Index Roxbury Farm 2012 Crop Manual

Arugula

Erica sativa (Brassicaceae or cabbage family)

Soil Preparation

- Arugula should not be followed after other cole crops.
- Early arugula does well on land without cover crop and little plant debris (carrots, late lettuce)
- Late Arugula does well after a winter cover crop of rye and hairy vetch or can follow a spring planted lettuce crop.
- 10 ton of compost creates a surplus of P and is more than sufficient in nutrients for N and K.
- Compost is incorporated and Arugula is planted on raised beds.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
60	**0-125**	**0-200**	**5.5-6.8**

Varieties

- Astro (for bunching), Sylvetta (for machine harvest)

Direct Seeding Information

	Rows	Seeds per foot	Seed plate #	Depth	Notes
Planet Jr.	**5**	50	**3** or **4**	Depth 2	Use spreader shoe
Sutton Jr.	**9**	20-30	**6**	¼ inch	1 mph (or 1.6 km)

Number of successions

- **15** (no summer plantings)

Cultivation Procedures

- Sutton Jr. or Planet Jr. Planters in combination with fine seeded crops like Arugula do not perform well with plant debris on soil surface. Arugula does well after a winter cover crop of oats and peas (September seeding) or when no cover crop was planted the previous fall.
- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- For 5 row culture; basketweed 7-10 days after emergence, or as soon as possible without burying the young plants.
- Hand weeding should not be necessary as Arugula crowds out weeds very well as long as flea beetles are controlled.

Disease and Insect Protection

- Cover with floating row covers before emergence to avoid flea beetle damage (for earliest plantings). Keep covered until harvest.
- Fall planted arugula hardly ever needs protection as seeding time occurs at the tail end of the second generation of flea beetles. Any planting after Sept 1 is free from hole damage.
- Beneficial nematodes can be sprayed on heavily infected land to avoid future generations. Flea beetles overwinter in hedgerows and grass strips.

Other Cultural Practices

- Arugula is a short season crop that allows for a wide variety of cover crops to follow if planted for spring or late summer harvest. Early arugula can be followed with another cash crop like lettuce or spinach and has some bio-fumigant effect to reduce soil borne disease.
- Arugula as a second or at times third cash crop is harvested too late to allow for the establishment of a cover crop. Working up soil at this point in the fall can cause erosion due to the poorly established cover crop. Late season Arugula serves poorly as a cover crop but is preferred to bare ground. Alternatively Rye can be over seeded right after harvesting. This needs to be done before the end of October.

Basil

Ocimum basilicum (Lamiaceae or mint family)

Soil Preparation

- Basil should not be followed after basil or cut flowers
- 10 ton of compost creates a surplus of P and is sufficient in nutrients for N and K.
- Compost is spaded in and Basil is planted on raised beds.
- Basil does well on clean ground and is not a heavy feeder

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
100-130	**0-160**	**0-200**	**6.0-6.8**

Varieties

- Genovese, Italian Large Leaf, Sweet Thai. Only red and purple leaved basil show some resistance to downey mildew

Transplant

- For first two plantings, then direct seed or continue with transplants

Greenhouse Guidelines

- **EZ Seeder** seeding plate **# 9**

Tray	Germ. @	Grow @	Hardening Off	Notes
Tray **128**	75	75	Withhold water	3-4 seeds to a cell. Take plants outside 1 week before planting in field

Number of successions

- 5 to 7

Transplant readiness indicators

- Pulls from trays easily. Plants should generally not be older than four weeks. If they get too bushy, transplanting with a transplanter is more difficult as they can get stuck inside the tube of the carousal.

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	9 in.	Normal to deep when plants are tall	Needs fertile conditions Basil is an aggressive neighboring plant

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Sprocket	Depth	Notes
Planet Jr.	**3**	50	**6**		¼ inch	can take up to a few wks to germinate when soil is cool
MaterMacc	**3**	12-20	**192 H 0.8**	**17-18**	¼ inch	

Cultivation Procedures

- Stale seedbed for direct seeding. Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basket weeding 7 days after transplanting
- Hand hoeing in between plants
- Use the fingerweeder or spring hoes if very slight hilling is desired after 2 – 3 weeks,

Frost, Disease and Insect Protection

- Very cold sensitive. Harvest before first frost.
- Black spots on basil is becoming more and more common (downey mildew). Some farmers now grow their basil in high tunnels or greenhouses to prevent downey mildew.
- For earlier basil, plant on BioTelo mulch and cover with hoops and floating row cover.

Cover Cropping / Under-Seeding Procedures

- Earlier crops are usually followed with oats and peas and later crops by rye and hairy vetch

Beans, Snap

Phaseolus vulgaris (Fabaceae or legume family)

Soil Preparation and General Information

- Beans should not be followed after other legumes, lettuce, carrots, nightshades, cole crops, or plowing under a lush green manure.
- Rotate after cereals (grains like corn and rye) to avoid soil borne diseases.
- Total Nutrient uptake is 170 lbs of N (Mostly from N fixing bacteria), 16 Lbs of P, and 80 lbs of K. but do not fertilize more than 60 lbs of N in form of compost or granular organic fertilizer.
- Beans do not do well on very fertile soil as they tend to fall over at maturity.
- Beans follow well after winter cover crop of oats or when no cover crop was planted that winter. Late planted beans can be planted after rye and vetch that was harvested for straw.
- Direct seed, mixing yellow and green varieties in hopper if beans are to be used for U-Pick. Keep purple beans separate as they mature at a different rate.

Common Recommended fertilizer rates in New York (CCES 1994):

Nitrogen	Phosphorus	Potassium	pH
30-40	**0-100**	**0-80**	**5.5 - 6.8**

Varieties

- Maxibel, Isar, Royal Burgundy for hand picking. Caprice for machine picking. Machine picked beans contain more fiber to avoid bruising and breaking. Caprice is still tender when harvested young. Add T 22 (Trichoderma harziana) to planter box to avoid damping off

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Depth	Sprocket	Notes
MaterMacc	**2**	12	**24 H 4.5**	½ to 1"	**22-17**	Mix seed with T22 and inoculants
Planet Jr.	**2**	24	**hole # 32**	½ to 1"		Soil temp must be over 60 degrees for good germination

Number of successions

- 8-9

Cultivation Procedures

- Two weeks in advance prepare seedbed, then again before planting. For machine picking do not make a raised bed as harvester needs a flat field.
- Apply 800 lbs/acre of dried granular composted poultry manure.
- Fingerweed 7-10 days after emergence or as soon as possible without damaging the plants.
- For second cultivation you can use Lilliston Rolling Cultivators when picked by hand. Set hillers less aggressive to only slightly hill the plants. Bean picker does not do well when plants are ridged and only use the Steketee finger weeders to cultivate.

Frost, Disease and Insect Protection

- Very cold sensitive. Harvest before first frost.
- For leafhoppers use Mycotrol O (Beauveria Bassiana). Adding molasses and milk as feeding/attractant stimulant will increase efficacy of product.
- For high infestations use PyGanic EC 5.0II at 6 to12 Oz to the acre at nymph stage; repeat for three 5 day applications for best results.

Cover Cropping / Under-Seeding Procedures:

- Early beans can be followed with oats and peas mixture, later plantings with rye and hairy vetch.

Beets

Beta vulgaris var. ruba (Chenopodiaceae or goosefoot family)

Soil Preparation

- Beets should not be followed after other chenopods, potato, brussels sprouts, sweet clover, or corn
- 10 ton of compost creates a surplus of P but is insufficient in nutrients for N and K.
- Total Nutrient uptake is 140 lbs of N, 14 Lbs of P, and 140 lbs of K
- Compost is spaded in and beets are planted on raised beds.
- Soil test will determine if additional K is needed. Beets need high amounts of K.
- Test for Boron. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute Solubor through a water solution with a sprayer at 50 GPA
- Spread gypsum if soil test indicates low Calcium levels

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
150-175	0-200	50-400	6.0-6.8

Varieties:

- Merlin, Monetta, Detroit Dark Red, Ace

Direct Seeding Information

	Rows	sds/Ft	Plate #	Sprocket	Depth	Notes
Planet Jr.	**3**	50	**20**		¼-½ inch	
MaterMacc	**3**	24	**144 H 2.5**	**17-19**	¼-½ inch	Use higher seeding rate for bunching beets

Number of successions

- Bunching beets 4
- Storage beets 2

Cultivation Procedures

- Prepare seedbed two weeks in advance.
- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basketweed 7 to 10 days after planting. Cover row 2 and 4 with chisels mounted on Basketweeder or side knives mounted on rear toolbar.
- Hand-weed in between plants.
- Use finger weeder or springhoes for second cultivation with rear mounted S-tines in wheel track and side knives in between rows.

Other Cultural Practices

- Calcium and Boron are important nutrients for beets and chard. Under most East coast conditions: apply 18 lbs of Solubor to the acre before planting. Spray colloidal Calcium on plants when Calcium levels are below optimum (varies per soil type).
- Beets are planted over a wide range of the season. Early bunching beets are one of the first crops to be planted while the storage beets should not be planted until July to avoid oversized beets. For this reason a variety of cover crops can be used either prior or after a crop of beets.
- Cercospora leaf spot is best controlled by applying plenty boron and K and practicing broad rotations that do not include any member of the Chenopod family and do not allow weeds to survive like lambsquarter or pigweed as they carry the disease. Sweet clover is also a host of Cercospora.

Broccoli Raab

Brassica rapa (Brassicaceae or cabbage family)

Soil Preparation

- Broccoli Rabe should not be followed after other cole crops.
- 10 ton of compost creates a surplus of P and is usually sufficient in nutrients for N and K.
- Compost is spaded in and Broccoli Raab is planted on raised beds.
- If additional fertilizer needs to be applied, this will need to be done with the first cultivation as Broccoli Rabe is a fast developing crop.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
80	0-125	0-200	5.5-6.8

Varieties:

- Sessantina Grossa, Spring Raab

Direct Seeding Information:

	Rows	Plate #	Seeds/Ft	Sprocket	Depth	Notes
Planet Jr.	**3**	**2-3**	30		¼ - ½"	Two seeds should easily be pushed through the hole for proper seed plate.
MaterMacc	**3**	**192 H 1.0**	12	**12-17**	¼ - ½"	

Number of successions

- Spring 3
- Fall 3

Cultivation Procedures

- Broccoli Raab follows well after winter cover crop of oats and peas or when no cover crop was planted that winter. Planet Jr. Seeders and fine seeded crops like broccoli rabe do not deal well with plant debris on soil surface. MaterMacc planters have a double disc opener (slicing the debris in front of the furrow) and wheels behind the furrow to firm the seedbed which allows for a variety of soil conditions.
- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basket 7-10 days after emergence as soon as possible.
- Second cultivation use finger weeder or spring hoes.
- If third cultivation is possible use the spider gangs to slightly hill up the plants in combination with the spring hoes.

Frost, Disease and Insect Protection

- Cover with floating row covers before emergence. Keep covered if possible until harvest. fall raab hardly ever needs protection as seeding falls at the tail end of the second generation.
- Beneficial nematodes can be sprayed on infected land to avoid future generations.

Other Cultural Practices

- Early broccoli rabe can be followed by fall transplanted lettuce or cover crop. Mow after last harvest with flail mower and spade the harvest leftovers in the ground. This ground is not suitable for direct seeded crops due to crop residue from fibrous stems of the raab plants.
- Spring planted Broccoli Raab follows well after winter cover crop of oats and peas or when no cover crop was planted the previous fall.
- Fall planted raab does well after hairy vetch without any application of additional N.

Broccoli, main crop

Brassica oleracea (italica group) (Brassicaceae or cabbage family)

Soil Preparation

- Broccoli should not be followed after other cole crops.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 165 lbs of N, 10 Lbs of P, and 210 lbs of K
- Compost is spaded in and Broccoli is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.
- Fall Broccoli does exceedingly well when followed after a spring seeding of bell beans, barley and oats without any application of additional N.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-150	0-160	0-200	6.0-6.8

Varieties

- Blue Wind, Arcadia, Packman, Windsor

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	75-85	60	Less water	Take plants outside 1 week before planting in field

Number of successions

- Spring 3
- Fall 3

Signs to watch for & what to do

- Purpling leaves indicate phosphorous deficiency in potting soil, feed with foliar spray.
- During late spring watch plants for getting leggy from too much warmth, put outside to harden off.
- Stocky plants result in higher survival rate in the field.

Transplant readiness indicators

- 4 true leaves, plants pull easily from tray. Plants should generally not be older than four to five weeks

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
2	14 in.	Long plants bury as deep as possible without covering true leaves	Use 14 inch sprocket. Even when plants wilt, they always come back.

Cultivation Procedures

- Use Steketee fingerweeder or Bezzerides spring hoe with side knives 7-10 days after transplanting.
- Hand hoe in between plants as necessary.
- Second cultivation use Steketee fingerweeder or spring hoes with knives in the back.
- If third cultivation is necessary use Lilliston Rolling Cultivators and hill aggressively without burying the plants.

Insect and Disease Protection

- Control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays.
- Look for eggs of cabbageworm/cabbage looper at the underside of leaves. When small worm population is over 2 per plant spray Bt using 1 to 2 pints to the acre or spinosad (Entrust) at 1-3 Oz per acre every week until population is under control. Alternate spraying schedule by using Bt aizawi or Bt kurstaki in conjunction with spinosad at 1-3 Oz to the acre to avoid developing

resistance. (Total amount of Entrust per season per acre should not exceed more than three applications with a total of 9 Oz.). Add some feeding/attractant stimulant like molasses and milk for greater effect (1 lb per acre).

- Choose tolerant and well-domed varieties and supply plenty of water and nitrogen to avoid brown bead.

Other Cultural Practices

- Earlier planted broccoli can be followed by cover crop. Mow plants down as low as possible with flail mower. Incorporate crop residue with disc to avoid wintering over of insects and diseases.
- Later plantings can be over seeded with a mixture of red and sweet clover at a rate of 20 lbs per acre. This is done right after the last cultivation. Alternatively Rye can be overseeded a few weeks before harvesting. This needs to be done before the end of October. Great care should be taken to avoid seed getting caught in the plants.

Broccoli, early crop

Brassica oleracea (italica group) (Brassicaceae or cabbage family)

Soil Preparation

- Cultural practices are similar to main crop broccoli except that early cabbage is planted on BioTelo mulch.
- Avoid too much plant debris from previous cash or cover crop as plastic will be laid as early as possible in the growing season.
- Use dried granular composted chicken manure at the rate of 1500 lbs per acre when laying Biotelo plastic.

Varieties

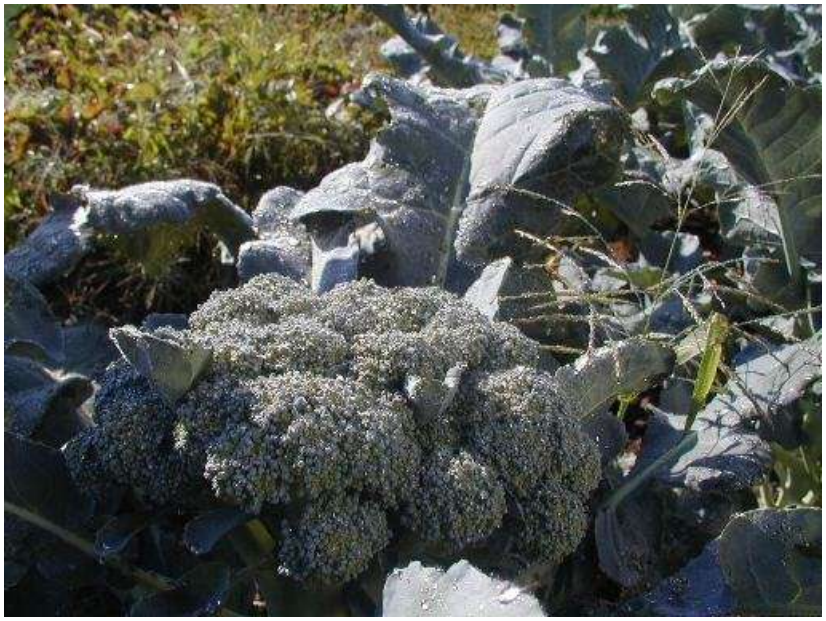
- Blue wind

Waterwheel Planter

Rows	In-Row	Planting Depth	Notes
3	12.	As deep as possible	Use 12 inch wheel and add kelp to water as ½% solution

Cultivation Procedures mini Cabbage

- Cover plants with floating row cover
- Cultivate with Hillside cultivator
- If desired plant cover crop like oats and peas in between plastic
- After harvest work in cover crop and plant debris to allow for bare fallow
- Follow with garlic or rye and vetch



Brussels Sprouts

Brassica oleracea (gemmifera group) (Brassicaceae or cabbage family)

Soil Preparation

- Brussels Sprouts should not be followed after other cole crops.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 236 lbs of N, 29 Lbs of P, and 235 lbs of K
- Compost is spaded in and Brussels Sprouts are planted on raised beds.
- Soil test will determine if additional K is needed. Brussels Sprouts needs high amounts of K. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-150	0-160	0-200	5.5-6.8

Varieties

- Diablo, Oliver

Transplant:

- Brussels Sprouts can be followed after oats and peas or rye with hairy vetch, which is preferred.
- Plant far away from cabbage and other cole crops.

