

2014 Southern Wisconsin
Vegetable Production Workshop



Winter Squash

Scott Williams
Garden to Be

Rufus Haucke
Keewaydin Farm

Chris Upper
The Tree Farm

Location	Mt. Horeb	Viola	Town of Berry
Acres in Vegetables	3 to 8	10	15
Acres in Winter Squash	< 1	0.5	0.7
How These Tasks are Done for Winter Squash			
field prep/tillage	with a tractor	with a tractor	with a tractor
transplanting	with a tractor	by hand	do not do this task for winter squash
field seeding	by hand	by hand	with a tractor
cultivating	with a tractor	with a tractor	with a tractor
spreading amendments	do not do this task for winter squash	with a tractor	with a tractor
mulch laying	do not do this task for winter squash	with a tractor	do not do this task for winter squash
laying irrigation lines	by hand	do not do this task for winter squash	by hand
laying row cover	by hand	do not do this task for winter squash	do not do this task for winter squash
spraying for pests, diseases, or weeds	do not do this task for winter squash	by hand	with a tractor
harvesting	by hand	by hand	do not do this task for winter squash
hauling harvested crop from the field	with a tractor	with a tractor	do not do this task for winter squash
mowing cover crops or crop residues	with a tractor	with a tractor	do not do this task for winter squash
incorporating cover crops or residues	with a tractor	with a tractor	with a tractor
Farming Style	certified organic	certified organic	conventional

Propagation

Varieties	Waltham Butternut	I like to grow a standard Butternut like Waltham, Delicata JS, Red Kuri, and Blue Ballet which is a Mini Blue Hubbard. The Blue Hubbard acts as a bug trap and is planted on the outer beds of my field.	Butternut: Avalon, Atlas Buttercup: Burgess strain Kabocha: Sweet mama Acorn: Tay bell Spaghetti: searching for a new one Delicata Sweet dumpling
Soil Mix	I purchase mix from Tomato Mountain, Albany, WI	For the last couple of years we have been purchasing potting soil for our transplants from Cowsmo. Their #2 mix is what we have been using	n/a
Seedling Trays	72's	We seed our transplants in 3 1/2 inch black plastic pots and never up-pot.	n/a

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Propagation Schedule	Seed into 72's around May 5th. Cell flats go into germination chamber, set temp at 80-85 degrees. Remove flats 5 days later and set out on benches in greenhouses. Transplant directly from 72's to field within 3 weeks.	We do one planting per season. Our current schedule is to seed our black plastic pots for transplanting around the first week of May. We then do our in field planting around the first week of June.	Plant in field after 10 May as soil conditions allow.
Germination	I use a closed chamber, inside one of the greenhouses, entirely dark, heated with a bucket heater and thermostat; 100% humidity, 80-85 degrees. Also, in the germination chamber, all squash flats are placed in heavy plastic bags and enclosed tightly.	Because winter squash is kind of a delicate plant I like to wait a bit on seeding till the beginning of May. At this point night time temps are usually warmer. Sometimes if it is cooler spring I may even hold off until Mid May for starting my transplants. Really I don't want them to become root bound in their pots sometimes I am transplanting them into the field as early as two and a half weeks after planting. I like my greenhouse temperature to be around 75 to 80 degrees. I don't do anything to alter the light or humidity and I don't have an specific location that my trays sit. Basically any spot on our tables that is open.	n/a
Greenhouse Irrigation	hose and water breaker, by hand, as needed - usually daily	During that time of year we typically water our greenhouse two to three times a day depending on how sunny and warm the day is. It is very important to monitor the watering system to make sure the transplants don't dry out.	n/a
Optimal Greenhouse Conditions	constant air circulation, maintain min temps of 55 degrees;	The only thing we really try to control in our greenhouse is temperature. The big thing is to make sure it doesn't get to hot as excessive heat can cook transplants quickly. We do this by venting the greenhouse with fans and opening all our doors on warm sunny days. If a warm day is going to be followed by a cooler night, we do close up our greenhouse earlier in the day then we usually would, so that we can capture as much of that heat as possible for the evening hours.	n/a

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Hardening-off-off	If outside temps are steadily above freezing and the plants are ready to be transplanted but weather conditions haven't allowed for bed prep or transplanting, I will move the cell flats to benches outside of the greenhouses prior to transplanting. However, I usually keep the cell flats in the greenhouse right up until planting and then row cover immediately after transplanting.	Before transplanting we will set our squash outside for at least two to three days. Sometimes we will set them out up to a week before planting.	n/a
Pests or Diseases in the Greenhouse	Generally the only greenhouse pests I have in the spring are mice. I set many traps and plug in an electronic sonic deterrent. Also, in the germination chamber, all squash flats are placed in heavy plastic bags and enclosed tightly.	So far we have not had any issues with pest or diseases	n/a
Other Notes on Propagation			

