Year-round Backyard Mini-Farming:
Food with the Least Fossil Fuel and Footprint

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PART B

PART 4. YIELDS, EXPERIMENTS AND WHAT WE DO WITH OUR PRODUCE

4.1 Yields

We've kept track of our yields over the years. Our biggest constraints have been dry conditions and insufficient sunlight. In the winter of 2006 we took down two mature trees that shaded our garden, and yields jumped for most crops, often dramatically. Notice in the table below ("Yields at Neo-Terra") that for a majority of crops, the 1st and 2nd highest yields have occurred since we took down the two trees (years 2007,08, 09).

Below left: Tania weighing potatoes. Below right: Recording number and weight of corn picked for dinner.

Below left: onions drying. Below right: garlic drying. We found that fall-planted garlic benefits from an additional layer of compost worked in gently in the late winter, when it begins growing again. In a side-by-side comparison, bulbs getting additional compost were 26% heavier.

We report our yields in our chart below (“Yields at Neo-Terra”). Column 2 (blue text) shows the Jeavons yields: L for low, M – medium, and H – for high. With our increasing sun, we have moved to the medium range on many of our crops. We exceed Jeavons high yields with beans and, earlier, with raspberries. We abandoned parsnips for a time as it never did well in our heavy soils, but have recently reintroduced it with greater success.

Yields at Neo-Terra f=c:garden/yields

green – highest; blue – 2nd highest

Crop	Jeavons Yields (lbs/100 sq.ft.)	'99	'00	'01	'02	'03 wet	'04 wet	'05 dry	'06 dry[1]	'07 dry[2]	'08	'09 wet	'10
	L –M –H												
beans, pole	30-72-108	89	64	51	49[3]	77	94	60	103	130	104	105	
beans, cranberry	29.7 (max)					24					9	23	
beets, red	55-110-270			84-147	81-131	175	116[4]	72	voles	185	186	139	
beets, winter				56	0[5]	34	21.3	49[6]	53	131	88	113	
mangels	200-400-960			129	239	303	273	196					
winter mangels					0[7]	62	75						
blueberries	19-32-75											40	
burdock	75-150-300												
carrots	100-150-1080				83	100	132	89	88	145	156	186	
winter carrots				33.6	34	65	42	52	89	74	69	120	
corn[8]	17- 34- 68		33	18[9]	20[10]	0[11]	26	23	35	41	47	40	
garlic	60-120-240			26	forgot	18.6	102	74	84	70	60	85	
J. artichokes[12]	100-206-420					131	168	187	110	161			
onions	100-200-540			121	165	92	104[13]	80	119	184	112	167	
parsnips	119-238-479			43	47	19	38[14]	19[15]			115[16]		
peas	25-53-106			22	20	39.2	46.3	37	31	35	32	27	
potatoes[17]	100-200-780	70-102	60	45	56	0				249	106	101	
raspberries[18]	6-12-24		29	31	29	8	11.4	13.8	12	10	21[19]	33	
black											20	20	
June red											32	58	
fall red											13	36	
squash, butternut	50-100-350		53	70	68	44[20]	99	65	78	50[21]	54	88	
strawberries	40-80-320										74[22]	38	
Cover Crop Ratio: 9/1- 8/31	60%	42%	33%	38%	52%	40%	28% 23	45%	40%	39%	42%	46%	

Bottom row (red text) shows one of the most important indicators of performance in biointensive: the cover crop ratio. This is the percent of time that your beds are in cover crop during the year. Jeavons has determined that with a percentage of 60%, you can build soil fertility without adding any additional carbon. Since we have many hardwood trees in our yard, we compost our leaves and this allows us to reduce the cover crop ratio. We have averaged 40% over the past nine years. Achieving this ratio requires considerable discipline in harvesting crops, cleaning beds, and seeding to cover crops. We follow the calendar here. Thus, we do not leave our tomatoes and pole beans in until the last ones can be pulled from the vines. To do so would stint the time required for fall cover crops. For us, our cover crops are every bit as important as our food crops. Without good cover crops we cannot get good food crops.

Below: our spring cover crops showing rye and rye/vetch combinations. Where pea trellis is visible we had grown a fall crop of oats, which winter-killed in time to decompose for early planting of peas.

Using cover crops and compost, we achieved a nitrogen content of 150 ppm (0.015%) and a carbon content of 7.8% (5-6% desired) at the end of the season! No additional fertilizer was required. Commercial compost might have an NPK rating of 0.5-0.5-0.5. One worm casting brand was 0.5-0.5-0.3. Our own compost compares quite favorably at 1.2-.08-.14.

In the chart below, we show an example calculation for the cover crop ratio.

COVER CROP RATIO
ACTUAL BED TIME RECORD:
SEPT 1, 20066AUG 31, 2006 FALL SPRING

Bed	A section	B section	C section	Total days
1	oats: 9/25-11/30 = 67 days j. millet: 7/10-10/31 x0.5=56 (half the bed section only)	oats/vetch: 9/25-5/4=132 days fava: 4/9-5/4 (overlaps, so no extra days)	j. millet: 7/1-10/31x0.5= 61.5 days	199.0 117.5 316.5 days
2-8				2188.5
Total				2505 days 6325 days = 39.6%

Note: Maximum days calculated as follows: Growing season assumed from March 1 to Nov. 30 = 275 days. We assume no growth occurs from 12/1 to 2/28. We have 23 bed sections. Therefore, max days = 23 x 275 = 6325.

4.2 Experiments

We have conducted numerous experiments over the years. We summarize the results here:

1) Sheet Composting. One of the claimed shortcuts to digging a bed is to use sheet composting. In this technique, you lay cardboard or newsprint on top of the area you wish to dig. You then pile compost on top of that, and finish with a layer of mulch. You wait. In our case, the grass was clearly killed, but the area below was the yellow greasy clay we had before. When I thought about it, I realized no self-respecting earthworm was going to leave the richness of compost to burrow into yellow clay. We concluded that sheet composting doesn't work where it is required, and works where it isn't necessary. It is a waste of compost, better dug into your garden bed.

Below: winter bed with sheet composting experiment.

In a hearty exchange on this experiment, Frank Teuton of Montreal distinguished between our sheet composting and his sheet mulching. He suggested we might have had better results had we used raw organic material rather than finished compost as a mulch over sod, and let the earthworms do the work. Raw mulch materials could include shredded leaves, paper, cardboard, coffee grounds, fresh manures, etc. This method really only works with the big night crawler Lumbricus terrestris (spatulate tails) which draws organic material deep into vertical burrows, thus adding organic matter and aerating soil at the same time. The night crawler should not be confused with Esenia fetida, a little worm which breeds rapidly and lives in letter (little wriggler). This latter is the worm of choice for high speed vermicomposting with large numbers of worms, and is suitable for outdoor and indoor vermicomposting systems of various kinds.