Greenhouse Guidelines:

- **EZ seeder** seeding Plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	75 - 90	65	Withhold water.	Take plants outside 1 week before planting in field

Transplant readiness indicators:

- When plants pull easily from cell. Plants should generally not be older than five weeks

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
2	24 in.	Cell is buried by soil	Use 24 inch sprocket, and plant every other cup.

Cultivation Procedures

- Use Steketee fingerweederor Bezzerides spring hoe with side knives 7-10 days after transplanting.
- Hand hoe in between plants as necessary.
- Second cultivation use Steketee fingerweeder or spring hoes with S tines in the back.
- Only when absolutely necessary, a third cultivation with a Lilliston Rolling Cultivators to hill without burying the plants.

Insect and Disease Protection

- Control flea beetles with Entrust at 3 Oz per acre every 5 –7 days not to exceed three sprays.
- Look for eggs of cabbageworm/cabbage looper at the underside of leaves. When small worm population is over 2 per plant spray Bt using 1 to 2 pints to the acre or spinosad (Entrust) at 1-3 Oz per acre every week until population is under control. Alternate spraying schedule by using Bt aizawi or Bt kurstaki in conjunction with spinosad at 1-3 Oz to the acre to avoid development of resistance. (Total amount of Entrust per season per acre should not exceed more than three applications with a total of 9 Oz.) Add some feeding/attractant stimulant like molasses and milk for greater effect (1 lb per acre).
- Brussels sprouts should be planted separate from other Cole crops as Alternaria can be a big problem. Copper sprays have been ineffective.

Other Cultural Practices

- Brussels Sprouts can be followed after oats and peas or rye with hairy vetch, with a preference on the latter.

- Plants should be topped in September to induce greater yield and uniformity of sprouts. Yellow leaves are to be removed from lower parts of plants to keep sprouts healthy. Green leaves can also be harvested as a share item. Do not remove too many leaves from one plant as this affects final yield.
- Plants can be over seeded with a mixture of red and sweet clover at a rate of 20 lbs per acre. This is done right after the last cultivation, although Brussels sprouts tend to create too much shade to create a successful stand of clover. Alternatively Rye can be overseeded a few weeks before harvesting. This needs to be done before the end of October. Great care should be taken to avoid seed getting caught in the plants.

Belly mounted Bezzerides springhoes (3 row)

Cabbage, Chinese

Brassica rapa (pekinensis group) (Brassicaceae or cabbage family)

Soil Preparation

- Chinese cabbage should not be followed after other cole crops.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 165 lbs of N, 10 Lbs of P, and 208 lbs of K
- Compost is spaded in and Chinese Cabbage is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.
- Chinese cabbage does exceedingly well when followed after a spring seeding of bell beans, barley and oats without any application of additional N.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-150	0-160	0-200	6.0-6.8

Varieties

- Rubicon

Transplant

- Early Chinese cabbage after oats and peas and summer planted Chinese cabbage after rye and hairy vetch.

Greenhouse Guidelines

- **EZ Seeder** seeding plate **# 16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	75 - 90	65 - 75	Reduce water.	Take plants outside 1 week before planting in field

Signs to watch for & what to do

- Watch that they don't start to get leggy from too much warmth, put outside.

Transplant readiness indicators

- When plants come easily out of cell. Plants should generally not be older than five weeks

Number of successions

- Spring 1
- Fall 1

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
2	12 in.	Do not bury the cell, top of cell even with soil level.	Use 12 inch sprocket. Irrigate after planting, and watch for flea beetles

Cultivation Procedures:

- For direct seeding: prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basketweed 7-10 days after transplanting or after seeding when plant has developed true leaves.
- Hand hoe in between plants. Thin when necessary when direct seeded
- Second cultivation, use only fingerweeder as springhoes cause slight hilling which can be detrimental for Chinese cabbage. Use the two row S-Tine cultivators on three-point-hitch for control of weeds in wheel tracks and between rows. Side-dress with dried granular composted chicken manure when not preceded by legume cover crop.
- Third cultivation use use fingerweeder in combination with rear mounted side knives to avoid damaging tender leaves.

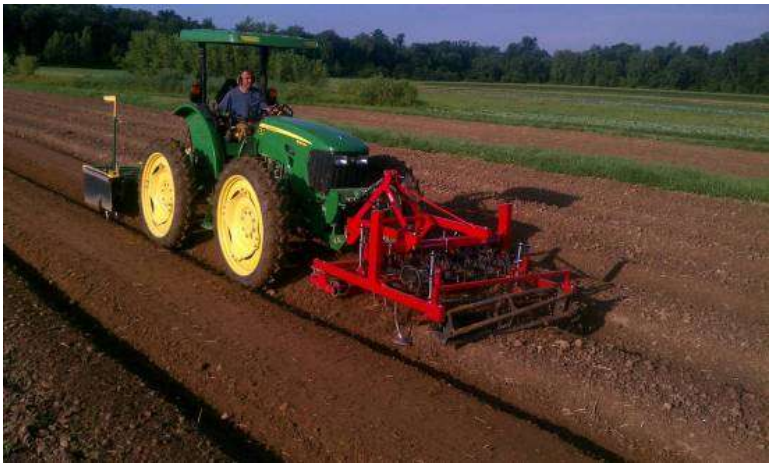
Insect Protection

- Control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays.
- Look for eggs of cabbageworm/cabbage looper at the underside of leaves. When small worm population is over 2 per plant spray Bt using 1 to 2 pints to the acre or spinosad (Entrust) at 1-3 Oz per acre every week until population is under control. Alternate spraying schedule by using Bt aizawi or Bt kurstaki in conjunction with spinosad at 1-3 Oz to the acre to avoid build up of resistance. (Total amount of Entrust per season per acre should not exceed more than three applications with a total of 9 Oz.) Add some feeding/attractant stimulant like molasses and milk for greater effect (1 lb per acre).

Other Cultural Practices

- Early Chinese cabbage can be followed by fall lettuce or cover crop. Mow plants down as low as possible with flail mower. Incorporate crop residue with disc or spader. Late planted Chinese cabbage creates too much shade to develop a cover crop while cabbage is growing.
- Early Chinese cabbage after oats and peas and summer planted Chinese cabbage after rye and hairy vetch.

Front and Rear view of combo seedbed maker and bedshaper.



Cabbage Green & Red
Brassica oleracea (capitata group) (Brassicaceae or cabbage family)

Soil Preparation

- Cabbage should not be followed after other cole crops.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 165 lbs of N, 10 Lbs of P, and 208 lbs of K
- Compost is spaded in and Cabbage is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.
- Storage cabbage does exceptionally well when followed after a spring seeding of bell beans, barley and oats without any application of additional N.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-150	0-160	0-200	6.0-6.8

Varieties

- Green main: Storage #4, Rivera
- Red main: Integro
- Savoy: Alcosa

Transplant

- Early cabbage after oats and peas and summer planted cabbage after rye and hairy vetch.

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	77-95	>60	Reduce water	Take plants outside 1 week before planting in field

Number of successions

- Spring 1 (mini cabbage and early red)
- Fall 1 (varieties allow for even harvest)

Signs to watch for & what to do

- Watch that they don't start to get leggy from too much warmth, put outside.

Transplant readiness indicators

- When plants come easily out of cell. Plants should generally not be older than five weeks

Lännen Transplanter:

Rows	In-Row	Planting Depth	Notes
3	18 in.	As deep as possible	Use 18 inch sprocket
2	14 in	As deep as possible	Use 14 inch sprocket

Cultivation Procedures Cabbage

- Use the fingerweeder or springhoes 7-10 days after transplanting. Use the Two row S-Tine cultivators on three-point-hitch for control of weeds in wheel tracks and top of the bed.
- Hand hoe in between plants if necessary.
- For the second cultivation use fingerweeder or springhoes again. Use the Two row S-Tine cultivators on three-point-hitch for control of weeds in wheel tracks and top of the bed. Side-dress with granular fertilizer when not preceded by legume cover crop.
- If third cultivation is necessary (in two row planted cabbage like Storage #4 only) use Lilliston cultivators and hill aggressively without burying the plants.

Insect Protection

- Control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays.
- Look for eggs of cabbageworm/cabbage looper at the underside of leaves. When small worm population is over 2 per plant spray Bt using 1 to 2 pints to the acre or spinosad (Entrust) at 1-3 Oz per acre every week until population is under control. Alternate spraying schedule by using Bt aizawi or Bt kurstaki in conjunction with spinosad at 1-3 Oz to the acre to avoid build up of resistance. (Total amount of Entrust per season per acre should not exceed more than three applications with a total of 9 Oz.). Add some feeding/attractant stimulant like molasses and milk for greater effect (1 lb per acre).

Other Cultural Practices

- Early cabbage after oats and peas and summer planted cabbage after hairy vetch or bell beans.
- Early cabbage can be followed by fall lettuce if transplanted. Mow plants down as low as possible with flail mower. Incorporate crop residue with spader.
- Close plantings of fall cabbage allows for smaller head development. Storage #4 can be spaced at 12 by 36 to allow for a larger head that keeps better in storage. Generally speaking customers prefer a 3 lbs size head.

Cabbage Mini

Brassica oleracea (capitata group) (Brassicaceae or cabbage family)

Soil Preparation

- Cultural practices are similar to regular cabbage except that early cabbage is planted on BioTelo mulch.
- Avoid too much plant debris from previous cash or cover crop as plastic will be laid as early as possible in the growing season.
- Use dried granular composted chicken manure at the rate of 500 lbs per acre when laying plastic.

Varieties

- Early Green: Arrowhead, Farao
- Early red: Red Express

Waterwheel Planter

Rows	In-Row	Planting Depth	Notes
3	12.	As deep as possible	Use 12 inch wheel and add kelp to water as ½% solution

Cultivation Procedures mini Cabbage

- Cover plants with floating row cover
- Cultivate with Hillside cultivator
- If desired plant cover crop like oats and peas in between plastic
- After harvest work in cover crop and plant debris to allow for bare fallow
- Follow with garlic or rye and vetch

Carrots

Daucus carota var. sativus (Apiaceae or carrot family)

Soil Preparation

- Carrots should not be followed after other umbellifers, and not after potatoes, cereals and cucurbits due to weed and possibly structural problems.
- Late carrots follow well after early lettuce or early greens.
- 10 ton of compost creates a surplus of P and is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 145 lbs of N, 25 Lbs of P, and 150 lbs of K
- Subsoiling before planting greatly improves root quality
- Compost is worked in and carrots are planted on raised beds.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-150	0-160	0-200	5.5-6.8

Varieties

- Sugarsnax, Bolero, Red Cored Chantenay

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Depth	Sprocket	Notes
Planet Jr.	**3**	25-50	Plate 5	¼ - ½"		Irrigate before seeding
MaterMacc	**3**	32	**192 H 0.8**	¼ - ½"	**22-17**	

Number of successions

- Fall 2

Cultivation Procedures

- Carrots follow well after winter cover crop of oats and peas or when no cover crop was planted the previous fall. Raw organic matter causes forking of carrots.
- Subsoil before primary cultivation to disrupt plowpan.
- Prepare seedbed two to three weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Flame weed 5 days after seeding or right before they emerge
- Basketweed 7 to 10 days after planting. For storage carrots cover row 2 and 4 with small chisels mounted on Basketweeder or side knives mounted on rear toolbar.
- Hand weed meticulously to avoid having to pull large weeds later on.
- Basketweed until plants are too big. Then follow with torsion weeders with rear mounted side knives.
- Hand weed again.

Disease Protection

- To prevent Alternaria (leaf blight that also affects the roots by forming black spots on the surface) use tolerant varieties and for intervention you can spray a copper/serenade mixture. Mixture consists of 6 lbs of Serenade with 1½ lbs of copper to the acre. Spraying has only fair results and we discontinued it after one season of mediocre results. Good short season varieties (like some of the Chantenay types) that can be seeded late are better remedies. Timing irrigation (only water during the day) helps in minimizing the spores to incubate.

Other Cultural Practices

- Storage carrots are generally not over seeded or followed by a cover crop unless they are harvested before the end of September. Interseeding with rye is not successful as digging up the carrots disturbs the root system of the rye.

Carrot Baby

Daucus carota var. sativus (Apiaceae or carrot family)

Varieties:

- Nelson

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Depth	Speed	Notes
Planet Jr.	**5**	25-50	**5**	¼ - ½"		Irrigate before seeding
Sutton Jr.	**5**	32	**8**	¼ - ½"	0.8 mph	

Number of successions

- Spring 3

Cultivation Procedures

- Only choose your cleanest ground for early seeding of baby carrots
- Subsoil before primary cultivation to disrupt plowpan.
- Ideally prepare seedbed two to four weeks in advance, then cultivate with stale seedbed maker when weeds emerge and right before planting.
- Flame weed 5 days after seeding or right before they emerge
- Basket 7-10 days after emergence as soon as possible w/out burying.
- Summer harvested baby carrots can be followed with oats and peas or rye and vetch.

Other Cultural Practices

- Early carrots can be followed with a bare fallow and late summer planted cover crop like oats and peas or a fall seeding of salad mix or greens.

Front mounted Steketee fingerweeder for 2 and 3 row cultivation

Cauliflower

Brassica oleracea (botrytis group) (Brassicaceae or cabbage family)

Soil Preparation

- Do not follow Cauliflower after other cole crops.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 165 lbs of N, 10 Lbs of P, and 208 lbs of K
- Compost is spaded in and Cauliflower is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.
- Cauliflower does exceptionally well when followed after a spring seeding of bell beans, barley and oats without any application of additional N.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-150	0-160	0-200	6.0-6.8

Varieties

- Panther, Quasar, Cassius, Skywalker

Transplant

- Early cauliflower after oats and peas and summer planted cauliflower after rye and hairy vetch or broad (bell) beans.

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	germ. @	Grow @	Hardening Off	Notes
128	75-90	>60	Reduce water	Take plants outside 1 week before planting in field

Signs to watch for & what to do

- Watch that they don't start to get leggy from too much warmth, put outside.

Transplant readiness indicators

- When plants come easily out cell not older than five weeks. Stunted plants do not form large heads.

Number of successions

- Fall (one planting date with varieties creating even harvest)

Lännen Transplanter:

Rows	In-Row	Planting Depth	Notes
2	24 in.	As deep as possible	Use 24 inch sprocket . Water after planting

Cultivation Procedures

- Use fingerweeder or spring hoes with rear mounted side knives 7-10 days after transplanting.
- Hand hoe in between plants if necessary.
- For the second cultivation use the fingerweeder or spring hoes with side knives.
- Use the Two row S-Tine cultivators on three-point-hitch for control of weeds in wheel tracks and top of the bed.
- If third cultivation is necessary use Lilliston cultivators and hill aggressively without burying the plants. Side-dress with dried granular composted chicken manure when not preceded by legume cover crop.

