

# Niche Hoophouse Crops



**Robyn Calrey**  
Park Ridge Organics  
**Celery**

**Sandy Dietz**  
Whitewater Gardens Farm  
**Ginger**

**Liz Graznak**  
Happy Hollow Farm  
**Kale**

Location	Fond du Lac, WI	Altura, MN	Jamestown, MO
Acres in vegetables	15 certified, 7 in production	8	7
Area in HOOPHOUSE for this crop	3000	2700	Total high tunnel space is 20,976 sq. ft. I usually have 1,140 linear feet in kale each winter
How these tasks are done for these crops			
bed prep/tillage	with a tractor	by hand	with a walking tractor (BCS, Troy-bilt, etc.)
transplanting	by hand	by hand	by hand
cultivating	by hand	by hand	by hand
spreading amendments		by hand	by hand
mulch laying	do not do this task for hoophouse celery	do not do this task for hoophouse ginger	by hand
laying irrigation lines	by hand	by hand	by hand
laying row cover	do not do this task for hoophouse celery	do not do this task for hoophouse ginger	by hand
spraying for pests, diseases, or weeds	by hand	by hand	by hand
harvesting	by hand	by hand	by hand
hauling harvested crop from the field	with a tractor	by hand	by hand
mowing residues	with a tractor	do not do this task for hoophouse ginger	by hand
incorporating residues	with a tractor	with a walking tractor (BCS, Troy-bilt, etc.)	with a tractor
farming style	certified organic	certified organic	certified organic

## Propagation

Varieties	Conquistador- Johnny's Select Seed	Bubba Blue, Hawaiian Yellow, Khing Yai. The Bubba Blue is especially fun to mature because it does take on a greenish blue hue.	Dinosaur & Winterbor during the spring & late summer/early fall. Red Russian, & Winterbor for the winter months
Soil Mix	Vermont Compost Fort Vee	Puna Organics	Vermont Compost Fort V
Seedling Trays	Started in 1020 with 500ish seeds per tray in 7 rows. Pot up to 60's (rose pots from Growing Systems in Milwaukee). We have used 72's in the past but find its hard for our crew to pot up into 72's. The 60's also have more soil and the roots don't outgrow it and jump cells.	We place the seed ginger into shallow containers of potting mix until we see stem growth, usually sometime in late April, in temperatures of around 70 to 75 degrees. We then transplant into either larger containers or into the soil.	Soil blocks 1.5"

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Propagation Schedule	#1 planting is started 2nd week in March, potted up 6 weeks later (end of April), transplanted 3 weeks after that (mid May) #2 planting is started beginning of June, potted up 6 weeks later (mid July), transplanted 3 weeks after that (early August)	We place the seed ginger into the shallow containers in mid-March as soon as it arrives. Late-April we begin to see stem growth and transplant into the soil or larger containers. We usually only do one succession.	For spring seed 2nd week of February. For fall/winter second week of July
Germination	NOT in the germination chamber. We cover the 1020's with clear plastic to maintain moisture until the root is visible.	N/A	Greenhouse in soil blocks. Nothing special.
Greenhouse Irrigation	As needed. Maintain moisture but minimize crust forming.		Mister nozzle twice a day until germinated. Once up basic water wand mid morning (once per day).
Greenhouse Conditions	Our greenhouse is kept at 60 degrees nighttime and shutters open when daytime temp is over 90 degrees.	Greenhouse is kept at 70 to 75 degrees while seed pieces are sprouting.	South facing greenhouse. Above freezing at night. Daytime temps above 50 (usually not a problem when sunny out).
Hardening-off	Hardening off is done via water NOT temp. We let them get water stressed the week prior to planting and water enough to keep them alive.		Once third true leaf is out they go out to harden off. Usually 4-5'ish weeks after seeding. Harden off for 1 week, maybe more, then transplant.
Other Notes on Propagation	When crust forms on 1020's we run a knife or pencil down between rows to break the surface and allow for air and water exchange. Important to make sure crew knows to individualize plants when potting up. Its easy to think two plants are one. If two are transplanted together, they will be two spindly plants together forever.		