Teuton concedes that if the big earthworms can't be established, then the argument for deep mechanical working of the soil becomes stronger (as Jeavons does with double digging, or farmers do with mechanical tillage). In this case, one would incorporate finished compost deeply rather than raw organic matter. Doing the latter may lead to anaerobic decomposition, creation of toxins and noxious gasses (e.g., methane).

Frank's time frame for completion of a bed: fall to spring if earthworms are present, longer if not (up to 5 years for the population to build). Sheet mulching follows what farmers have traditionally done by spreading manure over ploughed fields.

Of course, we in suburban backyards do not have the soil of good farmers, nor are we prepared to wait for several years. Mechanical breaking of the soil is required. If you have the soils, the earthworms and the time you may want to experiment.

In the absence of burrowing night crawlers, two additional caveats are worth mentioning. First, raw animal manures can carry pathogens. One way to eliminate pathogens is through the heat of proper composting (Elaine Ingham). Another is to pass pathogens through two systems. Thus, spreading raw manure on fields to grow grains, and then feeding the grains to grazing animals clears the pathogens so that we can eat the meat (or eggs if chickens graze on the grains). The second caveat: organic matter lying on top of the ground, especially finished but also raw, oxidizes to carbon dioxide, especially during the heat and moisture of the growing season. In short, use it or lose it (though if properly dried, you can store it for a period of time, as Jeavons mentions).

2) Crop Spacing. Since our yields of root crops were so low prior to removing the two trees, we conducted experiments on crop spacing, and determined the following. With beets and carrots, we could increase both size and yields by increasing spacing – from 4 to 5” for beets, and from 3 to 4” for carrots. With onions, we could get either higher yields at 4” or larger onions at 5” but not both. We have stuck to higher yields at 4". Increasing distance for peas from 3" to 4" lowered yields, so we stuck with using 3".

3) Verticillium wilt. Many years ago I introduced a diseased Early Girl tomato plant I purchased at a greenhouse. Unknown to me, it had verticillium wilt. I thought the wilted look was just due to dry conditions, but didn’t think much about it. I composted the debris, and unwittingly used the diseased compost in the following year’s tomato bed. That year I lost 3/4 of our tomatoes to wilt. I then took a diseased plant to the pathology lab at Penn State, and got the diagnosis. I remembered that Jeavons wrote that fava (bell) beans counteract wilt, so the next year I planted fava beans in early April, and put the same tomato varieties in the same bed. Mortality dropped to 1/4th. Since that time, we always precede tomatoes with bell beans. We have reduced wilt even further.

4) Experiments with peas. We had poor germination due to seed rot on direct seeding. In side-by-side comparisons in flats, we tried using neem and cayenne pepper to control the fungal rot no avail. Finally, I thought to plant peas in a flat with a sterile mix of peat moss and sand, 50-50. We achieved excellent germination, but we had to transplant. Small price to pay for spring peas. Our peas also suffer from Ascochyta blight, a fungus already in our soil. We tried several fungicides, including neem, copper, and potassium bicarbonate, to little avail. We will try Serenade this year, which worked well last summer against late tomato blight.

5) Controls against oriental fruit moth in peaches. Many gardeners who are otherwise organic in vegetable production often throw in the towel when it comes to tree fruit production. The first year our two peach trees came into production, we had wonderful, disease-free peaches. Then the oriental fruit moth found our trees and took up residence. The fruit was wormy, and covered with dried sap ooze. One year I tried pheromone traps, one in each tree. Results improved markedly. The traps were full of dead moth.

6) Potato experiments. Over the years we’ve conducted careful same-season tests with potatoes. These have included comparisons of early, mid and late season varieties; comparisons of traditional row-hill vs. hexagonal bed planting following Jeavons; and comparisons with finished vs. unfinished

compost. We were intent on improving our poor yields. We collected excellent data, but in the end gave up on potatoes. No method overcame what we concluded was an underlying limiting factor: insufficient sunlight in our shaded back yard. When we removed two large trees shading the garden, yields jumped dramatically – doubling over the previous high. This year we will try sweet potatoes: much more nutritious than Irish potatoes.

4.3 <u>What We Do With Our Produce</u>

1) First, we eat well. Our food is fresh, right from the garden, as pictured below. We have many vegetarian cookbooks. One of our favorites is “From Asparagus to Zucchini: A Guide to Farm-Fresh Seasonal Produce” produced by the Madison Area Community Supported Agriculture Coalition.

2) Second, the addition of our winter greenhouse enables us to eat fresh greens through much of the fall and winter. This has taken the pressure off having to store or put up vegetables from the summer.

3) Third, we store food in several ways (see chart and photo series below).

Ways We Store Our Food

	Vegetables	Fruits	Herbs	Seeds
Open storage	Winter squash, zucchini	Apples, pears		
Cold Storage	Potatoes in bags, beets and carrots in wet sand; garlic & onions in flats; Burdock in refrigerator			Seeds for next year in tight plastic box with silica gel
Lactic Fermenta-tion	Pole beans, cucumbers, tomatoes, Jerusalem artichokes			
Drying	Borghese tomatoes, hot and sweet peppers, scallions in flax-seed based onion wafers	Apples, pears	Air-drying of: 14 Culinary herbs, stevia, ashwaganda, astragalus, mints, chamomile in jars	Black cumin, caraway, celery, coriander, dill, fennel, love-in-a-mist, poppy
Freezing	Corn (off cob), pole beans tomatillos, grated zucchini	Blueberries, peaches pears, raspberries strawberries, goose-berries, currants	Basil in oil, cilantro, dill, lovage in wax paper packets	
Tinctures, decoctions		Elderberry decoction & tincture	Echinacea, hops, horehound cough syrup & drops, lemon balm, sacred basil, St. John's wort, valerian	
Canning	Tomatoes, whole and in chutney; pickled beets	Chutneys, jams, grape jelly		
Oil	Basil (chopped); garlic (peeled and frozen)			

Below: Harvesting St. John's Wort and turning it into tincture.

Below left: washing Ashwaganda roots. Below right: chopping valerian roots prior to soaking in vodka

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Above: finished tinctures.

Below left: dried herb mixtures. Below right: horehound cough drops.