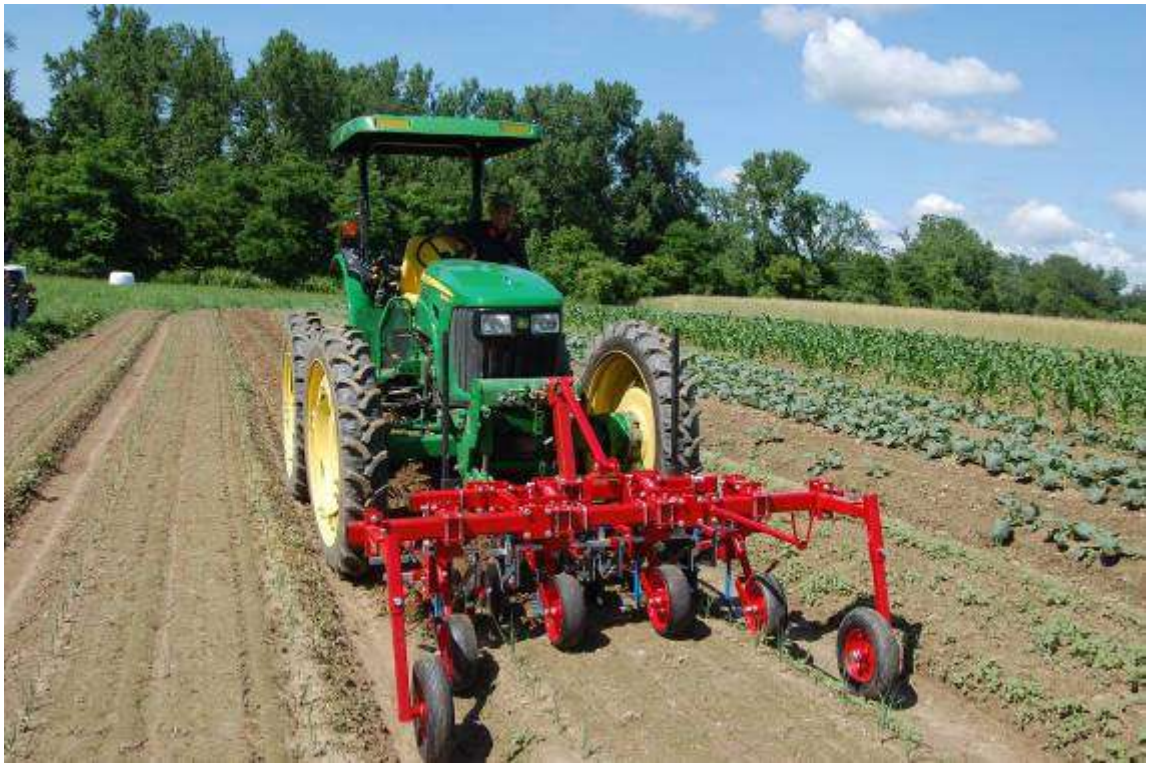
Insect Protection

- Control flea beetles with Entrust at 2-3 Oz per acre every 5 –7 days not to exceed three sprays.
- Look for eggs of cabbageworm/cabbage looper at the underside of leaves. When small worm population is over 2 per plant spray Bt using 1 to 2 pints to the acre or spinosad (Entrust) at 1-3 Oz per acre every week until population is under control. Alternate

spraying schedule by using Bt aizawi or Bt kurstaki in conjunction with spinosad at 1-3 Oz to the acre to avoid build up of resistance. (Total amount of Entrust per season per acre should not exceed more than three applications with a total of 9 Oz.). Add some feeding/attractant stimulant like molasses and milk for greater effect (1 lb per acre).

Other Cultural Practices

- Early Cauliflower after oats and peas and summer planted Cauliflower after rye and hairy vetch or broad beans.
- When cauliflower matures, cover white part up with outer leaves to avoid yellowing of curds.
- If possible: Mow plants down as low as possible with flail mower. Incorporate crop residue with disc. Follow with rye and hairy vetch.
- Late planted cauliflower is not incorporated and followed with a cover crop. Alternatively Rye can be overseeded a few weeks before harvesting. This needs to be done before the end of October. Great care should be taken to avoid seed getting caught in the plants. Never seed down rye when curds have started to develop.



Front view of Steketee fingerweeder cultivating young leeks

Celeriac

Apium graveleolens (Apiaceae or carrot family)

Soil Preparation

- Celeriac should not be followed after other umbellifers, and not after potatoes, cereals and cucurbits due to weed and possibly structural problems .
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 105 lbs of N, 16 Lbs of P, and 160 lbs of K
- Compost is spaded in and Celeriac is planted on raised beds.
- Soil test will determine if additional K is needed. Celeriac is known to need high amounts of K. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
180	0-200	60-300	6.0-6.8

Varieties

- Diamant, Brilliant

Transplant:

- As Celeriac tends to get weedy and has high need for moisture, it can be transplanted in plastic mulch for greater results

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#13**

Tray	Germ. @	Grow @	Hardening Off	Notes
288	70-75	60-70	Reduce water NO low temps	Exposure below 55 for 10 days or more causes bolting

Transplant readiness indicators

- When the plants have at least 2 true leaves, transplant to Tray **128**'s

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	12 in.	Make sure crown is not buried since that will stop the plant from growing	Use 12 inch sprocket. Needs high fertility

Cultivation Procedures:

- Basket 7-10 days after transplanting
- Use fingerweeder or spring hoes for later cultivation. Celeriac is a finicky crop. Side-dress with dried granular composted chicken manure to help increase size of crop
- Celeriac needs clean land, and keep the crop clean by frequently hand hoeing in between plants.
- Irrigate generously

Cover Cropping / Under-Seeding Procedures:

- None as Celeriac is harvested in November

Celery

Apium graveleolens (Apiaceae or carrot family)

Soil Preparation

- Celery should not be followed after other umbellifers.
- 10 ton of compost gives plenty P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 195 lbs of N, 50 Lbs of P, and up to 435 lbs of K
- Compost is spaded in and Celery is planted on raised beds.
- Soil test will determine if additional K is needed. Celery is known to need high amounts of K. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
180	0-200	60-300	6.0-6.8

Varieties

- Ventura

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#13**

Tray	Germ. @	Grow @	Hardening Off	Notes
288	70-75	60-70	Reduce water No low temps	Exposure below 55 for 10 days or more causes bolting

Transplant readiness indicators:

- When there are 2 true leaves transplant to Tray **50**'s

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
2	9 in.	Can be planted deep	Use 9 inch sprocket. Needs high fertility

Cultivation Procedures

- Basketweed 7-10 days after transplanting
- Use fingerweeder or Springhoes for later cultivation. Side-dress with composted poultry manure
- Hand hoe in between plants.

Other Cultural Practices

- Main problem is lack of Nitrogen, Calcium and Boron. Spray colloidal Calcium on plants if necessary.
- Celery like Celeriac needs fertile ground with plenty moisture and organic matter to do well.
- Summer harvested celery can be followed by oats and peas and fall harvested celery by rye and vetch.

Chard Swiss

Beta vulgaris var. cicla (Chenopodiaceae or goosefoot family)

Soil Preparation

- Swiss chard should not be followed after spinach, beets, but later plantings do very well after early peas.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 105 lbs of N, 16 Lbs of P, and 160 lbs of K
- Compost is spaded in and Chard is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
150-175	0-200	60-300	6.0-6.8

Varieties:

- Golden Sunrise, Magenta Sunset, Fordhook Giant

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Shoe Depth	Notes
Planet Jr.	**3** or **5**	50	**22**	Depth 2-3	
Sutton Jr.	**5-9**	35	**24**	¼ to ½ inch	0.8 mph or 1.3 km

Greenhouse Guidelines: **EZ Seeder** seeding plate **#9**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	75 - 90	65 - 75	Reduce water.	2-3 seeds per cell. Take plants outside 1 week before planting in field

Signs to watch for & what to do:

- Watch that they don't start to get leggy from too much warmth, put outside.

Number of successions

- Summer 3
- Fall 3

Transplant readiness indicators:

- When plants come easily out of cell. Plants should generally not be older than four weeks

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	5 in.	Do not bury the cell, top of cell even with soil level.	Use 5 inch sprocket. Irrigate after planting.

Cultivation Procedures

- Basketweed 7 to 10 days after planting. For three row cultivation cover row 2 and 4 with chisels mounted on Basketweeder or use side knives mounted on rear toolbar.
- Hand hoe in between plants

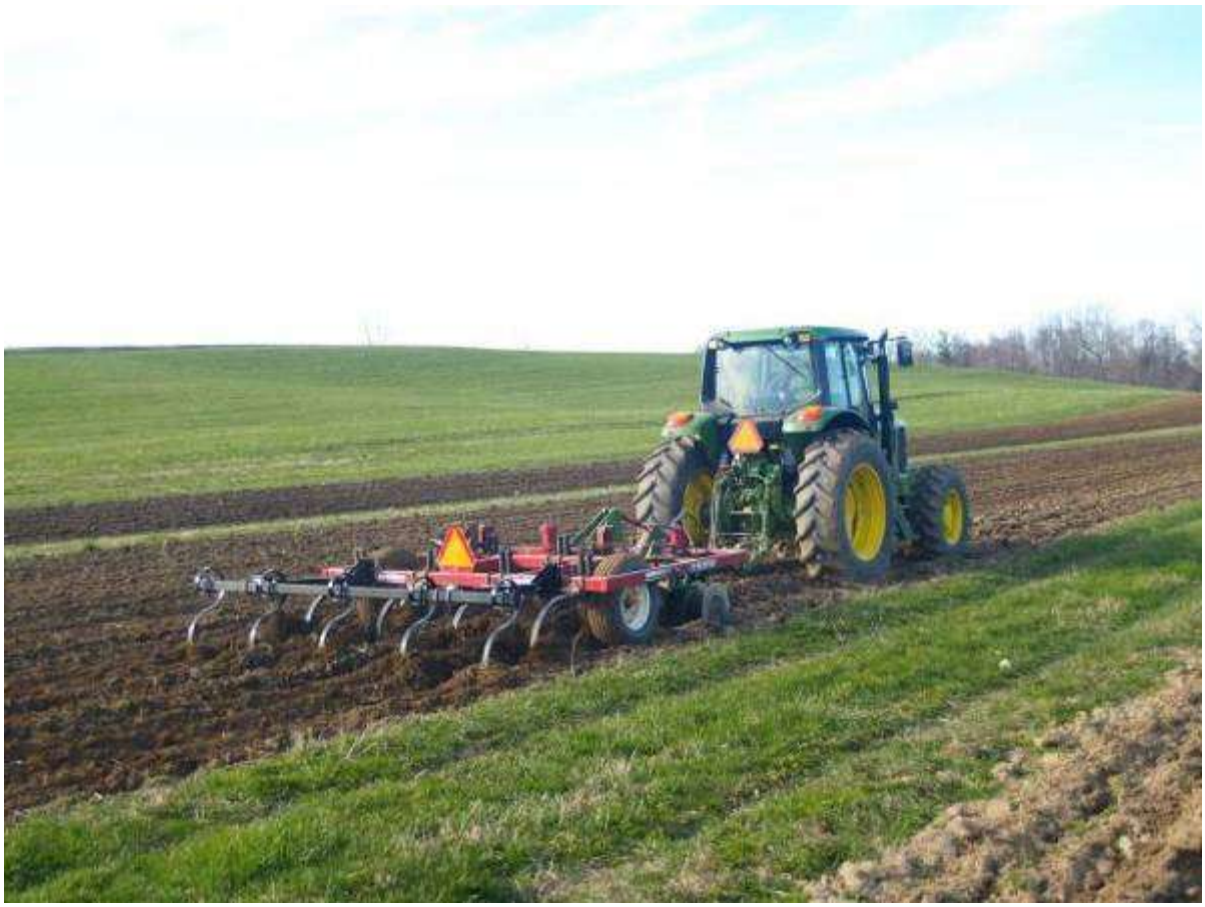
- For second cultivation in three row cultivation, use fingerweeder or spring hoes with rear mounted S-tines in wheel tracks and side knives in between rows.

Frost Disease and Insect protection:

- Calcium and Boron are important nutrients for beets and chard. If necessary spray colloidal Calcium on plants.
- Protect against leaf miner. When it cannot be controlled work under the crop.

Other Cultural Practices

- To renovate Swiss chard after harvesting, use Bezzerides Spidergangs and hill vigorously. Side dress for renewed growth.
- Early chard is not followed with a cash crop as the roots will re-grow and act as a weed. After working the ground with a disc and harrow a cover crop can be established.
- Late planted chard is not incorporated to be followed with a cover crop. Alternatively Rye can be overseeded a few weeks before harvesting. This needs to be done before the middle of October. Great care should be taken to avoid seed getting caught in the heart of the plants



Cilantro

Eryngium foedum (Apiaceae or carrot family)

Soil Preparation

- Cilantro should not be followed after other umbellifers, and not after potatoes, cereals and cucurbits due to possible weed problems.
- Late Cilantro does well after early lettuce and greens
- 10 ton of compost creates a surplus of P and is sufficient in nutrients for N and K.
- Compost is spaded in and Cilantro is planted on raised beds.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
60	0-125	0-200	6.0-6.8

Varieties:

- Santo, Jantar

Direct Seeding Information:

	Rows	Seeds/Ft	Plate #	Shoe Depth	Notes
Planet Jr.	**5**	50	**22**	Depth 3	
Sutton Jr.	**9**	50	**24**	½ inch	0.7 mph or 1.3 kmph

Number of successions

- Spring 3
- Summer 8
- Fall 3

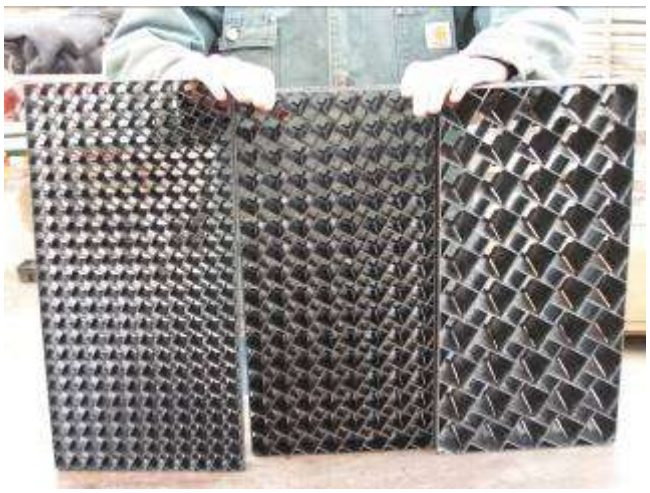
Cultivation Procedures

- Cilantro follows well after winter cover crop of oats and peas or when no cover crop was planted that winter. Sutton or Planet Jr. seeders in combination with fine seeded crops like cilantro do not perform well with plant debris on soil surface.
- Three weeks in advance stale seedbed, then again at 10 days and again before planting.
- Basket 7-10 days after emergence, or as soon as possible without burying.

Cover Cropping / Under-Seeding Procedures

- Cilantro can follow many crops in the field or it can be followed since it only takes 30 to 40 days until ready to harvest.

Winstrip trays 288, 128, and 50



Corn

Zea mays (Poaceae or grass family)

Soil Preparation

- Corn should not be followed after corn, other grains or cucurbits (corn rot worm, which should not be an issue with transplanted corn).
- Corn does well after a leguminous green manure like sweet clover. Early plantings will not be able to depend on the N out of clover.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and corn is planted on raised beds.
- Total Nutrient uptake is 155 lbs of N, 20 Lbs of P, and 105 lbs of K
- PSNT (Pre-Side Dress Test) will determine amount of N to be applied with side dressing. Soil test will determine if additional K is needed.
- Corn is both direct seeded and transplanted. For greater weed control and earlier corn it is started in the greenhouse and set in the field after two weeks.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-160	5.5-6.8

Varieties:

- Sweet corn: Mirai 308 BC and Mirai 301 BC
- Popcorn: Robust

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Shoe Depth	sprocket setting
MaterMacc	2	3	24 H 4.5	1 inch	22 - 17

Greenhouse Guidelines:
Use specific sweet-corn seeder or seed by hand.

Tray	Germ. @	Grow @	Hardening Off	Notes
128	70-95	65	Withhold water	Seed two seeds per cell Move outside 3 days before planting

Number of successions

- 10

Signs to watch for & what to do

- Air pruning in transplants is extremely important with corn as roots have strong development and can cause difficulties with transplanting.
- Make sure plants don't get too tall before planting.
- Transplant as soon as plugs pull well and stay together. If roots are tangled to the bottom of tray they will need to be cut or pulled out straight so they don't interfere with planting.

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
2	15 in.	As deep as possible	Works only well when you have a carrousel transplanter

Cultivation Procedures

- Use the fingerweeder or spring hoes with rear mounted S tines 7-10 days after transplanting.
- Hand hoe in between plants when row covers have been applied for early plantings.
- For the second cultivation use the fingerweeder or spring hoes with S tines. Side-dress with dried granular composted chicken manure for additional N
- Only if third cultivation is necessary use Lilliston Rolling Cultivators and hill aggressively without burying the plants.