**Hoophouse Soil Prep**

Long-Term Hoophouse Use Issues	celery we have not seen as much of a problem with this as we have in the past with tomatoes (decrease yield big time). There can be aphid problems with celery in the HH due to the indoor conditions. We scout for them frequently and spot spray as needed with Pyganic.	Our main issues would be a decrease in soil structure and salt build up. Cover crops, adding citric acid to our water which is quite alkaline, and allowing a season every couple of years without a hoophouse cover to expose the soil to the elements seems to help.	In the early spring aphids can be a problem. Insecticidal soap or an early release of Lacewings takes care of them. Sclerotinia is starting to pop up on places in my high tunnels. The most important thing to control this is good ventilation and not over watering!
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Preceding Cash Crop	basil or tomatoes or celery or celery and sometimes celery :(	This could be anything from early spring greens to a cover crop. Compost mixed with a little field soil is used when planting into containers.	Anything other than a brassica
Preceding Cover Crop	oats and peas, or just oats	Usually something like a mix of oats and peas.	n/a
Soil Amendments	We apply compost to the HH in the fall after final celery harvest and till in before winter. Ideally we would seed a cover crop if there is enough time for it to get started. We apply chicken pellets prior to each planting of celery to help with fertility.	We will usually use compost at a rate of about 1 inch and an application of Sustain 4-6-4. These will also be added again at each addition of soil (approximately every 4 weeks). Ginger is an extremely heavy feeder and needs a lot of fertilizer.	This depends entirely on the soil test results for the tunnel that I am growing the kale in.
Bed Prep	Rotovator is used to work the soil. No bed shaping.	A trench of about 12 inches is dug into the soil with the soil in the bottom loosened and mixed with compost. This is usually dug by hand or could be dug with a middle buster on a tractor.	Once a year, either broad fork the beds or run the tractor with a spring tine harrow thru the entire tunnel. Bed shaping is done with the rototiller on a BCS. If the soil is pretty loose, which depends on what was in the bed prior, I may use the tilther.
Pre-Planting Mulch	no mulch used		n/a
Other Hoophouse Prep Notes		Most of the above information is for planting the ginger in the ground. We also plant into large 20 gallon tubs, 3 seed pieces to a tub, and follow the same steps for adding soil, compost and fertilizer.	For winter production, I usually add 25% more compost & fertilizer than the soil tests recommend.

**Planting**

Bed Width	8 feet	Sometimes we will use an eighteen inch wide single row, sometimes a 24 inch double row.	42 inches
Plant Spacing	10 rows per block (bed), 6" between rows, 4-6" in row spacing.	Usually 2 rows per bed, 6 to 8 inches between rows and 4 to 6 inches between plants. These may or may not be staggered.	3 rows per bed, 14" between rows, 12" within the row (between the plants). Direct seeded (at time of transplanting) radishes, hakurei turnips, spicy greens mix, or arugula between the kale rows.

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Transplanting Process	We mark rows with contraption of 2 boards with 30 foot long strings tied between them to indicate rows. 10 rows per contraption. We hand transplant.	Rows will be measured out and marked with string tied to poles at either end of the bed. Trenches are usually dug by hand using a spade shovel, leveling the bottom of the trench. Compost is added to the bottom of the trench with a shovel or from a bucket making a solid layer in the trench. Sprouted seed pieces are place into the trench by hand and compost/soil mix is again added with a shovel. Fertilizer is sprinkled on the surface, drip tape is placed on top, and the bed is watered deeply. The trench is then filled with soil, compost and fertilizer approximately every 4 weeks almost as you would asparagus. The first addition being done when dirt cleared away at the base of the stem shows a pink color on the stalk. You may end up either at ground level or the beds may be mounded. This is done because the ginger root grows up and out as the soil level rises, resulting in larger roots.	The bed is completely cleaned out & free of weeds. Compost is applied with a shovel & fertilizer are applied with a cup/by hand. The bed is tilled with a BCS rototiller down & back and possibly a second time if the bed didn't get worked deep enough. 3 lines of 4" drip tape is laid down & pinned with sod staples, 14" apart. The water is turned on in the bed & soil block transplants are laid out every 3 drips (12" apart). The plants are staggered between the 3 rows so that the kale plants are not all in a straight line across the bed (creating a checkered pattern of kale plants). While the plants are being laid out someone is direct seeding straight down the middle of each line of drip tape between the rows (before the bed gets wet). 2-3 people come along behind and push in the transplants burying the soil block & kale stem up to the first true leaf. The transplant should be pushed in far enough that there is a small divet at the base of the stem/plant.
Fertility at Transplant		Compost is added at a rate of approximately one inch on the surface. Fertilizer is applied at the label rate, broadcast by hand.	A thin layer of compost is applied to the bed with a shovel. Usually 4 wheelbarrows per 190'. Fertilizer is then applied at the recommended application based on the soil test results.
Water at Planting		The crop is immediately watered with drip tape following transplant.	I let the water run for at least 1 hour total at time of transplanting. 3 days later the bed is watered again for 1 hour.
Mulch at Planting	None	None	n/a