Above left: canned vegetables, jams, including row of green beans being preserved by lactic fermentation. Above right: Jerusalem artichokes being preserved by lactic fermentation.

PART 5. LESSONS WE HAVE LEARNED OVER 13 YEARS OF BIOINTENSIVE FOOD GROWING

Reflecting on our 13 years of biointensive minifarming, and the experiences of many other backyard growers, we close with 11 lessons. Were we a business, these lessons would be our "strategic directives." But we're not a business. Rather, these lessons are more like promises -- to ourselves, the earth, and the next generation.

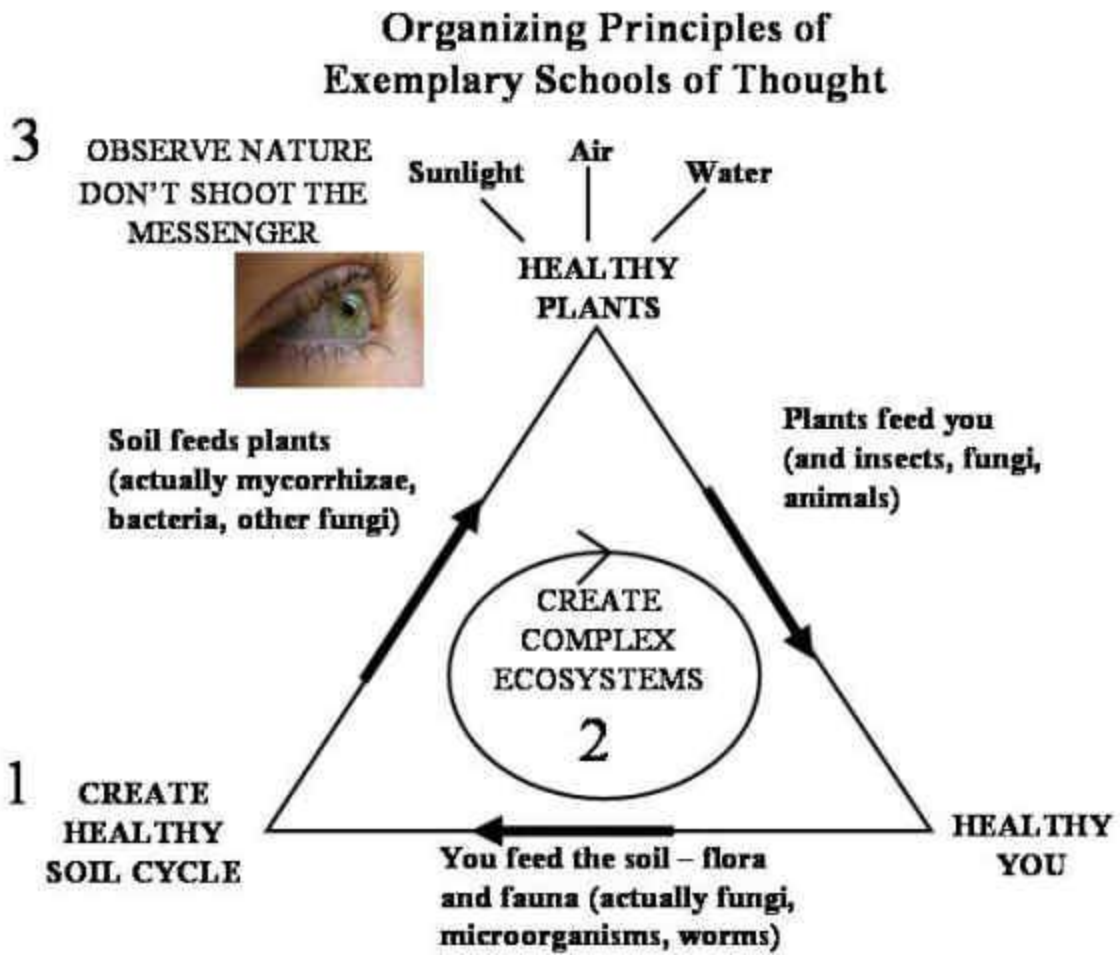
1) **Work yourself into a congenial school of thought.** For us, it was biointensive, integrated with a bit of permaculture and Eliot Coleman's winter harvest. Organic by itself is not a school of thought, but a series of practices. Organic practices in the hands of industrial farmers are not sustainable.

To our mind, the best schools of thought embody three principles (see triangle diagram below):

a) feed the soil: you feed the soil à the soil feeds the plants à the plants feed you. To determine just how integrated are the practices of a particular school of thought, ask the following question: "Where does the grower get his compost?" This is a bit like the business rule, "follow the money." In this case, the rule is "follow the compost." If the grower imports compost, he is a bit like the industrial farmer. If she produces her own, then she is living more lightly on the earth.

b) create complex ecologies/ecosystems.
   i) **Example of kale**, formerly high in folic acid but now less so, even though the presence of folic acid in the soil has not declined. What has changed is the condition of the soil, and the complex ecology around the root hairs. This micro-ecology has apparently become impaired so that kale does not absorb folic acid as it formerly did.
   ii) **Example of Serenade.** The latest category of natural bacteriocides makes use of bacteria that users spray on plant leaves, thereby depriving pathogens places to land. This is the principle put forth by partisans of aerated compost tea (Elaine Ingham). That is, compost tea, derived from plant matter, contains a plethora of beneficial organisms derived from the living soil. We are seeing similar natural preparations for human use based on the same principle. One uses a beneficial strain of streptococcus taken to occupy oral and nasal passages in humans to deny spots for the virulent strain.

c) observe nature; don't shoot the messenger.
   i) **Example**. You find hordes of aphids on your lettuce. You run to the garage and get your sprayer and douse your plants with an Insecticidal Soap. Sure, that will do the trick -- for a week or so. You will find yourself doing it again, and again, and again. Why? Two reasons. First, you are not correcting the underlying cause of the imbalance: aphids love watery leaves fed a too-rich nitrogen diet caused by overfertilizing. Second, organic insecticidals wipe out beneficials such as ladybug larva almost as easily as their chemical cousins. Beneficials need a little time to respond to the outbreak. LESSON: Attract beneficials to your garden and they will do the work. Eliot Coleman has few aphids on his lettuce plants, even in his greenhouses! By the way, there is a corollary lesson: get rid of all the pests and the beneficials will have nothing to eat. Thus, a policy of zero tolerance of pests is counterproductive.