Frost, Insect, and Nuisance Animal Protection

- Early corn is covered with floating row covers to protect against frost damage and for rapid development.
- European corn borer can be controlled with Gemstar LC which does not kill the trichogramma wasp (entrust is highly effective but will harm the wasps). When entrust is used apply 2 Oz/acre. Spray in whorl stage when you find more than 10 moths a day in the pheromone trap. Spray 3-5 days later to ensure covering all emerging tassels. Use high pressure (150 psi) to provide good penetration.
- Alternatively for ECB control use releases of Trichogramma Ostrinnea starting when the corn is knee high. Release 30,000 eggs per acre every week until full pollination.
- For CEW use Gemstar LC at 9 oz per acre at 120 psi or alternatively apply individual ears with Zea later applicator with 3 Oz Entrust or 2 pints of Bt per acre. Adding some feeding/attractant stimulant like molasses and milk will increase effect (1 lb per acre).
- Gemstar provides some control for fall army worm but in case of an outbreak apply BT or entrust.
- Put up a deer fence if they eat the silk. Bait deer fence with peanut butter. Make sure that fence is up, baited, and hot within one day. The surprise effect is what matters most with deer control.
- For Raccoon control, use a separate electric fence when corn has visible ears. Fence is woven grid and 18 inches tall. Only use high voltage fence charger (Inteli-shock 284) suitable for nylon woven wire to get effective control.
- For bird control use BirdGuard™ which is an electronic sound box that produces distress calls of certain birds and watch calls by predators. In extreme cases you can utilize a propane fired bird cannon that produces a blast at set intervals. Neither one is effective long term as birds get used to the sound. Balloons are effective but need to be taken down each time you use the boom sprayer

Other Cultural Practices

- Corn needs to be mowed and incorporated after harvest to reduce future ECB infestations.
- Corn is followed with an oats and peas if corn is followed by plasti-culture. Early seeded oats and peas should be mowed in December to break up long stalks as they will possibly clog up the mulch layer.
- Corn is followed by rye when planted in the floodplain (which we do not rotate in with plasti-culture)

24 feet one sided boom-sprayer with TX12 hollow cone nozzles @ 120 psi

Cucumbers

Cucumis sativus (Cucurbitaceae or cucumber family)

Soil Preparation

- Cucumbers should not be followed after other cucurbits, nightshades, but follow well after cole crops, and some leguminous green manure or sweet corn.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and cucumbers are planted on high raised beds covered with Biotelo mulch.
- Soil test will determine if additional K is needed. Apply all additional N and K needed through hopper on mulch layer.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-160	5.5-6.8

Varieties

- Slicer: Marketmore 76, 86
- Pickling: Eureka

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#5**

Tray	Germ. @	Grow @	Hardening Off	Notes
50	80-95	>70day >60 n	Withhold water	Space cucumbers flats like checkers when plants get too leggy

Transplant readiness indicators

- Transplant into Winstrip Tray **50**'s when plant formed two true leaves
- Transplant in the field when plants have enough of a root-ball to hold the pot together. When they don't they will be damaged and have a high fatality rate. Plants that are lush do not perform well in the field.

Number of successions

- 5

Waterwheel Transplanter

Rows	In-Row	Planting Depth	Notes
1	12 in.	As deep as possible without burying the plant	Take great care to maintain root ball to stay attached to plant, as cucumbers do not like to be transplanted. Keep a walking break in the plantings. Skip two plants every 100 feet to allow for path. Add kelp to water as ½% solution

Cultivation Procedures

- Cucumbers are planted in Biotelo mulch. When laying the plastic add granular fertilizer as needed to the soil at the recommended rate.
- Cultivate twice in between plastic with hillside cultivators before laying straw mulch.

Frost, Disease and Insect Protection

- Lay IRT plastic for earliest planting. Use floating row covers against frost and to protect against Striped Cucumber Beetles. Remove at flowering for varieties that require pollination like Marketmore 76. Use 14-gauge wire to support row cover since abrasion will damage plants.
- Powdery and downy mildew (somewhat) is controlled with a mixture of Cease (bacillus Subtilis) and Milstop (Potassium Bicarbonate) at a rate of 2 Qt of Cease and 1 lbs of Milstop per acre. Melons are sensitive to Sulfur (phytotoxicity) so great care should be taken if Sulfur (in whatever form) is applied to control PM. The use of tolerant or resistant varieties is useful. (Marketmore is not resistant against downey mildew)

Other Cultural Practices

- Remove plastic or disc in BioTelo soon after harvest to avoid build up of squash bugs. Establish a cover crop soon after disking in the remainders of the straw and plants.

Daikon

Raphanus sativus (Brassicaceae or cabbage family)

Soil Preparation

- 10 ton of compost creates a surplus of P and is usually sufficient in nutrients for N and K.
- Compost is spaded in and daikon is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution if soil test determines deficiency.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
60	0-125	0-200	5.5-6.8

Varieties

- Summer Cross no. 3

Direct Seeding Information:

	Rows	Sds/Ft	Plate #	Shoe Depth	Sprocket Setting
MaterMacc	**2**	3	**24 H 2.5**	½ inch	**22 - 17**

Cultivation Procedures:

Basket weed after emergence and when large enough. As second cultivation use Finger weeder or spring hoes with rear mounted side knives.

Frost, Disease and Insect Protection

- Cover with floating row covers before emergence to avoid flea beetle damage. Keep covered until harvest. Another alternative is to spray Entrust at 1-3 Oz. to the acre. Spray every 5-7 days up to three times per season. Read directions for use on Entrust on label.
- Beneficial nematodes can be sprayed on infected land or in hedgerows (where they over winter) to avoid future generations.

Baleshredder spreading rye straw mulch in between Biotelo plastic (shown in onions)

Dandelion

Cichoricum intybus (Asteraceae or Compositae family)

Soil Preparation

- 10 ton of compost creates a surplus of P and is usually sufficient in nutrients for N and K.
- Compost is spaded in and dandelion is planted on raised beds.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
100-130	0-160	0-200	5.0-6.8

Varieties

- Catalogna Special, Red Rib

Greenhouse Guidelines

- **EZ Seeder** Seeding Plate **#9**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	56-85	75-60	Withhold water	Take out of greenhouse 5 days before planting. 3 seeds to a cell

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3 Row	5 in.	Normal, do not bury plant.	

Direct Seeding Information

	Rows	sds/Ft	Plate #	Depth	Sprocket	Notes
MaterMacc	**3**	12-15	**96 H 0.8**	¼ - ½ inch	**22-17**	For bunching
Sutton Jr.	**9**	50	**8**	¼ - ½ inch		1 mph or 1.6 km for salad or braising greens

Cultivation Procedures

- When direct seeding create seedbed 3 weeks before planting and cultivate after weeds emerge. Cultivate right before planting.
- Basket weed after emergence or 7 days after transplanting
- Hand weed or hoe in between plants.

Cover Cropping / Under-Seeding Procedures

- Dandelion can be harvested twice if crop is kept very clean from weeds.

3 row Lännen carousel planter

Grab four cells/plant four cells to speed up planting

Eggplant

Solana melongena (Solanaceae or nightshade family)

Soil Preparation

- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and eggplant is planted on high raised beds covered with plastic mulch.
- Soil test will determine if additional K is needed. Apply all additional N and K needed through hopper on mulch layer.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-200	0-200	5.5-6.8

Varieties

- Galine, Dancer, Irene (has some verticilium tolerance)

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
288	80-90	70-80 d 65-70 n	Transplant into **50**'s after first true leaves are developed	Start seeds in germination chamber. Rotate flats like in an oven for even temperatures.

Signs to watch for & what to do:

- If plants get too leggy space trays as in checkers.

Transplant readiness indicators

- Transplant into Winstrip Tray **50**'s when plant formed two true leaves
- Transplant in the field when plants have enough of a root-ball to hold the pot together. When they don't they will be damaged and have a high fatality rate. Plants that are lush do not perform well in the field.
- Irrigate with 12 Oz of Actinovate per acre to reduce soil borne and foliar diseases through dripline.

Number of successions

- 2

Waterwheel Transplanter

Rows	In-Row	Planting Depth	Notes
2	18 in.	As deep as possible through plastic	Add kelp to water as ½% solution in the water wheel planter. Keep a walking break in the plantings. Skip two plants every 100 feet to allow for a path.

Cultivation Procedures:

- In the rotation plastic mulch culture follows after a fall planting of mustard (Caliente). Mustard is worked in as bio-fumigant in the spring to reduce Verticillium and other soil borne diseases. After 7-10 days plastic is laid as the mustard remains will not clog up the mulch layer. Since eggplant is a tropical fruit IRT plastic is the preferred plastic to help warm the soil but we only use BioTelo.
- After transplanting, cultivate once or twice in between plastic with Hillside cultivator and cover wheel tracks with rye straw at a rate of 3lb per foot. (One 600 lb round bale covers 200 feet of wheel track). When an early cutting of orchard grass is used, increase that amount as hay breaks down much faster than straw. Hay can act as slow release K fertilizer later in the season and creates a very healthy environment by sanitary conditions and release of Silica in the soil.

Frost, Disease and Insect Protection

- Use floating row covers against frost for early plantings, consider keeping it on to protect against potato flea beetle. Support row cover with 14-gauge wire to prevent damage by abrasion. Remove at flowering for pollination.
- Spray with Entrust when CPB (Colorado Potato Beetle) shows up in field at a rate of 2-3 Oz. per acre depending on size of larvae and number of adults.

Escarole
Cichoricum endivia (Asteraceae or Compositae family)

Soil Preparation
- 10 ton of compost creates a surplus of P and is sufficient in nutrients for N and K.
- Compost is spaded in and Escarole is planted on raised beds.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
100-130	0-160	0-200	5.0-6.8

Varieties
- Rhodos for salad mix, Eros for full size heads

Greenhouse Guidelines
- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
Tray **128**	56-85	75-60	Withhold water	Take out of greenhouse 5 days before planting.

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	5 in.	Normal, do not bury plant.	For full heads plant at 9 inches

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Depth	Sprocket	Notes
MaterMacc	**3**	12-15	**96 H 0.8**	¼ - ½ inch	**22-17**	
Sutton Jr.	**9**	50	**8**	¼ - ½ inch		1 mph or 1.6 kmph

Cultivation Procedures
- When direct seeding create seedbed 3 weeks before planting and shallowly cultivate after weeds emerge. Cultivate right before planting.
- Basket weed after emergence or 7 days after transplanting
- Hand weed or hoe in between plants.

Other Cultural Practices
- For leafhoppers and whitefly use Micotrol O at 1 pint to the acre at nymph stage; repeat for three 5 day applications for best results. When pressure is high use PyGanic EC 5.0II at 6 to12 Oz to the acre. Make sure water is neutral as both low or high pH makes PyGanic ineffective. Spray in the evening to reduce UV breakdown.
- Escarole can be harvested twice if crop is kept very clean from weeds.
- Lends itself for double cropping or successful establishment of most cover-crops.

Fennel

Foeniculum vulgare (Apiaceae or carrot family)

Soil Preparation

- Fennel should not be followed after other umbellifers, and not after potatoes, cereals and cucurbits due to possible weed problems.
- Fennel does well after early lettuce and greens
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and Fennel is planted on raised beds.
- Soil test will determine if additional K is needed.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
180	0-160	0-200	5.0-6.8

Varieties

- Zefa Fino

Direct Seed or Transplant:

- Transplant early, direct seed later if soil conditions allow.
- Fennel requires warm and relatively weed-free soil

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	70-85	75-65	Withhold water	Seed two seeds per cell and remove one after emergence. Add more vermiculite to the mix to increase drainage. Keep warm since low temperatures can cause bolting.

Signs to watch for & what to do

- When plants are too small and don't develop well consider a warmer location. Do not overwater as Fennel in its earlier stages does not require much. Later this changes and additional fertilization might be required.

Transplant tips

- Plants that lose some of their root system when replanted have a higher incidence of bolting.
- Consider direct seeding for later plantings.
- Plant two plantings at approximately the same date of the greenhouse plan.

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
2	9 in.	As deep as the plant can tolerate without growing point getting buried	Irrigate after planting

Direct Seeding Information

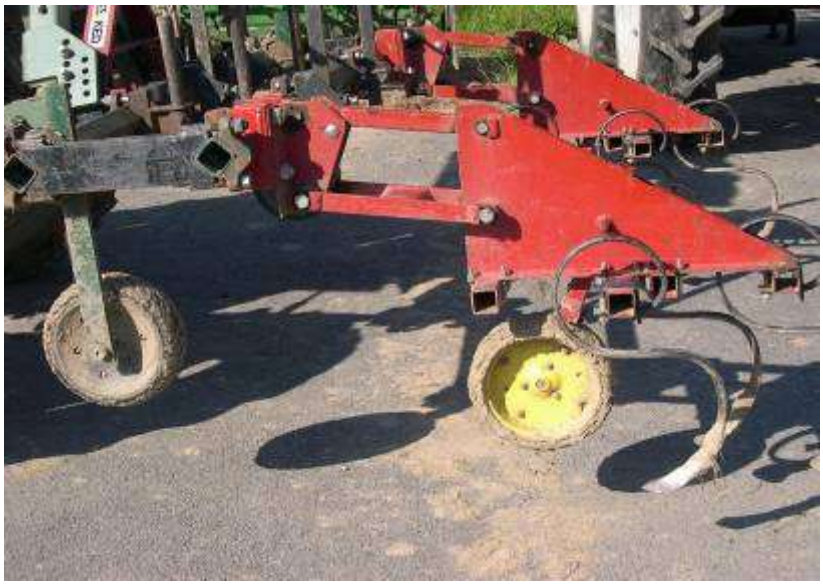
	Rows	Sds/Ft	Plate #	Shoe Depth	Sprocket setting
MaterMacc	**2**	12	**96 H 1.0**	¼ - ½ inch	**22-17**

Cultivation Procedures

- Prepare seedbed one to two weeks in advance, shallowly work seedbed before planting to eradicate weeds. Do not disturb soil too deep as new weed seeds will be brought up.
- Basketweed after planting or emergence.
- Use torsion gangs or fingerweeder for second cultivation with rear mounted S-tines for cultivation of wheel tracks and between rows. Do not hill Fennel as this makes harvest more difficult.
- Thin and weed at 9 inches apart for large bulb production.

Other Cultural Practices

- Fennel needs fertile conditions and is best grown on soils with high organic matter.
- Lends itself for double cropping as fall crop.



Rear set up with S tines in wheel tracks and side knives on bed (retracted in picture)

Laying BioTelo plastic, driptape and applying granular organic fertilizer with mulch-layer

Garlic

Allium ampeloprasum (Alliaceae or onion family)

Soil Preparation

- Land is bare fallowed the summer before planting usually after two years of red clover
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Compost is worked in with red clover in August. Raised beds are formed in September.
- Soil test will determine if additional K is needed.
- Garlic does exceedingly well when followed after a spring seeding of bell beans, barley and oats followed with a bare fallow in lieu of two years of clover.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
100-110	0-200	0-200	5.5-6.8

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	9 in.	As deep as the Lännen transplanter can be adjusted usually about two inches below the surface	Mulch with rye straw at a rate of 1 bale per 10- 20 bed-feet. Apply before first deep freeze

Other Cultural Practices

- A crop rotation of Sorghum and Forage soybeans in year 1, followed by bell beans, barley and peas serve as a good foundation for a successful garlic crop. Spread generous amounts of compost before planting.
- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Alternatively mulch with hay mulch (without seed) which supplies nitrogen to garlic at double the rate of straw (but it breaks down much faster and should be applied in larger amounts).
- Additional Nitrogen can be applied in early spring right over mulch with Vicon spreader.
- Mulch is not removed and has not led to yield losses in our experience as moisture preservation compensates for cooler soils
- Garlic needs to be weeded on a regular basis the season after planting.
- Scapes are harvested in June and early July.
- Garlic is lifted, pulled and then cured in greenhouse before long term storage
- Once cured store in a dry and cool place
- Select and save largest bulbs for seed.

Garlic harvested during members workday

Onions curing in the greenhouse covered by 80% shade cloth

Joi Choi
Mei Ching Choi
Brassica rapa (chinensis group) (Brassicaceae or cabbage family)

Soil Preparation
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 165 lbs of N, 10 Lbs of P, and 208 lbs of K
- Compost is spaded in and Cabbage is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-150	0-160	0-200	6.0-6.8

Varieties
- Red Choi, Fujo Chomi, Mei Ching Choi, Win-Win Choi

Greenhouse Guidelines: EZ Seeder seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	65-85	cool	Withhold water	Take plants outside 1 week before planting in field

Transplant readiness indicators
- Plants should easily come out of their cell. Plants should generally not be older than five weeks

Number of successions
- Spring 2
- Fall 2

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	12 in.	As deep as the plant can tolerate	Use 12 inch sprocket

Cultivation Procedures:
- Basket weed 7-10 days after transplanting.
- Hand hoe in between plants if basket weeder is used.