Field Prep

Preceding Cash Crop	Varies, though never any other cucurbits	My rotation is as follows. Sweet Corn, Potatoes, Squash. Sweet corn seems to help the yield of Potatoes. Both Potatoes and Squash are good crops for cleaning your fields with extra cultivations which helps the root crops that will be planted after the Squash is done.	Some solanaceous crop, usually peppers or eggplant.
Preceding Cover Crop	Nearly always winter killed oats. I have also followed winter rye/vetch, but this sometimes presents a challenge with field prep prior to transplanting.	Between each of these crops I plant a cover crop of either winter rye or a peas/oats mix. I like to do the peas/oats mix after the sweet corn, it winter kills and creates a nice mulch which gets tilled in before planting potatoes. After the potatoes are done winter rye goes in achieving nice growth through mid may. Around that time I till in the rye and prep the field for planting the winter squash.	Rye, if used.
Soil Amendments	I don't spread compost every year, but when I do I spread approx. 15-20 yards over the entire 6 or so acres.	My soil amendments are the cover crop residue from the winter rye that gets tilled in as well as around 2 ton an acre of composted chicken manure for nitrogen	Fertilizer per soil analysis

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Bed Prep	Chisel plow several weeks prior to transplanting. Immediately (usually) rototill the top few inches to even out the field. Then 2-3 times prior to transplanting, generally 1-2 weeks apart, I run the Williams Tool cultivator (tines always, sweeps if necessary) over the beds. If rains have inhibited effective use of this cultivator, I will use the rototiller again, skimming just the bed surface.	Depending on the growth of the winter rye I will either first brush hog the rye then chisel or disk or if growth has been slower I will just chisel or disk the field for the first time around the first week of May. That will be followed by a shallow pass with a rotovator. After that I will let it sit for one or two weeks. Finally I will do another pass with a rotovator.	On our clay loam and loamy clay soils the objective is to prepare a seedbed without causing compaction. The preferred method is chisel and finishing tool. If soil or debris prevents this, we chisel and rotovate. When the soil is too wet to work, we plant without tillage.
Mulch	I don't use any mulch for squash	None	n/a
Other Notes on Field Prep			

Transplanting

Bed Width	6'	six foot from outside to outside	10 feet
Winter Squash Spacing	1 row per bed, 18"-22" between plants	18"	1 row per bed, 12 to 18 inches per seed drop.
Direct Seeding Process	When I have seeded directly, I have used an Earthway seeder and also simply by hand with a long handle hoe to make holes (attempting to stay upright and move more quickly than having to bend over).	N/A	Monosem model NGplus planter
Transplanting Process	After thoroughly watering the cell flats, we transplant with a mechanical transplanter, carousel type, centered behind the tractor to place and cover exactly in the center of the bed. 1 driver, 1 rider/placer, and if available, 1 assistant to follow and check that root balls are completely covered and to run flats back and forth.	Rotovate the bed. My rotovator has a bolt mounted on the back of it that marks the row as it moves through the field. After that one person walks the bed removing transplants from the seed tray and placing them every 18" next to the marked row. Sometimes two people do this part. The second or third person places the plant in the ground on the line. This continues until the field is planted.	n/a
Compost at Transplanting	nothing else applied	We place a cup or so of composted chicken manure at the base of the plant a couple weeks after planting	n/a
Water at Transplanting	only prior to transplanting	None	n/a
Row Cover	Immediately after transplanting, we lay out drip tape for each row and then row cover (Ag 19) for additional temp moderation and insect deterrent.	None	n/a

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Other Notes on Transplanting		Because I don't do any additional watering I try to time planting so that it happens before an expected rain fall. If there is no rain in the forecast, I do have the ability to water each individual plant in the field, but it is a time consuming process that I try to avoid.	