2) **Start small.** Work out the principles of your school of thought before expanding. You will learn so much, and it is good to incorporate your own lessons as you acquire them. If you do everything at once, you short-circuit your own education. You are likely to exhaust yourself, waste time and money, get frustrated, and give up.

   If you decide to try the permanent double-dug bed, start with one bed. If you already have a garden, convert a small part of it to a one bed experiment with biointensive. You will be amazed. You may not be able to double dig to 2 feet. Don't worry. We could only reasonably dig to 1 foot in our heavy clay and rock. Over time our soil texture has improved dramatically, and the beds have gradually deepened on their own as humic acids from our compost percolated downward and broke up heavier subsoils.

3) **Get Organized.** Here's what we have:
   a) A garden notebook. We got ourselves a big three ring binder, with D rings. We have tabbed sections for each garden year, then subject tabs for soil tests, trees, garden designs, and other topics.
   b) Garden Calendar. In front of our garden notebook is a simple log sheet. Here we enter important information – rainfall, bug and pest sightings, disease outbreaks, bloom times, etc. From these logs we have compiled our Garden Calendar which we post on the bulletin board in our kitchen. We will email the log sheet and complete Calendar, shown below, to any who contact us.

Garden Log

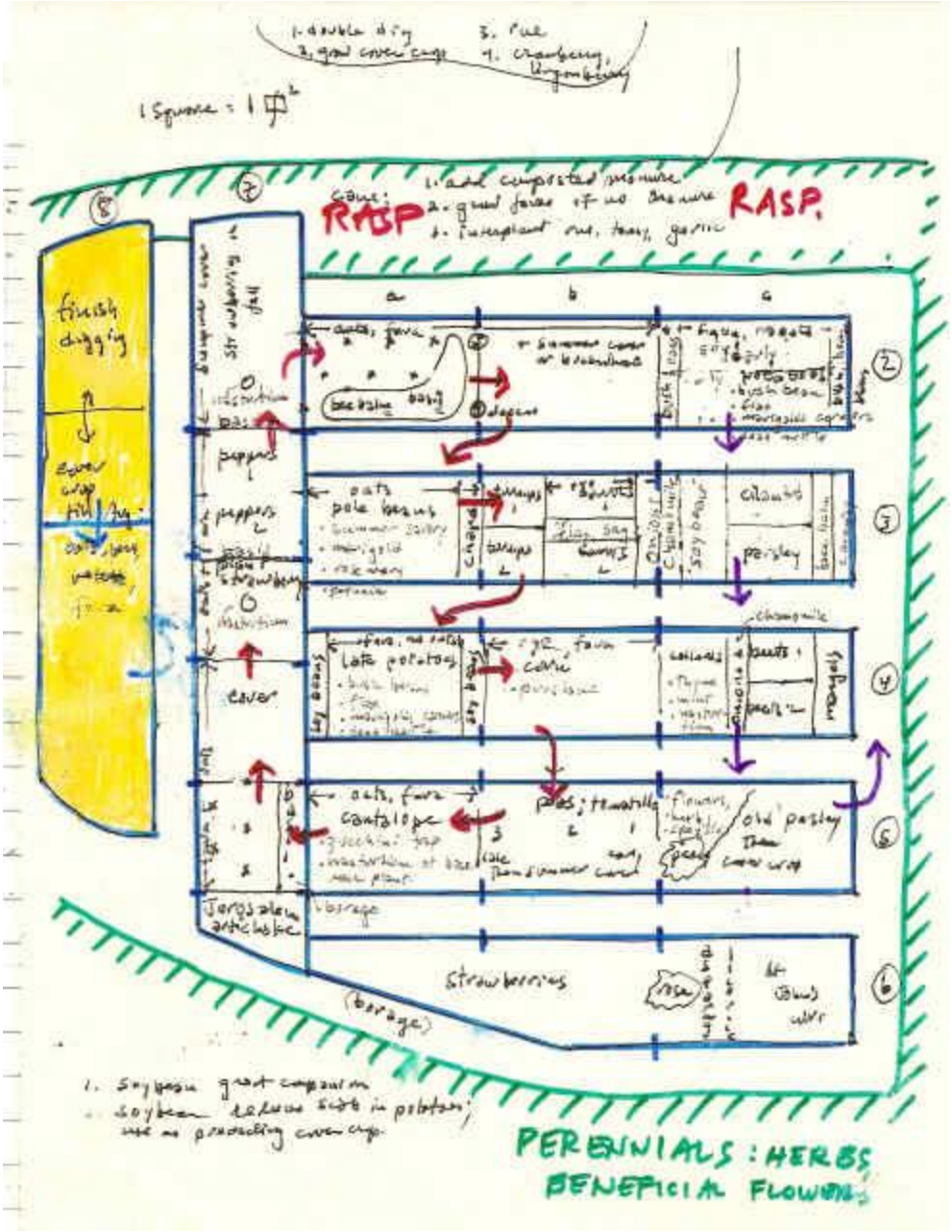
f=c/garden/log

Date 2008	Activity/Task/Observation	Bed	Time (hr/min)	Comments

TASKS	W	Mar	Apr	May	Jun	July	Aug	Fall
First leafrollers, hydrangea			*24*					
Peach: prune bloom to 2wks>petal fall[6]			16>>>>	>>>>				
Prune>bloss: forsy,quince,mock orange[7]			√	√	√			
First dandelions bloom: plant potatoes			*15—27*					
Lilacs bloom			*22—*	*-4*				
Pear blossoms, D'Anjou			*26*					
Redfree blossoms			*27*					
Lily of valley bloom			*29*	*—7*				
Peach petal fall			*30-*					
Start turning main compost pile (add sugar water @ 1lb/gal warm [filtered] water)			√	>>>>				
Start ant control: see folder 29 house			28					
Peonies: prevent botrytis [8]				√				
Killed 1st asparagus beetles				*1——14*				
June bug out				*4*				
Grape rot — spray Bordeaux mix 10 days before, after bloom, early June (bloom)				5 24—	———— 23 (3—13)			
Caught flying ants in living room				*10*				
Check for rust in domestic, wild black rasp				10				
Spray nematodes for Japanese beetle [9]				10				
First columbine blooms				*10*				
Bridal veil bush blooms				*13*				
Grape buds first visible				*15*				
Replace screen collars to apple, peach, apricot, cherry, plum trees				15				
Peach control: footnote 4-c [10]				(c)				

[6] Peach pruning: see MG manual
[7] Blooms form on new wood from previous year, so prune after bloom.
[8] Sign is black buds. Clean beds, add lime sulfur > 40 degrees, no rain, add ½" sharp sand
[9] Spray for jap beetles larva when they emerge (around May 15): garden beds, iris beds, fruit tree bed, esp sour cherry, peach, grape, raspberry, sweet cherry plus adjoining grassy area.

c) Schedules and map. We do our garden planning for the year in January, and order seeds and supplies early in the year. We update our garden map and planting schedule and put them in the garden notebook section for the current garden year. We can email the planting schedules to you.