Second cultivation use the fingerweeder or spring hoes with knives in the back.

Frost, Disease and Insect Protection
- Control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays. Read label on Entrust.
- If cabbage looper / worm population is over 2 worms per plant, spray Dipel DF or Javenil using at 1–2 pints to the acre, or Entrust at 1-2 oz to the acre (total amount per season per acre not to exceed 9 oz). Adding some feeding/attractant stimulant like molasses and milk will increase effect (1 lb per acre).

Kale, main crop

Brassica oleracea (Brassicaceae or cabbage family)

Soil Preparation

- Kale should not be followed after other cole crops.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and Kale is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.
- Kale does exceedingly well when followed after a spring seeding of bell beans, barley and oats without any application of additional N.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-200	5.5-6.8

Varieties

- Winterbor, Toscano

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	65-85	cool	Withhold water	Take plants outside 1 week before planting in field

Transplant readiness indicators:

- Plants should easily come out of their cell. Plants should generally not be older than five weeks

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
2	12 in.	As deep as the plant can tolerate	Use 12 inch sprocket

Cultivation Procedures

- Lely or basketweed 7-10 days after transplanting.
- Hand hoe in between plants if basket weeder is used.
- Second cultivation use the fingerweeder or spring hoes with knives in the back.
- If third cultivation is necessary use Lilliston Rolling cultivators and hill aggressively without burying the plants.

Insect Protection

- Control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays.
- Look for eggs of cabbageworm/cabbage looper at the underside of leaves. When small worm population is over 2 per plant spray Bt using 1 to 2 pints to the acre or spinosad (Entrust) at 1-3 Oz per acre every week until population is under control. Alternate spraying schedule by using Bt aizawi or Bt kurstaki in conjunction with spinosad at 1-3 Oz to the acre to avoid build up of resistance. (Total amount of Entrust per season per acre should not exceed more than three applications with a total of 9 Oz.).

Other Cultural Practices

- Early Kale can be followed by fall cover crop. Mow plants down as low as possible with flail mower. Incorporate crop residue with chisel plow or disk.
- Late planted Kale grows healthy and robust after hairy vetch or bell beans. No additional fertilizer (with the exception of Boron) needs to be applied when using this method.

Kale, early crop

Brassica oleracea (Brassicaceae or cabbage family)

Soil Preparation

- Cultural practices are similar to main crop kale except that early kale is planted on BioTelo mulch.
- Avoid too much plant debris from previous cash or cover crop as plastic will be laid as early as possible in the growing season.
- Use dried granular composted chicken manure at the rate of 500 lbs per acre when laying plastic.

Varieties

- Winterbor, Toscana

Waterwheel Planter

Rows	In-Row	Planting Depth	Notes
3	12.	As deep as possible	Use 12 inch wheel. Add kelp to water as ½% solution in the water wheel planter.

Cultivation Procedures early kale

- Cover plants with floating row cover
- Cultivate with Hillside cultivator
- If desired plant cover crop like oats and peas in between plastic
- After harvest work in cover crop and plant debris to allow for bare fallow
- Follow with garlic or rye and vetch

Kale, Russian

Brassica napus pabularia (Brassicaceae or cabbage family)

Varieties

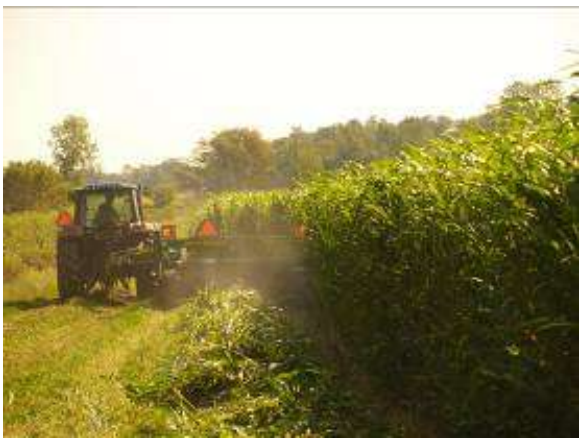
- Red Russian

Direct Seeding Information

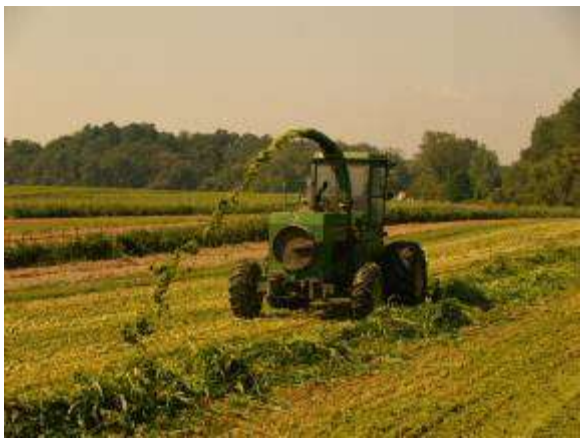
	Rows	Seeds/Ft	Plate #	Shoe Depth	Notes
Planet Jr.	**5**	50	**2** or **3**	Depth 2	Use spreader shoe
Sutton Jr.	**9**	30	**6**	¼ inch	1 mph (or 1.6 kmph)

- Use as braising green

Cutting Sudex as cover crop with a MoCo



Choping Sudex by neighbor before incorporation



Kohlrabi

Brassica oleracea (gongylodes group) (Brassicaceae family)

Soil Preparation

- Kohlrabi should not be followed after other cole crops.
- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and Kohlrabi is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-200	5.5-6.8

Varieties

- Winner

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening off	Notes
128	65-85	cool	Withhold water	Take plants outside 1 week before planting in field

Signs to watch for & what to do

- Kohlrabi plants tend to get leggy. Give enough light

Transplant readiness indicators

- Plants should easily come out of their cell. Plants should generally not be older than five weeks

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	5 in.	Normal depth level with top of the cell	Use 5 inch sprocket

Cultivation Procedures

- Basketweed 7 to 10 days after planting. Cover row 2 and 4 with chisels mounted on Basketweeder or side knives mounted on rear toolbar.
- Hand hoeing in between plants
- Use fingerweeder or Springhoes for second cultivation with rear mounted S-tines in wheel track and side knives in between rows.

Insect Protection

- Control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays.
- Look for eggs of cabbageworm/cabbage looper at the underside of leaves. When small worm population is over 2 per plant spray Bt (Dipel DF) using 1 to 2 pints to the acre or spinosad (Entrust) at 1-3 Oz per acre every week until population is under control.

Other Cultural Practices

- Early Kohlrabi can be followed by fall cover crop or second cash crop. Mow plants down as low as possible with flail mower. Incorporate crop residue with spader.
- Late planted Kohlrabi grows healthy and robust after incorporation of hairy vetch.

Leeks

Allium porrum (Alliaceae or onion family)

Soil Preparation

- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and Leeks are planted on raised beds.
- Soil test will determine if additional K is needed.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-200	0-200	0-200	6.0-6.8

Varieties

- King Richard (Summer), Tadorna (Fall)

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	60-85	cool	Light and withholding water	2 Seeds per cell. Fertilize regularly with fish. Take plants outside 1 week before planting in field

Signs to watch for & what to do

- Yellowing; feed with fish fertilizer.
- Poor growth; don't over water. Leeks stay in the greenhouse longer than they might like to. Algae might form over time if the plants are kept to wet, and potassium and nitrogen leaches out

Transplant readiness indicators

- Pencil thickness is desired but unattainable in a 128 tray. Transplant before the end of May.
- Drench plants in Actinovate® SF at 4-6 Oz per 100 gallons before transplanting

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
2	9 in.	Plant deep, just 1-2" of leaves above soil	Use 9 inch sprocket

Cultivation Procedures

- Basket weed or Lely when plants are back out of transplant shock in upright position.
- Use the Fingerweeders for second cultivation. Use the Two row S-Tine cultivators on three-point-hitch for control of weeds in wheel tracks and top of the bed. Side-dress with granular fertilizer when not preceded by legume cover crop.
- At third cultivation use the torsion gangs and use optional side-dressing. Use the spider gangs to hill the plants without burying them.
- Last cultivation use just the spiders or regular discs to hill soil up against the well-developed plant. When careful use the Lilliston rolling cultivators but plants are easily buried too deep. Set less aggressive.

Frost, Disease and Insect Protection

- Watch for thrips, and control with Entrust at a rate of 2-3 oz or 1 lb of Mycotrol O to the acre with 1 lb of JMS Stylet oil and Nu-Film P as adjuvant/spreader sticker. Repeat every 5 – 7 days not to exceed 9 oz per acre per season. Use TX 12 hollow cone nozzle @ 120 psi for greatest effect. Only spray at night as thrips are nocturnal. adding molasses and milk as feeding attractant stimulant will increase efficacy of Mycotrol O or Entrust.

Lettuce, heads, main crop

Lactuca sativa (Asteraceae or Compositae family)

Soil Preparation

- 10 ton of compost creates a surplus of P and is sufficient in nutrients for N and K.
- Compost is spaded in and Lettuce is planted on raised beds.
- Total Nutrient uptake is 95 lbs of N, 12 Lbs of P, and 170 lbs of K

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
100-130	0-160	0-200	6.0-6.8

Varieties

- Jericho, Galactic, Oscarde

Greenhouse Guidelines

- **EZ Seeder** seeding plate **# 9**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	Below 80	75-60	Withhold water	Take out of greenhouse 5 days before planting. 1 seeds to a cell. Plants should be finished within 23 days from seeding

Transplant readiness indicators and tips

- Plants should easily come out of their cell. Plants should generally not be older than 3-4 weeks
- If weather is too hot keep flats in a cool location until seeds germinate.

Number of successions

- Summer 10
- Fall 5

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	9 in.	Do not bury plant. Leave the top of the cell a little above ground to avoid bottom rot.	Use 9 inch sprocket. Distinguish between plantings for heads and for cut lettuce.

Cultivation Procedures

- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basket weed 7 days after transplanting
- Hand weed or hoe in between plants.

Frost, Disease and Insect Protection

- Watch for aphids and whitefly; control with Mycotrol O at a rate of 2-4 pints to the acre. Repeat every 5 – 7 days. Alternatively insecticidal soap (just against aphids) can be used at a rate of 2 gallons (of 49% Safer's solution) per 100 gallons of spray solution but when infestation is heavy PyGanic is more effective.
- Use TX 12 hollow cone nozzle @ 120 psi for greatest effect. Adding molasses and milk as feeding/attractant stimulant will increase efficacy of Mycotrol O (Beauveria Bassiana).

Cover Cropping / Under-Seeding Procedures

- Suitable for double cropping. Reserve this ground for later direct seeded crops since crop residue is low.

Lettuce, heads, early production

Lactuca sativa (Asteraceae or Compositae family)

Soil Preparation

- Cultural practices are similar to main crop kale except that early lettuce is planted on BioTelo mulch.
- Avoid too much plant debris from previous cash or cover crop as plastic will be laid as early as possible in the growing season.
- Use dried granular composted chicken manure at the rate of 500 lbs per acre when laying plastic.

Varieties
- Jericho, Galactic, Oscarde

Number of successions
- 2-3

Waterwheel Planter

Rows	In-Row	Planting Depth	Notes
3	12 inch	Top of cell should be above soil line to avoid bottom rot	Use 12 inch wheel. Add kelp to water as ½% solution in the water wheel planter.

Cultivation Procedures early kale
- Cover plants with floating row cover
- Cultivate with Hillside cultivator
- If desired plant cover crop like oats and peas in between plastic
- After harvest work in cover crop and plant debris to allow for bare fallow
- Follow with garlic or rye and vetch

Lettuce, Salad mix
Lactuca sativa (Asteraceae or Compositae family)

Direct Seeding Information

	Rows	Seeds/Ft	Plate #	Shoe Depth	Notes
Planet Jr.	**5**	60	**7**	Depth 2	
Sutton Jr.	**9-18**	50	**8**	¼ to ½ inch	1 mph or 1.6 kmph

Number of successions
- Spring 5
- Summer 10
- Fall 5

Varieties
- Red Salad Bowl, Outredgeous, Green salad bowl, Defender

Cultivation Procedures
- Salad mix follows well after winter cover crop of oats and peas or when no cover crop was planted that winter. Planet Jr. seeders and fine seeded crops like salad mix does not deal well with plant debris on soil surface.
- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basket weed after plants are two inches tall. When 9 rows are planted you can't use any mechanical weed control.
- Hand weed in between plants but make sure you do not pull any soil up. 9 row salad mix generally is very clean and is free from soil.

Frost, Disease and Insect Protection
- During the hot summer months watch for aphids, leaf hopper and whitefly. Control with Mycotrol O at a rate of 1-2 pints to the acre. Adding molasses and milk as feeding/attractant stimulant will increase efficacy of Mycotrol O (Beauveria Bassiana). Repeat every 5 – 7 days.
- At high outbreaks use PyGanic EC 5.0II at 6 to12 Oz to the acre at early stage of insect development; repeat for three 5 day applications for best results as a rescue remedy (as it kills all insects). Only apply PyGanic in the evening to avoid premature UV breakdown and only dilute in pH neutral water.

Cover Cropping / Under-Seeding Procedures:
- Salad can be harvested twice if crop is kept very clean from weeds and if the weather tolerates it.
- Any small green or lettuce leaves land that is very suitable for double cropping. Reserve this ground for direct seeded crops since crop residue is low and easily incorporated.

Muskmelon/Cantaloupe

Cucumis melo (Cucurbitaceae or cucumber family)

Soil Preparation

- Melons should not be followed after other cucurbits, nightshades (phytophtora capsici), but follow well after cole crops, and leguminous green manure or sweet corn.
- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and melons are planted on high raised beds covered with plastic mulch.
- Total Nutrient uptake is 158 lbs of N, 27 Lbs of P, and 155 lbs of K
- Soil test will determine if additional K is needed. Apply all additional N and K needed through hopper on mulch layer.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-160	5.5-6.8

Varieties

- Athena

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#5**

Tray	Germ. @	Grow @	Hardening Off	Notes
50	80-90	75	Less water and temp for 1 week	Plants mature within 4 weeks

Transplant readiness indicators

- Transplant into Winstrip Tray **50**'s when plant formed two true leaves
- Transplant in the field when plants have enough of a root-ball to hold the pot together. When they don't they will be damaged and have a high fatality rate. Plants that are lush do not perform well in the field.
- Mix 4-6 oz. of Actinovate® SP in 100 gallons of water to create solution and drench complete tray before transplanting.

Number of successions

- 3

Waterwheel Transplanter

Rows	In-Row	Planting Depth	Notes
1	12 in.	normal	Add kelp to water as ½% solution in the water wheel planter

Cultivation Procedures

- In the rotation plastic mulch culture follows after sweet-corn and sweet clover. Sweet clover is flail mowed in May and spaded in. After 7-10 days plastic is laid as the sweet clover remains will not clog up the mulch layer. Melons don't do well on BioTelo Mulch as the weight of the fruit causes the plastic to be absorbed into the soil.
- When laying the plastic add dried granular composted chicken manure to the soil at a rate of 500 lbs per acre
- After transplanting, cultivate once or twice in between plastic with Hillside cultivator and cover wheel tracks with rye straw at a rate of one 3lb round bale per foot. (One 600 lb round bale covers 200 feet of wheel track). When an early cutting of orchard grass is used, increase that amount as hay breaks down much faster than straw. Hay can act as slow release fertilizer later in the season.

Frost, Disease and Insect Protection

- Use floating row covers against frost for early plantings, consider keeping it on to protect against cucumber beetle. Support row cover with 10-gauge wire to prevent damage by abrasion. Remove at flowering, for varieties that require pollination. When row covers are not used, cover plants with Surround® WP before transplanting. Use motorized backpack sprayer to apply mixture (read label)
- Powdery and downy mildew (somewhat) is controlled with a mixture of Cease (bacillus Subtilis) and Milstop (Potassium Bicarbonate) at a rate of 2 Qt of Cease and 1 lbs of Milstop per acre. Melons are sensitive to Sulfur (phytotoxicity) so great care should be taken if Sulfur (in whatever form) is applied to control PM.

Other Cultural Practices

- When melons have sized up, hold back on irrigation to avoid splitting.