Crop Maintenance

Irrigation	Drip irrigation when needed. I can run approximately 2800 ft. at a time from one main line and I will run it for 4-6 hrs before switching to another section	I don't irrigate	Trickle to maintain adequate moisture in the row as evapotranspiration requires. See http://agwx.soils.wisc.edu/uwex_agwx/sun_water/et_wimn for evapotranspiration model for Wisconsin.
Weeding	I stale bed with the Williams tine weeder 2 or more times prior to planting. Then again 1 week after transplanting. After that, as needed. If rain has prohibited effective use of the tine weeder, I will use the sweeps for bigger weeds as soon as I can get the tractor in the field. I will use hand weeding with hoes once in a season if the weather has been completely uncooperative and the tractor could not be used. A second hand weeding does not happen.	Before the squash starts to canopy I go through the field and do a very shallow pass with my rotovator. Usually I try to do this two times. In addition we use scuffle hoes on a weekly bases until canopy. After it canopies we usually move on to other projects. Sometimes this does leave a few weeds here and there but we live with it.	Sandea pre or post emergence. Cultivate as necessary. Hoe before canopy closure as needed.
Insects		Squash Beetles seem to be our biggest issue. We plant Blue Hubbard on our outermost rows as a catch crop and that seems to work well.	Cucumber beetle on emerging seedlings. Scout frequently and spray as needed. Cucumber beetle and squash bugs on maturing and mature fruit. Spot spray if necessary.
Diseases		No issues so far. Health fertile soil goes a long way in avoiding issues.	Powdery mildew usually ends the squash growing season before frost. Ignore. Fruit rots can shorten storage life. Plant early enough for fruit to mature before harvest.

Harvest and Yields

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Harvest Window	I generally wait until mid September to begin harvesting. Often I let 1 light frost kill off the leaves for an easier harvest. Once we go in, I try to get everything at once.	Harvest usually starts sometime around the end of September to Mid October. It all depends on when the vines die back as well as a window of dry weather that would allow the squash to be cut from the vine and cured infield	Harvest begins when enough fruits are mature to allow customers in the field. Harvest ends when cold damages the crop.
Harvest Procedure	Tractor, wagon, several loppers, and MANY towels and buckets of water. And all the boxes we will need. 2 people with loppers begin sweeping the field and cutting the squash from the vines. 2 tossers follow them to pick up the fruit and toss to catchers at the edges of the field, generally 2 catchers per tosser. The catchers catch the squash and gently lay them down in a line at the edge of the field. Others use damp towels to wipe the squash clean and pack into 1 1/9 boxes (to approx. 40 lb. each). Periodically, the wagon will be loaded with full boxes and driven to the storage facility, unloaded (labeled) and stacked neatly.	After vines have died back, I am checking the weather. If we have a couple days or a ideally a week of dry weather, then we will go through the field with a pruning sheer and cut the squash from the vine leaving around a half inch of stem on the squash. After cutting if weather cooperates, then we leave the squash in the field to cure. If weather is not cooperating, then we will clip the squash as before but instead of leaving in field we will collect the squash using a tractor and flat bed wagon. We fill up the wagon then transport the squash to our greenhouse that has been covered with a shade cloth and spread out the squash on tables to cure. After one or two weeks we will carefully place cured squash in apple bins and store at around 50/55 degrees in a low humidity spot.	Pick your own. Limited numbers of acorn squash may be hand harvested before the field is opened. This allows some early sale and functions to prevent unnecessary customer damage to growing vines. When hard freeze threatens, a limited number of butternut squash (a few hundred pounds) are hand picked into a lug that can be covered to prevent freezing to extend the season a little.
Cleaning	see above	We run our squash on our wash line as it is ordered. It is washed, wiped dry and packed in 35 lb cases.	none
Curing	no intentional curing on my part	See above	n/a
Packing		We pack squash into 35 lb cases. We use waxed boxes. For some customers we will pack full bins of squash which usually end up being around 500 lbs or so.	n/a
Storage	Dry storage room, maintain temp above 35 degrees. Sell out by the end of Jan.	Typically we store squash in cardboard bins or apple bins at round 50/55 degrees and low humidity. Our squash will keep usually through December, if everything goes well we have had squash through February	n/a

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Yields		At this point the best I can do is say I typically realize a gross of around \$2,500 for my half acre	n/a
Other Notes on Harvest and Yields			

Marketing

Markets	CSA, farmers market, direct to grocery, direct to restaurant	CSA, wholesale through a distributor	pick-your-own
CSA Winter Squash - quantity delivered per share	distributed once for storage at the last delivery, 35# mixed varieties	We like to put two varieties per box for four weeks.	
Farmers Market Prices	\$.75/lb.		
Direct to Grocery Prices	\$.70/lb.		
Direct to Restaurant	\$.75/lb.		
Wholesale through Distributor		\$14.00/35 lbs or \$0.40/ lb	
Pick-Your-Own Prices			\$0.60/lb in 2013