1. double dig
2. good cover crop
3. rue
4. cranberry, lingonberry
1 Square = 1 ft²
RASP
RASP
finish digging
cover crop
cover
peppers
peppers
pole beans
late potatoes
cover
cantaloupe
old parsley
strawberries
(borage)
Jerusalem artichoke
borage
parsley
chamomile
marigolds
1. Soybean great companion
2. soybean leaves side in potatoes; use as protecting cover crop
PERENNIALS: HERBS
BENEFICIAL FLOWERS

Crop Chart, 2007 Growing Season file=c:Garden/06CROPS

BG=Bountiful Gardens	CH=Centre Hall (364-1393)	F=Fedco	H=Houts	P=Pinetree	Ag-Star Bellville 717-935-7401	Gro-Mark 359-2725
NP: Nature's Pantry	Bellville Agway 1-717-935-2148	FF=Frank ferd Farm	U=Under-wood	G=Gurneys	Carl Lingle 466-6630 straw	

Last Frost Date: May 9 First Frost Date: Oct. 1

D= days/*weeks* to proj. first yield vs actual yield; TinF= Time in Flats(wks)/actual TinF; r = # rows in flat i=indeterminate, d=determinate, h=hybrid, *italics: order;* upright: have on hand

ds= direct sow seeds n= number of seeds to plant; (n)= # desired plants

SUMMER CROP	Source	D: proj/ act	sow dat targ/act	# flats	time in flat	date transpl: targ/act	date 1st yield	sq ft plant-ed	bed #
onion: bng	*F2439EV*	65/	3-30/	1.0	5-6	5-13/	6-29/	10	3c
onion: sets 4"	*Houts*	??	3-30/	2.5#	6-8		7-20/	20	3c
lettuce sp	Have	*6-12/*	3-30/	0.4	3-4	5-5/	5-28/	20	10
Spinach	Have	*43*	3-30/	3r	3-4	5-2/	5-26/	5	10
Leaf beet	F3034PS	*55/*	3-30/	1r	3-4	5-5/	5-26/	5	3c
Bts:Detroit [1]	*F2182DD*	60/	3-30/	1.0	3-4	5-5/	7-9/	10	3a
Bts:mangels	BG (1)	*8-12*	3-30/	0.5	3-4	5-1/	7-20/	10	
ct:danvers 4"	*P70*	75/	3-30/	1.25	4-5	5-10/	7-23/	10	3b
ct:chantenay [2]	BG	70/	3-30/	1.6	4-5	5-10/	7-23/	20	
Bulb fennel 10"	4556ZF		3-30/	(6)	4-5	5-10/		(3)	12
Sumo 5'	*F833SO*	66/	3-30	1.75	2	4-18/	6-18/	20	4b
Sugar Ann 2'	*F882SU*	58/	3-30	1		4-10/		13	4b
Cascadia 2.5'	*P263*	48/	3-30	1		4-10/		13	4b
Mammoth M	*F842MM*	72	3-30	1.75		4-10/		13	4b
Collards [3]	BG	70	4-1/	2r	4-5	6-1/	6-10/	20	5c
Parsley 5"	*PW274*	70/	4-1/	0.5	5-6	5-12/	6-20/	10	4c
dill 5"	ours		4-1/	.33	5	5-11/	7-23 seed/	5	4c,5c
caraway 6" [4]	ours		4-1/	.4	7	5-14/	7-2/	10	4c
cilantro 5"	*U HCSS*		4-1/	0.4	5	5-11/	6-12/	10	4c
Kale	F3385WO	60/	4-1/	r=1	3-4	5-11/	7-14/	(6)	10
Pr:bells	*F3706KN*	70/	4-2/	n=15	7-8	6-1/	7-30/	(10)	3b
pr: hot wax	F3754HH	68/	4-2 /	n=6	7-8	6-1/	7-30/	(2)	3b
Pr: jalapeno	ours		4-2/	n=4				(3)	3b
Pr: cayenne	*3770CY*	75	4-2/	n=4				(3)	3b
Eggplant	P154	66/	4-2/	n=8		6-1/		(4)	7d

* flats: 22 rows x 14 cells; 23 rows x 13 cells

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[1] Increase spacing on ½ bed from 4" to 5". Count out seeds for 1 flat, may have to mix EW with DRs

[2] Soak in kelp overnight; if not enough chantenay, mix in danvers

[3] Potted up 5/1 n=14

[4] Bleach as tomatoes and soak overnight

WINTER CROPS: BED 8	Source	D=	sow dat targ/act	# flats	time in flat	date transpl: targ/act	date 1st yield	sq ft planted
bng onions	above	65/	7-24/	1.25f	6-8	8-21/		12
Bts:Det. Red	Above	48/	7-24/	7r	3-4	8-14/		5
Ct. Chantenay	Above	75/	7-24/	0.5f	3-4	8-17/		7.5
Parsley [1]	above	70/	8-1/	6r	7-8	8-26/	12-1/	10
cilantro (5")	ours		8-1/	8r	3-4	8-24/	10-15/	12
Dill (5")	Ours		8-1/	6r	4-5	8-24/	10-15/	6
Lettuce: 8" [2]	Ours	65	8-7/	8r	3-4	8-29/	9-25/	25
Spinach [3]	Ours	43	8-10/	6r	3-4	8-29/	10-21/	10
tatsoi (8")	F3245TO	45/	8-14/	1.5r	3-4	9-1/	10-1/	2.5
Hardy tatsoi (6")	F3198SO	45/	8-14/	1 r	3-4	9-3/		7.5
Kale (2 red, 3 white) 15"	Above	59/	8-14/	1r	3-4	9-25/		10
arugula	F3193AO	45/	8-14	1r	3-4	9-4/		w lettuce
mache (5") [4]	F3102VC	45/	8-21/	0.5f	5	9-26/	11-1/	10+40
			9-10/	1.0f	8-9	11-23/		
							Total	115
							Avail	115
Garlic [5]	Ours	*17-26*	10-1/	ds			7-14/	15

* flats: 22 rows x 14 cells; 23 rows x 13 cells

[1] Soak and rinse three times.
[2] Chill; split between lettuce, mesclun.
[3] Soak spinach prior to planting
[4] Mache: only 60% germination rate; plant enough to replace lettuce when it finishes (after thanksgiving) and then fill in when dill and cilantro finishes.
[5] Planted 183 cloves for this year (up from 165 previous year, when they were small!