Melon, Watermelon

Cirullus lanatas var. lanatus (Cucurbitaceae or cucumber family)

Soil Preparation

- Melons should not be followed after other cucurbits, nightshades (phytophtora), but follow well after cole crops, and leguminous green manure or sweet corn.
- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and melons are planted on high raised beds covered with plastic mulch.
- Soil test will determine if additional K is needed. Apply all additional N and K needed through hopper on mulch layer.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-160	5.0-6.8

Varieties

- Sugar Baby, New Orchid

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#5**

Tray	Germ. @	Grow @	Hardening Off	Notes
50	80-90	85	Less water and temp for 1 week	Start seeds when greenhouse can be kept warm day and night. Germination is poor at lower temperatures.

Signs to watch for & what to do

- Poor growth; keep the greenhouse warmer.

Transplant readiness indicators

- Transplant into Winstrip Tray **50**'s when plant formed two true leaves
- Transplant in the field when plants have enough of a root-ball to hold the pot together. When they don't they will be damaged and have a high fatality rate. Plants that are lush do not perform well in the field.
- Mix 4-6 oz. of Actinovate® SP in 100 gallons of water to create solution and drench complete tray before transplanting.

Number of successions

- 3

Waterwheel Transplanter

Rows	In-Row	Planting Depth	Notes
1	12 in.	normal	Add kelp to water as ½% solution in the water wheel planter.

Cultivation Procedures

- In the rotation, plastic mulch culture follows after sweet-corn and a cover crop of oats and peas. After spading plastic is laid. As melons are a tropical fruit, IRT plastic is the preferred plastic to help warm the soil. When laying the plastic add dried granular composted chicken manure to the soil at a rate of 500 lbs per acre.
- After transplanting, cultivate once or twice in between plastic with Hillside cultivator and cover wheel tracks with rye straw at a rate of one 3lb round bale per foot. (One 600 lb round bale covers 200 feet of wheel track). When an early cutting of orchard grass is used, increase that amount as hay breaks down much faster than straw. Hay can act as slow release fertilizer later in the season.

Frost, Disease and Insect Protection

- Use floating row covers against frost for early plantings, consider keeping it on to protect against cucumber beetle. Support row cover with 10-gauge wire to prevent damage by abrasion. Remove at flowering, as watermelon requires pollination. When row covers are not used, cover plants with Surround® WP before transplanting. Use motorized backpack sprayer to apply mixture (read label). A 3 gallon sprayer takes about 4 -6 lbs of Surround. apply twice to get good coverage.
- Powdery and downy mildew (somewhat) is controlled with a mixture of Cease (bacillus Subtilis) and Milstop (Potassium Bicarbonate) at a rate of 2 Qt of Cease and 1 lbs of Milstop per acre.
- Melons are sensitive to Sulfur (phytotoxicity) so great care should be taken if Sulfur (in whatever form) is applied to control PM.

Onions

Allium cepa (Alliaceae or onion family)

Soil Preparation

- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and Onions are planted on high raised beds covered with BioTelo plastic mulch.
- Total Nutrient uptake is 145 lbs of N, 25 Lbs of P, and 155 lbs of K
- Soil test will determine if additional K is needed. Apply all additional N and K needed through hopper on mulch layer.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
100-110	0-200	0-200	6.0-6.8

Varieties

- Ailsa Craig, Gunnison, Red Bull, Redwing

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	60 -85	60-65 d 55-60 n	Withhold water	3-4 Seeds per cell. Take plants outside 1 week before planting in field

Signs to watch for & what to do

- Yellowing; feed with fish fertilizer.
- Poor growth; don't over water. Onions stay in the greenhouse longer than they might like to. Algae might form over time if the plants are kept to wet, and potassium and nitrogen leaches out
- Clip tops off tall onion leaves to avoid falling over. Onions are transplanted after a good "haircut".

Transplant readiness indicators

- Transplant in the field when plants have enough of a root-ball to hold the pot together.
- Mix 4-6 oz. of Actinovate® SP in 100 gallons of water to create solution and drench complete tray before transplanting.

Waterwheel Transplanter

Rows	In-Row	Planting Depth	Notes
3	9 in.	Not too deep. Same level as potting medium and a little below	Add kelp to water as ½% solution in the water wheel planter.

Cultivation Procedures

- In the rotation, plastic mulch culture follows after sweet-corn and a cover crop of oats and peas. After spading plastic is laid. The plastic can help the onions for two reasons; One: to increase bulb size before the longest day as temperatures are warmer underneath the plastic, Two: a silver strip can be applied to the plastic it repels the thrips away from the onions.
- When laying the plastic add dried granular composted chicken manure to the soil at a rate of 500 lbs per acre.
- After transplanting, cultivate once or twice in between plastic with Hillside cultivator and cover wheel tracks with rye straw at a rate of one 3lb round bale per foot. (One 600 lb round bale covers 200 feet of wheel track). When an early cutting of orchard grass is used, increase that amount as hay breaks down much faster than straw. Hay can act as slow release fertilizer later in the season.

Frost, Disease and Insect Protection

- Onion's main pest is thrips, which is controlled with Entrust at a rate of 1.5 to 3 oz per acre. Alternatively garlic oil (which is an adjuvant) can be used at a rate of 1 pint to the acre as it smothers the thrips. Irrigation with larger droplets works also very well to wash the thrips off. During years of heavy rain, thrips are usually not a problem.
- Botrytis (neckrot) can be controlled with 6-10 lbs of Serenade to the acre although the use of resistant varieties is more effective and less expensive. (Candy, Ailsa Craig can be used for green onions but are very sensitive to botrytis)

Other Cultural Practices

- Onions are usually followed by oats and peas as they are harvested by September.

Parsley

Petroselinum crispum (Asteraceae or carrot family)

Soil Preparation

- 10 ton of compost creates a surplus of P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and Parsley is planted on raised beds.
- Soil test will determine if additional K is needed.
- Side dress N as needed

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-200	6.0-6.8

Varieties

- Italian Dark Green

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#9**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	75	65	Withhold water	Place 3-5 seeds per cell. Take plants outside 1 week before planting in field

Signs to watch for & what to do

- Yellowing; use a dressing of Vermont Compost's Forte Plus.
- Poor growth; don't over water. Parsley stays in the greenhouse longer than it might like to. Algae might form over time if the plants are kept to wet, and potassium and nitrogen leaches out

Transplant readiness indicators

- Plants come easily out of cell

Number of successions

- 3

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	12 in	Same level as potting medium	Use 12 inch sprocket

Cultivation Procedures

- If transplanted on bare ground basket weed followed by spring hoes. Crawling many times through the crop to keep it weed free is a common procedure with this crop as we cut it over three times per season. It is important to feed it with a granular fertilizer to keep it productive at a rate of 500 lbs per acre (17 lbs per 500 feet in between each row).
- When planted on BioTelo plastic also set it at three rows 12 inches apart.

Frost, Disease and Insect Protection

- Main pest is cutworm that takes out the whole plant. No remedy except replanting

Parsnip

Pastinaca sativa (Asteraceae or carrot family)

Soil Preparation

- Parsnips should not be followed after other umbellifers, and not after potatoes, cereals and cucurbits due to weed and possibly structural problems . 10 ton of compost creates a surplus of P but is usually sufficient in nutrients for N and K.
- Compost is spaded in and Parsnip is planted on raised beds.
- Soil test will determine if additional K is needed.
- Side dress N as needed

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-150	0-160	0-160	6.0-6.8

Varieties

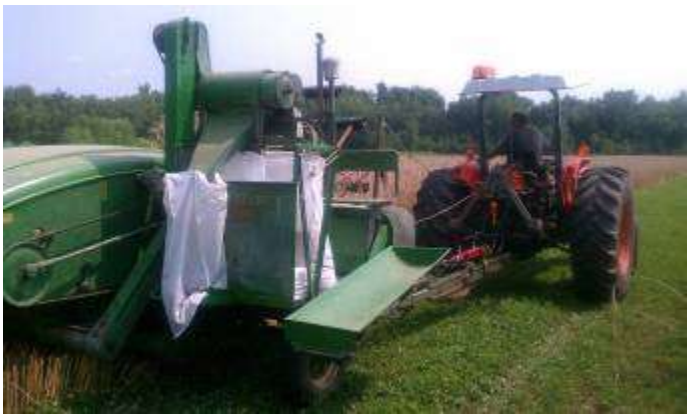
- Javelin

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Sprocket	Depth	Notes
Planet Jr.	**3**	15 -25	**15**		½ inch	Takes 3 wks to germinate
MaterMacc	**3**	20	**192 H 2.0**	**22-19**	½ inch	

Cultivation Procedures

- Parsnips follow well after winter cover crop of oats and peas or when no cover crop was planted that winter.
- Subsoil before planting to break up any possible plowpan.
- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Use only a precision seeder to avoid using too much seed.
- Cultivate when weeds emerge and right before planting
- Flame weed before parsnips come up. Look for sprouted seeds under plate of glass. Basket weed with soil busters in front of the baskets since soil will be hard at this point.
- Use a variety of tools after this. Initially the fingerweeder or springhoes, followed by the rear mounted Bezzerides Spiders proved to work very well (the latter as hiller, as long as you are careful).



Combining rye

Peas

Pisum sativum (Fabaceae or legume family)

Soil Preparation

- 10 ton of compost creates a surplus of P and is usually sufficient in nutrients for N and K.
- Compost is spaded in and Peas are planted on raised beds.
- Total Nutrient uptake is 170 lbs of N, 22 Lbs of P, and 80 lbs of K
- Soil test will determine if additional K is needed.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
40-50	0-120	0-160	5.5-6.8

Varieties

- Sugarsnap
- Snow Pea

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Depth	Notes
Planet Jr.	**1**	25	**36**	½-1" Depth 4 or deeper. Only use regular shoe	Mix with Inoculants and T22. Important to bury completely!
MaterMacc	**1**	12	**144 H 4.5**	½ - 1 inch	Sprocket **17-19**

- Seed two rows of peas by traveling twice with the one row planter on the same bed. Drive carefully so each row is 4 inches apart from the other.

Cultivation Procedures

- Peas follows well after winter cover crop of oats or when no cover crop was planted that winter. Planet Jr. seeders do not deal well with plant debris on soil surface.
- Because of the peculiar way this crop is seeded, basket weeders and spring hoes are useless. In order to keep the crop clean use rear mounted side knives and cultivate as close as possible near the germinated peas.

Other Cultural Practices

Trellis like you would trellis tomatoes (see tomatoes for description)

Cover Cropping / Under-Seeding Procedures

- Peas can be followed by another vegetable crop. Take great care to spade the residue in right after the first harvest before the vines lose their nitrogen content and weeds go to seed.

Picture: Trellising in tomatoes. Improved version alternates every fourth wooden stake with a T post.

Peppers

Capsicum annuum (Solanaceae or nightshade family)

Soil Preparation

- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 140 lbs of N, 12 Lbs of P, and 140 lbs of K
- Compost is spaded in and peppers are planted on high raised beds covered with plastic mulch.
- Soil test will determine if additional K is needed. Apply all additional N and K needed through hopper on mulch layer.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
130	0-200	0-200	5.5-6.8

Varieties

- Bell peppers: Alliance
- Italian Peppers: Carmen, Banana Bill
- Hot Peppers: Tiburon, Sahuaro, El Jefe, Red Rocket

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
288	80-90	70 day 60 night	Withhold water	Consider cold treatment of 55 after 3rd true leaf appears for 4 wks, then back to 70

Signs to watch for & what to do

- Transplant into Winstrip Tray **50**'s when plant formed two true leaves
- Yellowing; make sure the temperatures are high enough during the day. When temperatures drop too low premature flowers form that need to be picked off.
- If necessary side dress with Vermont Compost Forte plus to keep plants healthy.

Transplant readiness indicators

- Transplant in the field when plants have enough of a root-ball to hold the pot together. Plants that are lush do not perform well in the field

Number of successions

- 2

Waterwheel Transplanter

Rows	In-Row	Planting Depth	Notes
1	12 in.	As deep as the plant allows	Add kelp to water as ½% solution in the water wheel planter. Plant with abundant water mixed with kelp. Keep a walking break in the plantings. Skip two plants every 100 feet to allow for path.

Cultivation Procedures:

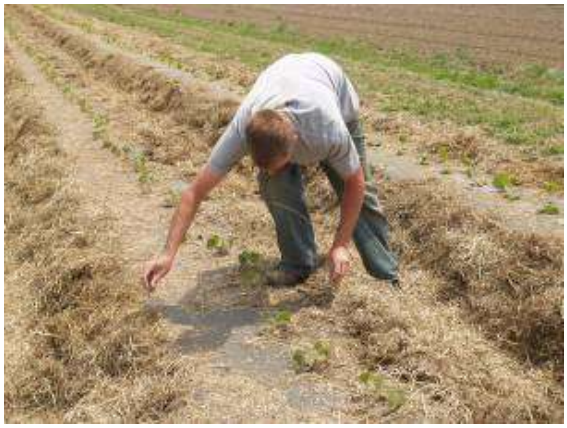
- In the rotation plastic mulch culture follows after a winter cover of oats.
- When laying the plastic add dried granular composted chicken manure to the soil at a rate of 500 lbs per acre.
- After transplanting, cultivate once or twice in between plastic with Hillside cultivator and cover wheel tracks with rye straw at a rate of one 3lb round bale per foot. (One 600 lb round bale covers 200 feet of wheel track). When an early cutting of orchard grass is used, increase that amount as hay breaks down much faster than straw. Hay can act as slow release fertilizer later in the season. Both hay and straw releases K and Silica in the soil acting suppress disease and adding nutrients to plants later in the season. Soil in between BioTelo much is very active with worms and ground beetles.

Frost, Disease and Insect Protection

- Use floating row covers against frost for early plantings, but remove as soon as the danger of frost has passed. Support row cover with 14-gauge high tensile wire to prevent damage by abrasion. Peppers need abundant water and nitrogen during the season.
- Apply Actinovate in the drip tape at 12Oz per acre to prevent plant diseases.
- CEW is a problem in peppers when they fly in from the sweet-corn during the second generation (usually around the third week in July). Control with frequent release of Trichogramma Ostrinnea as soon as the second generation has hatched. Release at high numbers to be effective. Entrust is not very effective as it is more difficult to get direct contact with the larvae. Eggs are often hatched on the fruit with the hatched larvae creating an opening that causes the fruit to prematurely ripen and subsequently rot.

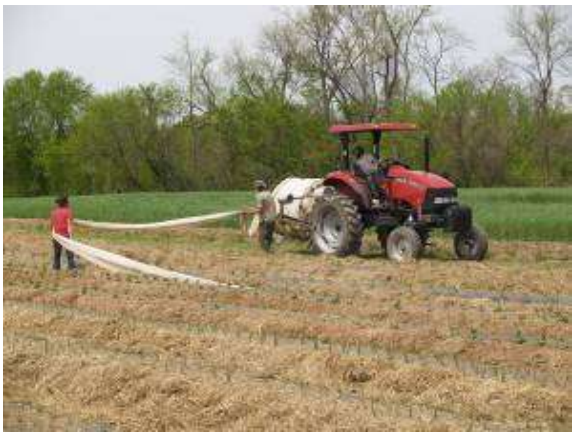
Loading round bales in bale shredder

Shredding the bales and depositing in wheel tracks



Setting the 12 gauge wire hoops

Laying out the row covers with the Hiwer System



Securing the row covers with pins

Potato

Solanum tuberosum (Solanaceae or nightshade family)

Soil Preparation

- 10 ton of compost is usually insufficient in nutrients for N, P and K.
- Total Nutrient uptake is 180 lbs of N, 26 Lbs of P, and 225 lbs of K
- Compost and SulPoMag and possibly a source of P is spaded in and potatoes are planted with two row planter.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
150	120-300	50-300	5.0-6.8

Varieties

- Yellow: Keuka Gold
- White: Kennebec, Green Mountain
- Red: Red Maria, Adirondack Red, Chieftain
- Russet: Amey Russet
- Fingerling:

Planting in the Field with Potato Planter

Rows	In-Row	Planting Depth	Notes
2	7" -9"	As deep as the planter allows the seed to be dropped in the furrow (not deeper than 2-3 inches	100 lbs seed is good for approximately 600 feet. Any potatoes larger than B size need to be cut in smaller pieces.

Cultivation Procedures:

- Lely tine weeder or rolling cultivator at ground crack.
- Steketee fingerweeder and S tine cultivators mounted in the rear to get second wave of weeds.
- Lilliston Rolling Cultivators for initial hilling third and fourth wave of weeds. If necessary side-dress with 34 Lbs of fertilizer every 500 foot bed (500 lbs per acre)
- Two large discs mounted on the toolbar to do final hilling.

