Cauliflower is very inconsistent for us in its head formation. Early varieties are sporadic when they first come on and sometimes depending on the weather may never produce a head even when transplanted early.</p>	<p>Late August through October</p>
Harvest Procedure	<p>Harvest when cool early, in summer. Cut with knife. Packed in crates in field with plenty of wrappers to flat bed truck or ecart. Spray crates with water to cool then store in cooler.</p>	<p>Cauliflower is usually harvested in our second trip to the field after greens unless its a really cool fall day. We use the yellow lettuce knife from Johnny's, harvest into 1.75 bu green totes and take back to harvest vehicle. If we have a large amount to pick we will use our harvest belt. We harvest twice a week.</p>	<p>Field knives are used to cut heads leaving enough wrapper leaves to fully wrap the heads. They are stacked in harvest totes which are carried to pallet bins on a trailer or flat bed pickup. The heads are then stacked or carefully dumped into bins.</p>

Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieErth Farm

Abby Benson
Featherstone Farm

Cleaning	Clean to order, by peeling wrappers spray or dunk if necessary.	We will dunk cauliflower in a tank of water (including sanidate) and let it drain before storing in the cooler. If we are wholesaling cauliflower to Chicago we will ice to keep it fresher.	We do not wash cauliflower. Leaves may be trimmed to make them more presentable or to fit in boxes better, but overall cauliflower doesn't need much clean up.
Packing	For CSA heads are mostly peeled, if packing wholesale wrappers are kept intact and re packed to protect heads.	Heads are harvested and put into different boxes in the field based on their size. If its for our CSA we will grade based on 1's and 2's. If its for market or wholesale by the pound we mix it all together. We try to do as much prep for packing in the field as possible.	If used for wholesale, we may trim back some of the leaves and clean them up as they're boxed.
Storage	Wrappers are important, 32-38° high humidity, sell ASAP 2 weeks max.	We store cauliflower at most 5-7 days, if we are trying to keep it longer we will ice. Temp is kept at 38 degrees and covered with cooler tarps to prevent moisture loss.	When they come in from the field, bins are stacked in a cooler we use specifically for quickly cooling product coming 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 into cases to be shipped right away, or stored in another 36 degree cooler until packing. Bins must be covered in bin sized plastic bags to retain moisture. If properly cooled, stored, and not diseased, cauliflower can keep for weeks in the cooler. However, if disease was present on plants, we don't like to keep them longer than 7-10 days.
Yields	Can vary a lot with our rolling moraine, but plantings plans for an average of 1-1.25# per plant and usually can get yields as high as 2.5#-1.5# per plant 2017 fall ≈1.7#.	Cauliflower is very very variable. Some later plantings never even form heads in some seasons which is why we only plant twice. Disease plays a big role in this too. This past season alternaria was so bad we had nearly a complete failure. For this reason we are dramatically scaling back on how much we plant.	Fall 2017 - 2 lbs/bed foot However, our spring planting was diseased and probably closer to 0.5 lbs/bed foot

Tony Miller
Whitefeather Organics LLC

Hans Bishop
PrairieEarth Farm

Abby Benson
Featherstone Farm

Marketing

Markets	CSA, farmers market, direct to grocery, direct to restaurant, processor	CSA, farmers market, direct to grocery	CSA, direct to grocery, wholesale through a distributor
CSA	150 heads 2 weeks in summer, 150 heads 2 weeks in fall.	Our plan is to have it available for 2 distributions. If we have small heads those go into the "take 2" category and larger heads go for the "take 1."	We aim to put cauliflower in boxes 6 weeks between August and October.
Farmers Market Prices	\$3.00 to \$3.50/lb	\$3.00 to \$4.00/lb, if heads are consistently over 1.5 lb we will charge \$5 for a head.	
Direct to Grocery Prices	\$2.65/lb	Usually our grocery stores want them sorted so they can sell them by the piece. Typical wholesale to a coop would be \$3 each.	\$35 / 18 lb case
Direct to Restaurant Prices	\$2.65/lb	We rarely sell cauliflower to restaurants, when we do though, we try to sell them odd sized stuff and cut them a better deal for taking that.	
Other Markets	\$2.65/lb to processors	\$2.00 - 3.00/lb	\$28.25 / 18 lb case to distributors