COVER CROP 2008	Source	D=	sow dat targ/act	# flats	Time in flat -wks-	date transpl: targ/act	sq ft planted	bed #
Spring								
bell bean [1]	*PV SCL700*		4-4/	Direct seed			370	1b2,2b,2c,3b 3c2,4a2,4b, 5a,6b,7b,7c 12b(tomatoes) 13 (melons)
Barley, crimson clover	*F8101 F8301*		5-1/	Broad cast			250	Upper fruit
Barley, Vetch	*F8101 F8231*		5-4/	Broad cast			200	8,10
Triticale Vetch	Have above		5-4/				30	12c
Summer								
J. Millet 7"	Have		5-15 – 6-5	1-0.33 0.67	2-4	6-3/ 7-10/		3c2 5b(after peas)
Buckwheat Early in Su	Have		After lettuce	Broad cast			60	9
Oats w vetch if miss buckwheat	*CH*		After lettuce	Broad cast			60	9
Barley	Above		8-25 to 9-1	Broad cast			250	Upper fruit Bed
Fall								
Oats w vetch	Above		9-1 to 9-30				215	Early beds: 4c2 5a,5c, 9,10
Rye w vetch	*NP*		9-1 to 10-15					Later beds
Other covers								
Alfalfa	Granary	*17/*	4-1/	0.75	8	6-1/		
Timothy? [2]			"					
crim clov	F8302	*17-26*	4-1/		6-8			
Inoculants	*F8504 F8505*							

* flats: 22 rows x 14 cells; 23 rows x 13 cells

1. Rotate cover crops! Vetches, legumes, can transmit viral diseases to other legumes (peas, beans).
2. Check out tarnished plant bugs. Tania says infested red raspberries. These hang out in legumes (clover, alfalfa). See Rodale, Natural Insect and Disease Control, p. 29, color p. 264.

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[1] Soaking favas hastens germination. Soak 2-7 days, but change water twice/day

[2] Timothy is a perennial carbon crop. Often plant with alfalfa, for example. Can plant spring, fall. But wouldn't use it as an annual cover crop, as in oats, rye. Jan Holland uses it, may have seed.

d) Metrics page. The first page in our current garden year section is our “metrics” page. We will email this to any who ask.

Garden Metrics

file=c:garden/metrics.doc

Spacing Relationship

In Bed Spacing	Max # Plants/100sf	In Bed Spacing	Max # Plants/100sf	In Bed Spacing	Max # Plants/100sf
2"	5894	7"	432	15"	84
3"	2507	8"	320	18"	53
4"	1343	9"	248	21"	35
5"	833	10"	201	24"	26
6"	621	12"	159	30"	14

Compost Requirements

Amt	Per 100 sq.ft.	Per 125 sq. ft.	Per 40 sq. ft.
1" w. soil	8 cu.ft/60 gals/ 12 5-gal buckets	10 cu.ft/75 gals/ 15 5-gal buckets	3.2 cu.ft/24 gals/ 4.8 5-gal buckets
1/2" wo soil	4 cu.ft/30 gals/ 6 5-gal buckets	5 cu.ft/38 gals/ 7.5 5-gal buckets	1.6 cu.ft/12 gals/ 2.4 5-gal buckets

Cover Crop Weights

Cover Crop	BG:amt/ 1000 sf	Fedco:amt/ 1000 sf	Amt Chosen	100 sf wt	100 sf cups	125 sf	40 sf
vetch	3.4 lbs	1lb	6.8 lbs	11 oz	1.75 c	13.5 oz	4.5 oz
rye	8 oz	3-4 lbs	8 lbs	12.8 oz	1.25 c	16 oz	5.1 oz
oats	12.5 oz	3-4 lbs	8 lbs	12.8 oz	1.25 c	16 oz	5.1 oz
field peas	1.6 lbs	4 lbs	4 lbs	6.4 oz	1 c	8 oz	2.6 oz
buckwheat	26 oz	2-3 lbs	6 lbs	9.6 oz	1.5 c	12 oz	3.8 oz
fava 8"	4 lbs		320 seeds	6.3 oz	1 c	7.9 oz	2.5 oz
fava 6"	7.5 lbs		620 seeds	12 oz	1 7/8 c	15 oz	4.8 oz

In col. 4 1 doubled max. recommendation from BG or Fedco. If use mixture (e.g., oats, peas, vetch soil building mix), then cut each seed amount to 1/3.

Seedling Flat Mix Recipe (fills 2.5 flats)

10.0 gallons compost
2.5 gallons peat/sand
2.5 gallons turf loam

0.5 cups azomite
0.5 cups greensand
0.5 cups fish meal or alfalfa (nitrogen boost)

1 cubic yard – 200 gallons; 1 cubic foot – 7.5 gallons

Conversion of cow manure weights to volumes:

-- cow produces 20T manure/yr
-- 2.5 tons wet manure → 1 ton dry compost
-- weight compost: 25 lbs/cu. ft. or 675 lbs/cu. yard
-- 100 sq.ft. bed @ 1" requires 208 lbs compost or 1 ton compost will handle 10 beds 1" deep

Neo-Terra 4/3/2009

e) The permanent bed. This allows you to improve the soil year by year. The paths, also permanent, do not consume compost. The standard Jeavons bed is 5 x 20, or 100 sq. ft., but you may find a 4’ wide bed easier to reach into the middle.

Below: Three permanent double-dug beds: left to right – raspberries, vegetables, blueberries.

f) Tools.We use a number of useful but simple tools. Here they are.

Above left: Our larger tools include digging board, D-handled spade and fork (behind board), U-bar, homemade wooden seed flats, framed chicken wire “planting grid”, and sifter. Above right: smaller hand tools. We especially recommend use of a good bypass pruner (Felco are superior) and a Japanese trowel (which has an extra thick blade and one serrated edge).

Below: Where we start our seedlings. At left is the indoor three-tiered plant stand for warm-weather crops (tomatoes, peppers, basils) that need to be started early; at right is the outdoor mini-greenhouse for cold-tolerant crops and those warm-weather plants that get started in May (such as cucumbers and squash).

Above left: winter greenhouse frame of electrical metal tubing (emt) held together with machine screws.