Frost, Disease and Insect Protection

- Potato varieties above are resistant to scab.
- For Colorado potato beetle move potatoes far away from last year's plot. Use entrust at 1-2 Oz to the acre and spot spray where larvae hang out. Use motorized backpack sprayer for spot spraying.
- For leafhoppers use Mycotrol O (Beauveria bassiana) when leafhoppers are in the nymph stage. When infestations are high use PyGanic EC 5.0II at 6 to12 Oz with 1 pint of Nu-Film P as adjuvant/spreader sticker to the acre; repeat for three weeks for best results. Make sure water is neutral as both low or high pH makes PyGanic ineffective. Spray in the evening to reduce early UV breakdown of Pyrethrum.
- Late blight can be controlled with a weekly spray of ¾ lbs of Nordox 75 (CuO), or 1 lb of NuCop50 (CuOH) mixed with 1 quart of JMS Stylet Oil and 1 Qt of Regalia (Reynoutria sachalinensis) plus ½ pint of NuFilm P as a spreader sticker to the acre. We have not had to spray our potatoes for late blight as the prevalent strain of the past years affected the foliage and not the tuber. In 2009 we lost the foliage but the tubers were fine as we waited with harvesting until all foliage was decomposed (phytophtora can only survive on living tissue).
- When potatoes flower make sure they have abundant moisture available as this is a critical stage in their development.
- Mow down any weeds after foliage have died down (usually caused by leafhoppers) to avoid weeds from taking over. Use the flail chopper as this will suck up any weeds or foliage that has died down.

Cover Cropping / Under-Seeding Procedures

- Potatoes are followed by rye and vetch.

Pumpkin

Cucurbita pepo (Cucurbitaceae or cucumber family)

Soil Preparation

- Pumpkins should not be followed after other cucurbits, nightshades (phytophtora capsici), but follow well after cole crops, and leguminous green manure or sweet corn.
- 10 ton of compost creates a surplus of P and is usually sufficient in nutrients for N and K.
- Compost is spaded in and Pumpkins are planted on raised beds.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-160	5.5-6.8

Varieties

- Baby Pam, Baby Bear

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#5** or seeded by hand

Tray	Germ. @	Grow @	Hardening Off	Notes
50	75	75	Withhold water	Take outside 1 week before planting in field

Signs to watch for & what to do

- Pumpkins grow fast. Make sure they can go in the field without becoming leggy.

Transplant readiness indicators

- When plants have enough of a root-ball to hold the pot together. Plants that are lush do not perform well in the field.
- Cover plants with Surround® WP (Kaolin clay) before planting by diluting 8 lbs of clay in 3 gallons of water. Dunk plants in mixture or spray on with backpack sprayer. Do not add spreader sticker to solution.

Water wheel Planter

Rows	In-Row	Planting Depth	Notes
1 Row	12 in.	Same level as potting medium	Add kelp to water as ½ % solution in the water wheel planter.

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Shoe Depth	sprocket setting
MaterMacc	**1**	1	**9 H 4.5**	½ inch	**22 - 18**

Cultivation Procedures:

- After transplanting, cultivate once or twice in between plastic with Hillside cultivator.
- Cover wheel tracks with rye straw at a rate of 3lb per foot. (one 600 lb round bale covers 200 feet of wheel track). When an early cutting of orchard grass is used, increase that amount as hay breaks down much faster than straw. Hay can act as slow release fertilizer later in the season.

Frost, Disease and Insect Protection

- Choose less susceptible varieties to powdery and downy mildew varieties.
- Powdery and downy mildew (somewhat) is controlled with a mixture of Cease (bacillus Subtilis) and Milstop (Potassium Bicarbonate) at a rate of 2 Qt of Cease and 1 lbs of Milstop per acre. Melons are sensitive to Sulfur (phytotoxicity) so great care should be taken if Sulfur (in whatever form) is applied to control PM.
- Cucumber beetle is difficult to control. Spraying them every 5-7 days with PyGanic EC 5.0II at 6 to12 Oz with 1 pint of Nu-Film P as adjuvant/spreader sticker to the acre has some effect. Add some feeding/attractant stimulant like molasses and milk for greater effect (1 lb per acre).

Radish

Raphanus sativus (Brassicaceae or cabbage family)

Soil Preparation

- Radishes should not be followed after other cole crops.
- 10 ton of compost creates a surplus of P and is usually sufficient in nutrients for N and K.
- Compost is spaded in and radishes are planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
60	0-125	0-200	5.5-6.8

Varieties

- Crunchy Royale, Sora

Direct Seeding Information

	Rows	Seeds/Ft	Plate #	Depth	Notes
Planet Jr.	**5**	15	8	2-4	Use row-covers after planting for flea beetle control
Sutton Jr.	**5**	20	16	¼ -½ inch	1 mph or 1.6 kmph

Number of successions

- Spring 2
- Fall 2

Cultivation Procedures

- Radish follows well after winter cover crop of oats and peas or when no cover crop was planted that winter. Planet Jr. seeders and fine seeded crops like radish do not deal well with plant debris on soil surface.
- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basket weed once

Frost, Disease and Insect Protection

- Cover with floating row cover after seeding and until harvest to protect from flea beetles.
- Control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays. Read label on Entrust.

Other Cultural Practices

- Early crops can be followed by fall lettuce or spinach.

Rutabaga

Brassica napus (Brassicaceae or cabbage family)

Soil Preparation

- Rutabaga should not be followed after other cole crops.
- 10 ton of compost is usually insufficient in nutrients for N, P and K.
- Total Nutrient uptake is 165 lbs of N, 10 Lbs of P, and 200 lbs of K
- Compost and SulPoMag is spaded in and rutabaga is planted on raised beds.
- Soil test will determine if additional K is needed. Boron can be added with the SulPoMag to optimize Boron distribution. If SulPoMag is not needed, distribute boron through a water solution with a sprayer at 50 GPA whereby 18 lbs of Solubor is diluted per 50 gallons of water.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
130	0-125	0-200	5.5-6.8

Varieties

- Laurentian

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
128	75	65-75	Withhold water	Take plants outside 1 week before planting in field

Signs to watch for & what to do:

- Yellowing and purpling. Rutabaga doesn't make a strong transplant. Needs pampering. Feed with fish when plant shows distress.

Transplant readiness indicators:

Plants should easily come out of their cell. Plants should generally not be older than five weeks

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	9 in.	Same level as medium	Use 9 inch sprocket

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Depth	Notes
Planet Jr.	**3**	25	**1-2**	Depth 2	Only use regular shoe!
MaterMacc	**3**	3	**24 H 1.0**	¼ -½ inch	Sprocket **22-17**

Cultivation Procedures:

- Lely or basket weed 7-10 days after transplanting.
- Hand hoe in between plants if basket weeder is used.
- Second cultivation use the Bezzerides spring hoes with knives in the back. If needed side-dress with 34 Lbs of dried granular composted chicken manure every 500 – 600 bed (500 lbs per acre)
- Third cultivation use them in combination with the spider gangs and hill without burying the plants or alternatively use the Lilliston Cultivators without allowing them to bury the crop.

Frost, Disease and Insect Protection

- Control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays. Read label on Entrust. When direct seeded use row covers.
- If cabbage looper / worm population is over 2 worms per plant, spray Dipel using at 1–2 pints to the acre, or Entrust at 1-2 oz to the acre (total amount per season per acre not to exceed 9 oz).

Cover Cropping / Under-Seeding Procedures: Rutabaga is harvested too late to be followed with a cover crop.

Scallions

Allium cepa (Alliaceae or onion family)

Soil Preparation

- 10 ton of compost is usually sufficient in nutrients for N, P and K.
- Compost is spaded in and scallions are planted on raised beds.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
100	0-160	0-160	6.0-6.8

Varieties

- Ishikura, Nabechan

Greenhouse Guidelines: EZ Seeder seeding plate #16

Tray	Germ. @	Grow @	Hardening Off	Notes
128	60 -85	60-65 d 55-60 n	Withhold water	7-9 Seeds per cell. Take plants outside 1 week before planting in field

Signs to watch for & what to do:

- Yellowing; broadcast Vermont Compost's Forte Plus on cells.
- Poor growth; don't over water. Scallions stay in the greenhouse longer than they might like to. Algae might form over time if the plants are kept too wet, and potassium and nitrogen leaches out

Transplant readiness indicators:

- Plants come easily out of cell without soil falling off.

Number of successions

- 3

Lännen Transplanter

Rows	In-Row	Planting Depth	Notes
3	5 in.	Not too deep. Same level as potting medium and a little below	Use 5 inch sprocket

Cultivation Procedures

- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basketweed 7 to 10 days after planting. Cover row 2 and 4 with chisels mounted on Basketweeder or side knives mounted on rear toolbar.
- Hand hoeing in between plants
- Use finger weeders or Springhoes for second cultivation with rear mounted S-tines in wheel track and side knives in between rows.

Frost, Disease and Insect Protection

- Scallion's main pest is thrips, which is controlled with Entrust at a rate of 1.5 to 3 oz per acre.
- Alternatively Mycotrol can be used at a rate of 1-4 pints to the acre.
- Research has shown that an adjuvant only can provide good control as it smothers the thrips
- Irrigation with larger droplets works also very well to wash the thrips off. During years of heavy rain thrips is usually less of a problem.

Other Cultural Practices

- Scallions are followed by another cash crop or a cover crop like oats and peas. Scallions provide good conditions for a second crop to be seeded, since very little crop residue is left after harvest. Spade after harvest.

Spinach

Spinacia oleracea (Chenopodiaceae or goosefoot family)

Soil Preparation

- 10 ton of compost creates a surplus of P but is usually sufficient in nutrients for N and K.
- Total Nutrient uptake is 100 lbs of N, 12 Lbs of P, and 100 lbs of K
- Compost is spaded in and spinach is planted on raised beds.
- Soil test will determine if additional K is needed.
- Side dress N as needed if leaves in previous plantings are yellowing.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
130	50-170	0-200	6.0-6.8

Varieties

- Long standing Bloomsdale, Regiment, Tyee. Add T 22 (Trichoderma harziana) to planter box to avoid damping off

Direct Seeding Information

	Rows	Seeds/Ft	Plate #	Depth	Notes
Planet Jr.	**5**	50	**20**	2-4	Mix with T22 to avoid damping off
Sutton	**9**	25	**18**	¼ -½ inch	0.8 mph or 1.3 km

Number of successions

- Spring 5
- Fall 5

Cultivation Procedures:

- Spinach follows well after winter cover crop of oats and peas or when no cover crop was planted that winter. Planet Jr. seeders and fine seeded crops like spinach does not deal well with plant debris on soil surface.
- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- After emergence basket weed once if seeded on 5 rows.

Frost, Disease and Insect Protection

- Choose white rust resistant or tolerant varieties. Make sure high fertility is available before planting.

Cover Cropping / Under-Seeding Procedures:

- Spinach either follows or precedes other vegetables like lettuce, mustard. Etc.

Strawberry

Fragaria ananasa (Rosaceae or Rose family)

Soil Preparation

- 10 ton of compost creates a surplus of P but is usually sufficient in nutrients for N and K.
- Compost is spaded in and strawberries are planted on raised beds.
- Soil test will determine if additional K is needed.
- Side dress N as needed

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-160	5.5-6.8

Varieties

- Early: Earlyglow (small berries)
- Midseason: Cavendish, Cabot, Winona
- Late: Idea

Bare root transplanter (made by Powell)

Rows	In-Row	Planting Depth	Notes
2	12 in.	Pay attention that the roots are buried but not the crowns	Water after planting

Cultivation Procedures:

- Basketweed 1 week after planting.
- Use Buddingh Fingerweeder 10 –12 days after planting.
- Use the Torsionweeders or Springhoes while creating a slight hill. Use the Two row S-Tine cultivators on three-point-hitch for control of weeds in wheel tracks and top of the bed.
- Side-dress with granular fertilizer when strawberries are not preceded by legume cover crop. Do not fertilize in spring but after planting or renovation. Good vegetative growth and bud development results in good yield the following year. Fertilizer on berries results in rot.
- At end of the season cut back the runners to a strip of 8 inches with the use of a rotovator.

Frost, Disease and Insect Protection

- Pick flowers several times the season the berries are planted to ensure good plant and root growth.
- Cover with straw before the ground freezes solidly. Uncover after the snow melts.
- Protect against deer nibbling with temporary fence.
- Consider floating row-cover for warmth in spring to speed up plants, but uncover when they flower.

Cover Cropping / Under-Seeding Procedures

- Alternatively to reduce the amount of straw to be used; seed down oats in early September for winter cover. This is a cheap source of straw. But do it after you cut back the runners and the weeds are under control. The problem is incorporation and seeding should be done before the final cultivation.

Summer Squash/ Zucchini

Cucurbita pepo (Cucurbiticeae or cucumber family)

Soil Preparation

- Squash should not be followed after other cucurbits, nightshades (phytophtora), but follow well after cole crops, and leguminous green manure or sweet corn.
- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and squash is planted on high raised beds covered with plastic mulch.
- Soil test will determine if additional K is needed. Apply all additional N and K needed through hopper on mulch layer.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-160	5.5-6.8

Varieties

- Green: Tigress, Cashflow, Revenue
- Yellow: Sunray, Sunburst

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#5**

Tray	Germ. @	Grow @	Hardening Off	Notes
50	75	75	Withhold water	Take outside 1 week before planting in field

Signs to watch for & what to do

- Squash grows fast. Make sure they can go in the field without becoming leggy. Leggy plants suffer and can perish in the summer heat

Transplant readiness indicators

- When plants have enough of a root-ball to hold the pot together. Plants that are lush do not perform well in the field
- Mix 4-6 oz. of Actinovate® SP in 100 gallons of water to create solution and drench complete tray before transplanting.

Number of successions

- 3

Water wheel planter

Rows	In-Row	Planting Depth	Notes
1	12 in.	Same level as potting medium	Plant with abundant water mixed with kelp @ ½ gallon per 100 gallons of water. Keep a walking break in the plantings. Skip two plants every 100 feet to allow for path.

Cultivation Procedures:

- In the rotation plastic mulch culture ideally follows after sweet-corn and a cover of oats and peas. Early established oats and peas needs mowing before the winter to avoid clogging up of mulch layer. Spader does not cut up the long stalks.
- IRT plastic is the preferred plastic to help warm the soil for first planting then use BioTelo.
- When laying the plastic add dried granular composted chicken manure to the soil at a rate of 500 lbs per acre.
- After transplanting, cultivate once or twice in between plastic with Hillside cultivator and cover wheel tracks with rye straw at a rate of 3lb per foot. (One 600 lb round bale covers 200 feet of wheel track). When an early cutting of orchard grass is used, increase that amount as hay breaks down much faster than straw. Hay can act as slow release fertilizer later in the season.

Frost, Disease and Insect Protection

- Use floating row covers against frost for early plantings, consider keeping it on to protect against cucumber beetle. Support row cover every 4 feet with 10-gauge wire to prevent damage by abrasion. Remove at flowering, for varieties that require pollination.
- Watch for cucumber beetle and Squash bugs with later plantings. When row covers are not used, cover plants with Surround® WP before transplanting. Use motorized backpack sprayer to apply mixture (read label). Cucumber beetle is difficult to control.

Spraying them every 5-7 days with PyGanic EC 5.0II at 6 to12 Oz with 1 pint of Nu-Film P as adjuvant/spreader sticker to the acre has some effect. Add some feeding/attractant stimulant like molasses and milk for greater effect (1 lb per acre).

- As soon as squash bug larvae infest one planting disc in the crop or remove plants from field. High density should take care of possible losses but the main loss in this crop is secondary which is viral. Select virus resistant varieties.
- Also select less susceptible varieties to powdery and downy mildew varieties.
- Powdery and downy mildew (somewhat) is controlled with a mixture of Cease (bacillus Subtilis) and Milstop (Potassium Bicarbonate) at a rate of 2 Qt of Cease and 1 lbs of Milstop per acre. Melons are sensitive to Sulfur (phytotoxicity) so great care should be taken if Sulfur (in whatever form) is applied to control PM.

Other Cultural Practices

- Remove plastic soon after harvest to avoid build up of squash bugs. Establish a cover crop soon after disking in the remainders of the straw and plants.

Squash, Winter

Cucurbita pepo (Acorn, Spaghetti, Delicata) Cucurbita maxima (Kabocha, Hubbard) Cucurbita moschata (Butternut) All belonging to the Cucurbiticeae family

Soil Preparation

- Winter squash should not be followed after other cucurbits, nightshades (phytophtora capsici), but follow well after cole crops, and leguminous green manure or sweet corn.
- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Compost is spaded in and squash is planted on high raised beds covered with plastic mulch.
- Soil test will determine if additional K is needed. Apply all additional N and K needed through hopper on mulch layer if planted on corn starch based plastic.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
120-140	0-160	0-160	5.5-6.8

Varieties

- Delicata, Bon Bon, Carnival, Chieftain Butternut, Royal Ace, Sunshine.