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Row Cover	No row cover on celery. It seems to make it angry.		Hoops are placed 5' apart and Pro 19 floating row cover is put over the bed. If temps are in the 40's & it's sunny then the row cover is pulled off for the day but then put back on over night. If it is above 32-35 at night the row cover stays off the bed. It toughens up the plants to let them get cold while they are growing. They do better in the deep winter if they have experienced the cold.
Other Notes on Planting		Once again, we have also been planting in 20 gallon containers using the same rates of inputs as above. Another note is that when we have planted into our heated greenhouse, we plant the new seed pieces directly into the greenhouse soil or containers without pre-sprouting. This can be done as the greenhouse is always kept above 60 degrees at night and 75 degrees or over during the day.	

**Crop Maintenance**

Irrigation	Once a week about 1-2 inches.	Watering is done with drip irrigation approximately 2 hours a couple of times a week or when soil appears dry when planted into the ground. When planted into containers approximately a gallon to a gallon and a half of water is applied with a watering wand about once a week.	Drip irrigated when the bed needs it.
Irrigation Modifications	As plants get larger and form a dense canopy, water becomes less frequent due to so much trapped moisture.	Constant monitoring determines the schedule as we try to keep the soil from becoming too dry and definitely not too saturated. Containers will be taken outside in the summer when temperatures are warm enough so watering is determined by rain.	Not really. It is especially important to not let the bed get too wet during the winter months!

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Weeding	Hand weed 1 or 2 times.	When plants are very young hoeing with a scuffle hoe is used with hand weeding. After plants grow to 8 to 12 inches only hand weeding is done to protect any undetected new shoots. Taking care to weed very carefully to avoid harming new shoots is very important.	Once the rows of interseeded radish/turnip/greens mix/arugula have been harvested the bed is weeded, usually only once, with a stirrup hoe. Some minor hand weeding may take place later on in the season here & there.
Blanching	No blanching. Celery is better green!		
Insects & Pests	Aphids: spot spray Pyganic as needed Slugs: pick off by hand at harvest and throw at other crew members	We have had a small amount of worm damage but not enough to really affect yields.	Aphids are about the only pest that is problematic in the early spring. And Lacewings usually take care of them if introduced early enough (before the aphid population explodes). Careful monitoring of the crop will prevent an aphid explosion.
Diseases	Asters yellows: transmitted by leafhopper which we never seem to see.		n/a
Hoophouse Conditions			Two layers of pro 19 row cover on hoops. The larger the sheets of row cover the better. I like pieces that are half the width, and the entire length of the tunnel so, I can cover each half with one large sheet. Winter varieties of kale can handle most any temperature. Most important is to remove the row cover during the sunny days so the ground can reabsorb some heat.
Other Notes on Crop Maintenance		Although ginger likes warm temps, it does not like too much heat or sun. Planting in a protected area or with some shade protection keeps them much happier. Ginger will also tolerate being slightly too dry verses being too wet. Too much moisture will at the very least slow growth, but more likely will cause the plant to rot. Remember that ginger is a very heavy feeder and requires a fair amount of fertilization, especially calcium and potassium.	For fall/winter production it is important to let the crop get pretty big before you start harvesting it. I want each plant to be able to make at least 3 (8-10) stem bunches before harvesting it for the first time. This ensures a big healthy root system that will result in good regrowth during the winter months.