Above right: winter greenhouse covered with Tufflite IV, UV resistant 6 mil greenhouse plastic. Our plastic is in its 11th season. We take it down in April and store it until October.

Below left: view inside our greenhouse. Below right: greenhouse under snow cover.

4) **Avoid the seduction and rhetoric of 100% self-sufficiency.** You are never going to grow enough calories in your backyard, sustainably or otherwise. We grow 90% of our vegetables and 40% of our fruit, but only 10% of our calories. On the other hand, since vegetables and fruits are largely water, by growing your own, you avoid importing water from distant places such as California, Mexico, and Chile. Your own food is fresh, full of flavor and nutrient-rich. By the way, the four highest calorie crops for us were potatoes, apples, pears, and blueberries. The highest caloric density crop we grow is burdock, at 300 calories/sq.ft. And, we achieved this past year 20% of our protein requirements, albeit vegetable protein (largest contributors were collards and Brussels sprouts).

5) **Concentrate your food-growing in one area**, so that you can fence, water, maintain, harvest and watch things easily. We learned this the hard way by digging beds all around the yard. It looked nice, but became a major maintenance headache, which we are now correcting. When we started, we did not realize that Central PA tends to the dry side, and that suburban gardens attract a lot of animal pests, including bears, deer, raccoons, groundhogs, possums, skunks, rabbits, squirrels, voles and chipmunks. The first line of defense is Da Fence! We are amazed at gardeners who garden without a fence – and then complain about critters.

Below: Our main garden, concentrated in one area, behind a fence, with 21 beds.

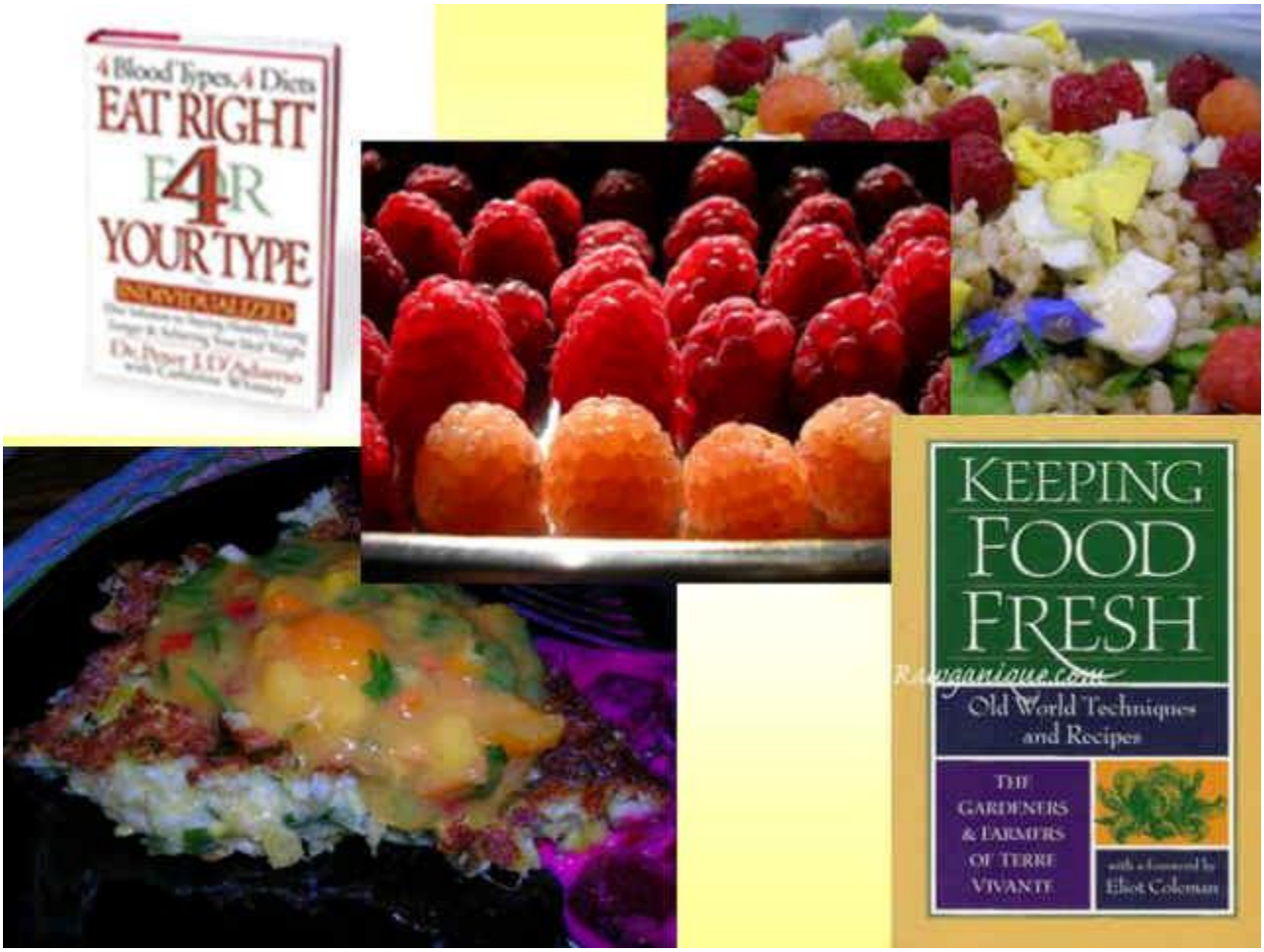
6) **Pick the sunniest location for your food growing.** Sounds obvious, but more sun gives you higher yields. Recall our yield chart: the best years for most crops occurred after we took down two large trees that shaded the garden. Pay particular attention to the way the sun's location changes during the course of the day and the growing season. We drew a sun chart to identify the best area.

Below: pick the sunniest spot for growing food.

7) **Grow food healthy for YOU.** In determining what to grow, start with an assessment of what for you and other household members constitute healthy foods and diets. Grow those foods. It is not enough becoming a raw foodist, a vegetarian, a vegan, or an omnivore. Food is not just a matter of what you like, but what likes you. That is, strive to be an informed raw foodist, an informed vegetarian, an informed vegan, an informed omnivore. The early vegetarian cookbooks, for example, were heavy on eggs, dairy, beans and rice, putting these forth merely as alternatives to fatty meat. We have come a long way since then in understanding healthy diets.