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#5** or seeded by hand

Tray	Germ. @	Grow @	Hardening Off	Notes
50	75	75	Withhold water	Take outside 1 week before planting in field

Signs to watch for & what to do

- Winter Squash grow fast. Make sure they can go in the field without becoming leggy.

Transplant readiness indicators

- When plants have enough of a root-ball to hold the pot together. Plants that are lush do not perform well in the field
- Cover plants in Surround® WP (Kaolin clay) before transplanting to protect against cucumber beetle. Dunk complete trays in mixture or apply with backpack sprayer. Do not use a spreader sticker as the irritation of the clay makes the SCB look for different places.

Water wheel Planter

Rows	In-Row	Planting Depth	Notes
1	12 in.	Same level as potting medium	Add kelp to water as ½% solution in the water wheel planter.

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Shoe Depth	sprocket setting
MaterMacc	**1**	1	**9 H 4.5**	½ inch	**22 - 18**

Cultivation Procedures

When not set in plastic:

- Torsion gangs as primary tool with the help of knives mounted behind the tractor.
- Make several passes and hoe the remainder out by hand
- If squash bugs is not a problem over-seed with a 50/50 mixture of red and sweet clover of 20 lbs to the acre after final pass.

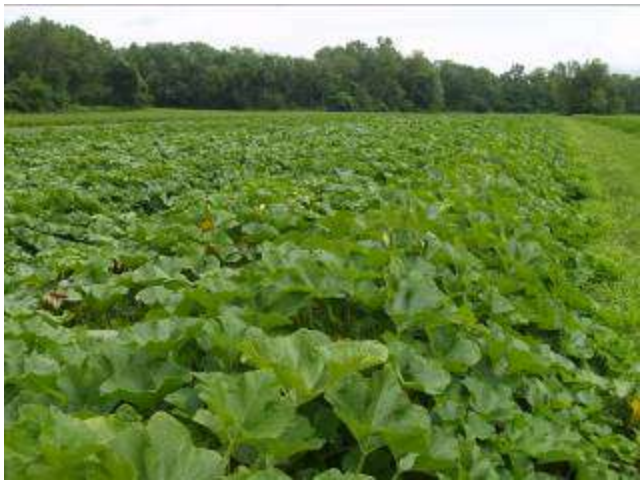
When set in plastic:

- Add dried granular composted chicken manure to the soil at a rate of 50 lbs per 500 feet when laying plastic.
- Cultivate twice in between plastic with Hillside Cultivators and cover wheel tracks with rye straw at a rate of one bale per 35 feet of wheel track.

Disease, insect Protection and other cultural practices.

- Watch for cucumber beetle. High density should take care of possible losses. Avoid buttercup varieties.
- Cover plants with Surround® WP before transplanting to protect against cucumber beetle. Use motorized backpack sprayer to apply mixture (read label)
- Watch for cucumber beetle and Squash bugs with later plantings. Cover plants with Surround® WP before transplanting. Striped cucumber beetle is difficult to control. Spraying them every 5-7 days with PyGanic EC 5.0II at 6 to12 Oz with 1 pint of Nu-Film P as adjuvant/spreader sticker to the acre has some effect. Add some feeding/attractant stimulant like molasses and milk for greater effect (1 lb per acre).
- As soon as squash bug larvae infest one planting disc in the crop or remove plants from field. High density should take care of possible losses but the main loss in this crop is secondary which is viral. Select virus resistant varieties.
- Also select less susceptible varieties to powdery and downy mildew varieties.
- Powdery and downy mildew (somewhat) is controlled with a mixture of Cease (bacillus Subtilis) and Milstop (Potassium Bicarbonate) at a rate of 2 Qt of Cease and 1 lbs of Milstop per acre. Melons are sensitive to Sulfur (phytotoxicity) so great care should be taken if Sulfur (in whatever form) is applied to control PM.

Harvesting in 20 Bu bins



Sweet Potato

Ipomoea batatas (Convolvulaceae or Morning glory family)

Soil Preparation

- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 140 lbs of N, 20 Lbs of P, and 200 lbs of K
- Compost and SulPoMag is spaded in and sweet potatoes are planted on high raised beds covered with plastic mulch, we use BioTelo.
- Soil test will determine if additional K is needed.
- Sweet potatoes do not well when nitrogen is applied before planting. If N is needed it needs to be supplied through the drip. Otherwise it is better to maintain N levels out of compost

Common Recommended fertilizer rates in Kentucky (KCES 2006)

Nitrogen	Phosphorus	Potassium	pH
30-50	0-180	0-275	5.0-6.8

Varieties

Plants are bought in as slips (bare root)

- Beauregard, Georgia Jet

Water wheel planter

Rows	In-Row	Planting Depth	Notes
2	12 in.	All roots should be firmly underground	Use bare root planter when not set in plastic. Water after planting

Cultivation Procedures

When not set in plastic:

- Basket weed for first cultivation.
- Use the torsion weeders for all other cultivation with the aid of knives in the back. No hilling.
- Make several passes and hoe the remainder out by hand

When set in plastic:

- Add dried granular composted chicken manure to the soil at a rate of 500 lbs per acre when laying plastic.
- Cultivate twice in between plastic with**.** but do not cover wheel tracks with rye straw as mice will cause too much damage on the roots (they love the cover of the rye mulch).

Frost, Disease and Insect Protection

- Sweet potatoes perform better at close spacing (maximum 12 inches in the row)
- Protect the crop from deer damage by putting up a temporary fence. Bait with peanut butter and complete project in one day, as the element of surprise is the only thing that makes this tool effective.
- Mow foliage and harvest tubers before soil temperature dips below 60˚ F
- Cure tubers at 85˚ F in greenhouse for one week
- Store tubers at 55˚ F. If tubers are stored below 55˚ F the develop hard spots, don't taste as sweet, and will not keep for long.

Cover Cropping / Under-Seeding Procedures

- Sweet potatoes are followed by rye and hairy vetch.

Tatsoi

Brassica rapa (narinosa group) (Brassicaceae or cabbage family)

Soil Preparation

- Tatsoi should not be followed after other cole crops.
- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Compost and is spaded in tatsoi is planted on a raised bed.
- Soil test will determine if additional K is needed.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
80-100	0-125	0-200	6.0-6.8

Greenhouse Guidelines: EZ Seeder seeding plate #16

Tray	Germ. @	Grow @	Hardening Off	Notes
128	65-75	65-75	Withhold water	Take plants outside 1 week before planting in field

Transplant readiness indicators:

- Plants should easily come out of their cell. Plants should generally not be older than five weeks

Lännen Transplanter

Rows	In-Row Planting Depth	Notes
3	5 inches	Normal Soil level even with potting medium

Direct Seeding Information

	Rows	Seeds/Ft	Plate #	Shoe Depth	Notes
Planet Jr.	**5**	22	**2**	Depth 2	Spreader shoe
Sutton Jr.	**9**	30	**6**	¼ inch	1 mph or 1.6 km

Number of successions

- **5**

Cultivation Procedures for five rows

- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basketweed 7 to 10 days after planting. Cover row 2 and 4 with chisels mounted on Basketweeder or side knives mounted on rear toolbar.
- Hand hoeing in between plants
- Use Springhoes for second cultivation with rear mounted S-tines in wheel track and side knives in between rows.

Insect Protection

- Control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays.
- Look for eggs of cabbageworm/cabbage looper at the underside of leaves. When small worm population is over 2 per plant spray Bt using 1 to 2 pints to the acre or spinosad (Entrust) at 1-3 Oz per acre every week until population is under control. Alternate spraying schedule by using Bt aizawi or Bt kurstaki in conjunction with spinosad at 1-3 Oz to the acre to avoid build up of resistance. (Total amount of Entrust per season per acre should not exceed more than three applications with a total of 9 Oz.).

Other Cultural Practices

- Early crops can be followed by fall lettuce or spinach. Mow plants down as low as possible with flail mower. Incorporate crop residue with spader when followed with other cash crop.
- Late crops can be harvested into November and are not incorporated before the winter.
- When machine harvested cut tatsoi before it gets tall as the lower leaves turn yellow in a matter of days after the crop reaches prime condition.

Tomato

Solanum lycopersicum (Solanaceae or nightshade family)

Soil Preparation

- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Total Nutrient uptake is 180 lbs of N, 21 Lbs of P, and 280 lbs of K
- Compost is spaded in and tomato is planted on high raised beds covered with plastic mulch.
- Soil test will determine if additional K is needed. Apply all additional N and K needed through hopper on mulch layer.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
130	0-200	0-240	5.5-6.8

Varieties

- Early Red: Polbig, Early Cascade (Alternaria tolerant)
- Midseason Red: Celebrity (sweet and good tolerance for diseases)
- Late Red: Mountain Fresh (Alternaria resistant)
- Small plum: Juliet (high disease resistance and great flavor), Golden Rave, and large cherry: Mountain Magic (new Randy Gardner release to be sold by BEJO with resistance to Phytophtora, Septoria and Alternaria- we called it Ping Pong when it still only had a number in our trials
- Heirloom: Valencia, Nepal, Brandywine
- Plum: BHN 685, San Marzano

Greenhouse Guidelines

- **EZ Seeder** seeding plate **#16**

Tray	Germ. @	Grow @	Hardening Off	Notes
288	75-90	60-70	Withhold water	Take plants outside 1 week before planting in field

Signs to watch for & what to do:

- Repot into Winstrip 50's when true leaves are developed.
- Brush plants with broom to get stocky seedlings once a week.
- Don't over water and keep them lean with nutrients. Don't let them turn yellow though.
- Space trays as in checkers to get more light on the plants.

Transplant readiness indicators

- When plants have enough of a root-ball to hold the pot together. Plants that are lush do not perform well in the field so increase light (by moving them outside) and reduce watering.

Number of successions

- 3

Water wheel planter

Rows	In-Row	Planting Depth	Notes
1	24 in.	As deep as possible	Add kelp to water as ½% solution in the water wheel planter. Keep a walking break in the plantings. Skip two plants every 100 feet to allow for path.

- Make sure to paint a four feet "walking break" on the plastic mulch every hundred feet to allow for later easy removal of tomatoes. Do not plant anything in the "break". Absence of this break will make picking of tomatoes a very arduous task as buckets or trays have to be handed over the trellis.

Cultivation Procedures

- In the rotation plastic mulch culture follows after a cover crop of oats
- First planting in IRT plastic, second and third on BioTelo
- When laying the plastic add dried granular composted poultry manure to the soil at a rate of 500 lbs per acre.

- After transplanting, cultivate once or twice in between plastic with Hillside cultivator and cover wheel tracks with rye straw at a rate of one 3lb round bale per foot. (One 600 lb round bale covers 200 feet of wheel track). When an early cutting of orchard grass is used, increase that amount as hay breaks down much faster than straw. Hay can act as slow release fertilizer later in the season.

Staking

- For staking use 6 feet stakes and T posts for indeterminate varieties (Juliet, Golden Rave, Mountain Magic), 5 feet posts for semi-indeterminate (Mountain Spring) and 4 feet stakes and T posts for determinate (Defiance, Regal Plum). Use a post pounder to pound in the stakes and T posts every other plant (4 feet apart) and avoid puncturing the drip tape.
- The first string should be about 10 inches above the soil and should be strung when the plants are 12 to 15 inches high. A "stringing tool" is used to pass the string along one side of the row, looping the string around each stake. Use the end of a broom handle with a eye round on the top to aid in trellising. Use twine that is in cardboard box attached to your belt and thread it through the eye round. Hold the twine steady by sliding it between your hand and the stick.
- It is important to keep the twine tight. Proceed to the end of the break and return on the opposite side passing the string along the other side of the plants, again looping each stake. It is helpful at the first stringing to cross the string between plants. Subsequent strings should be put up as the plants grow in order to maintain a well-trained system. 4 to 6 stringings are needed (depending on length of stake), each about 6 to 10 inches higher than the preceding one.

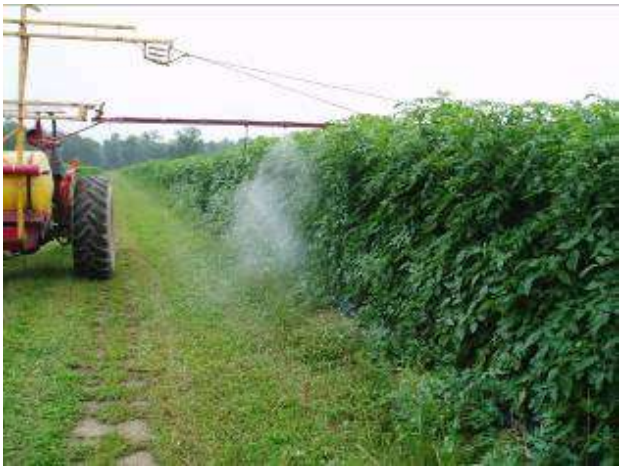
Frost, Disease and Insect Protection

- Staking greatly improves plant health but the thick mulch of rye straw also reduces plant diseases. While it will not prevent a late blight outbreak, the practice of tolerant or resistant varieties in combination with BioTelo and heavy rye straw mulch greatly reduces disease pressure. Some of this is due to release of both K and Silica out of the mulch into the plants at the time they need it most.
- Don't remove any suckers on determinate plants. Plant the three plantings in different parts of the field to avoid contamination and plant each planting away from the prevailing wind (west).
- When Late blight (phytophtora) early blight (Alternaria), grey mold (Claudosporium), Leaf spot (Septoria), or bacterial speck are a problem control this with a weekly spray of ¾ lbs of Nordox 75 (CuO), or 1 lb of NuCop50 (CuOH) mixed with 1 quart of JMS Stylet Oil and 1 Qt of Regalia (Reynoutria sachalinensis) and ½ pint of NuFilm P to the acre. Apply with 32" drops on the boom to achieve better penetration of foliage at 40 GPA at 120 psi. Drops have two TX 6 hollow cone nozzles that spray to one side. Each row is covered by two nozzles on the boom and four nozzles coming from each side from a drop. Do not spray when winds are over 2 mph to avoid drift. Very effective to keep plants from picking up early infestations and we have not had a late blight infestation since 2009 and very green plants until November using this treatment.

Other Cultural Practices

- Remove stakes out of the field and store in the greenhouse
- Late Tomatoes are generally harvested until October and do not provide good conditions for a successful cover crop establishment.
- Early tomatoes are followed with oats and peas after removal of plastic and plant remnant incorporated with disc.

Spraying tomatoes



Trellising tomatoes

Turnip

Brassica rapa (Brassicaceae or cabbage family)

Soil Preparation

- Turnips should not be followed after other cole crops.
- 10 ton of compost is sufficient for P but is usually insufficient in nutrients for N and K.
- Compost and SulPoMag is spaded in and turnips are planted on raised beds.
- Soil test will determine if additional K is needed.

Common Recommended fertilizer rates in New York (CCES 1994)

Nitrogen	Phosphorus	Potassium	pH
130	0-125	0-200	5.5-6.8

Varieties

- Hakurei

Direct Seeding Information

	Rows	Sds/Ft	Plate #	Depth	Notes
Planet Jr.	**3**	35	**1-2**	Depth 2	Only use regular shoe!
MaterMacc	**3**	12	**96 H 1.0**	¼ -½ inch	Sprocket **22-17**

Number of successions

- Spring 2
- Fall 1

Cultivation Procedures

- Turnip follows well after winter cover crop of oats and peas or when no cover crop was planted that winter.
- Prepare seedbed one to two weeks in advance, shallowly stale seedbed before planting to eradicate weeds if possible. Do not disturb soil too deep as new weed seeds will be brought up.
- Basketweed 7 to 10 days after planting. Cover row 2 and 4 with chisels mounted on Basketweeder or side knives mounted on rear toolbar.
- Use Springhoes for second cultivation with rear mounted S-tines in wheel track and side knives in between rows.
- Hand weeding is not necessary as turnips develop quickly to shade out in row weeds.

Insect Protection

- Consider the use of floating row covers against flea beetle until harvest, especially in hot dry weather. Otherwise control flea beetles with Entrust at 3 oz per acre every 5 –7 days not to exceed three sprays.

Other Cultural Practices

- Turnips can be grown before or after another vegetable or does very well after vetch or can be followed with a variety of cover-crops in the spring.