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**Harvest and Yields**

Harvest Window	<p>We harvest #1 planting for about 4 weeks (starting at end of June)</p> <p>We harvest #2 planting for about 6 weeks (starting mid September)</p>	<p>Ginger planted in April can be harvested in late August with enough fertilizer. It will hold as baby ginger for 4 to 6 weeks, and will start to develop a heavy skin around the 6th week. If ground temps stay at 50 degrees you can let some of the ginger mature for January harvest</p>	<p>Harvest begins when the plants are large enough (usually mid-late October).</p>
Harvest Procedure	<p>Harvest in the morning or when cloudy. We use red harvest knives (for everything!) and trim roots and remove and wonky stalks, discolored stalks and broken stalks. We also trim tops if they are longer than the length of a bulb crate (wholesale) and we trim them even shorter for shares so they fit into a bag. 6-8 heads per layer in bulb crate. Alternate direction of heads each layer. Approximately 24-32 heads per crate. Taken up to pack shed asap per crate if temps are warm.</p>	<p>Ginger is dug with a spade shovel. Time of day has not seemed to make too much difference for us, although we try to avoid the heat of the day in a hoop house. The ginger is piled as dug and transported to the pack shed via tractor or garden cart.</p>	<p>Winter kale is harvested after it has thawed, could be as late as 11am. Fall &amp; early spring kale are harvested after loose cut greens. Rubber bands are counted out onto last three finders of left hand and taken to the field with totes. Stems are harvested from the base of the plant working up. Each leaf is broken off close to the main stem, leaving no stub. 8-10 leaves per bunch for green curly &amp; Red Russian. 12-14 leaves per bunch of Dinosaur. Leaves do not have to be the same size but do have to be blemish free. They are placed on top of each other face up, lining up the stem ends. The rubber band goes three times around the bunch and is grouped half way between the stem end and the base of the leaf. so that the banding looks neat &amp; tidy. If there are blemished leaves on the plant they are removed and culled. We start harvesting at one end of the bed and move to the other, harvesting each plant fully. After the first harvest, usually a minimum of three leaves are taken from every plant. I want everyone to easily see which plants were harvested previously so that it is clear where to begin. Crates are filled with 16 bunches each, laid in the crate alternating directions. Once 2 crates are filled they are carried to the end of the row &amp; placed in the shade of the truck.</p>

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		Before being brought inside stalks are removed, leaving about an inch or two on the root. Stalks and leaves are either sold for tea or taken to the compost pile. Roots are rinsed with a hose to remove the largest amount of soil before bringing them inside. Once inside, long roots are removed from the main root with a knife or pruner and they are rinsed again with a shower head on a hose.	Once the harvest is complete the bunches go to the barn and if they are needed that day the bunches are washed. The first sink is plain water the second sink has Sanidate in it. Once the first sink water becomes cloudy it is changed. The Sanidate sink usually is fine for the entire washing.
Cleaning	Crates are dumped into bulk tank with cold water. Heads are swooshed around and put back into clean sanitized bulb crate in the same order as when harvested.		
Wash Water Products	Tsunami for the celery water. Oxonia for the crate disinfectant water.	We just use running water to rinse.	Sanidate
Packing	Crates are put on drying rack to drip dry for no more than 2 hours. Crates are then stacked on a small pallet with a black trash bag on the bottom. That bag covers the bottom three crates. Additional three crates added to stack and bagged from the top down for a total of 6 crates on a stack. We make sure all bag edges are tucked in or twisted shut. No moisture loss is important with celery!	Clean ginger is placed carefully in boxes lined with craft paper with a piece of dampened craft paper placed on top.	Clean bunches are placed in bulb crates to dry and once everything is washed, each bunch is given a shake and placed alternating stem end to leaf end (two bunches each way) in the grey folding lidded totes.
Storage	We keep the stacks in the walk in cooler (39 degrees) until needed. The final fall harvest keeps for up to 4 weeks well if kept very tightly closed.	We store our ginger in a 45 degree cooler. We try to harvest the ginger one or two days before sale to be as fresh as possible.	Totes are labeled with a lot code, quantity of bunches in the tote & stored in a 33 degree walk in cooler. Winter kale can be harvested up to 5 days prior to leaving the farm for its destination.
Yields	We harvest about 90% of the plantings (15% lost to disease and too small size, doubles). At full size there are about 2-3 heads per pound. Planting #1 yields about 540 lbs, planting #2 about 1,080 lbs.	Generally we harvest about a 5:1 ratio, although it is possible to get as high as a 16:1.	Approximately 1 bunch (7-10 stems) per 2 plants per week.

**Marketing**

Markets	CSA, farmers market, on-site farm stand, direct to grocery, direct to restaurant	farmers market, direct to restaurant	CSA, farmers market, direct to grocery, direct to restaurant
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CSA	1 head per small share, 2 heads medium share, 2-3 heads large share. Total times given per season is 7 times (3 in spring, 4 in the fall)		1 bunch every other week for the first 8 weeks of summer & last 8 weeks of summer season. The summer season is 24 weeks long. 1 bunch every other week for the 8 week winter season.
Farmers Market Prices	We bunch 2 heads per bunch with large twist ties and sell it for \$3 per bunch.	\$14.50 to \$16.00 per pound.	\$3.50/bunch
Direct to Grocery Prices	\$2.50/lb		\$2.25/bunch and \$2.15 if a case of 24 or more is ordered.
Direct to Restaurant Prices	\$2.50/lb	\$14.00 per pound.	\$6/lb.