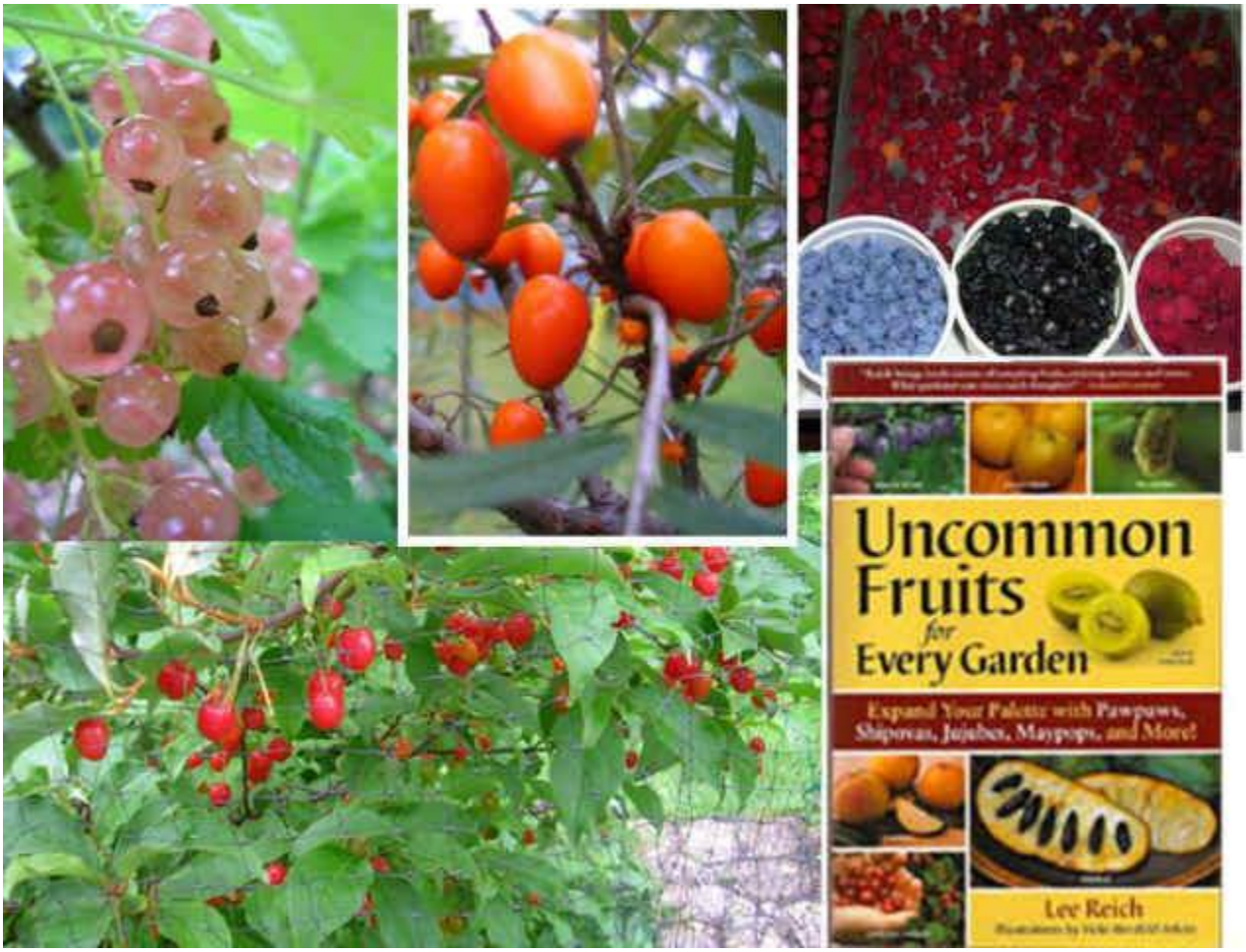
In his book "Live Right 4 Your Type," Peter D'Adamo correlates foods that are beneficial, neutral or harmful to your blood type. Gene realized that foods he had difficulty digesting were those D'Adamo suggested he should avoid. Folding in Tania's food sensitivities, we stopped growing Jerusalem artichokes, took out most of our rhubarb, and dramatically reduced tomato consumption. This freed up garden space, time and compost to grow other crops: burdock, brussels sprouts, more berries and bush fruit. Our latest addition is the goji berry which we grew from seeds pried out of dried fruit purchased from a local health food store. With our winter greenhouse, we eat fresh vegetables during the fall and winter. To store food, we dry, use lactic fermentation, and freeze fruit and some vegetables. Here, Eliot Coleman's "Keeping Food Fresh" was helpful. In adopting a new diet, take heart from nutritional scientists who determined that a dietary change followed for 18 days becomes yours. What some call "comfort foods" is a matter of bad habit. Make new habits.

Below: Grow food healthy for you – example references.



8) **Highlight bush fruit, background tree fruit.** With tree fruit, we have not been able to overcome the difficulties of slope, shade, humidity and poor air circulation. Handling diseases, insect pests, and animals have made the venture not worth the effort. We are shifting to bush fruit. Lee Reich, with his marvelous book "Uncommon Fruits for Every Garden," has made us aware of so many choices – not just delicious, but also healthy. But choose cultivars carefully. Gooseberries and juneberries for example vary considerably in habit, flavor, yield, disease and pest susceptibility and cultivation requirements. Pick your nurseries carefully. Whether you are limited in space or time, you cannot afford to waste either on generic shrubs. If something doesn't pan out, pull it and try something else. No experimentation, no learning.

Below: Consider fruit-bearing shrubs as alternatives to tree fruit.



9) **Include plants – herbs and flowers -- that for you have important other benefits.** For example plants that strengthen your immune system, help with particular chronic or acute conditions, or attract beneficials. Thus, we grow Echinacea, a beautiful perennial, whose roots we use to make a powerful tincture which boosts our immunity to colds and flu. We learned that the stronger Echinacea is angustifolia, so we began growing that, and will turn over spots occupied by Echinacea purpurea to other plants, keeping some for the bees who love the summer blossoms, and goldfinches who love the fall seeds. One recommended anti-flu remedy combines Echinacea with garlic and cayenne, so we grow all three.

Below: Echinacea angustifolia (left); Echinacea purpurea right); Gene's favorite immune system builder and cold-flu remedy: hot peppers, Echinacea tincture, garlic (lower right).

10) **Set yourself on a course to improve your competence.** Acquire good tools; try your hand at designing and building your own garden devices; use good references, field guides, cookbooks, herbal primers.

a) **Our favorite tools:** English forged steel spading shovels, Felco pruners, hori-hori trowel, kneepads, and Atlas nitrile-coated gloves.

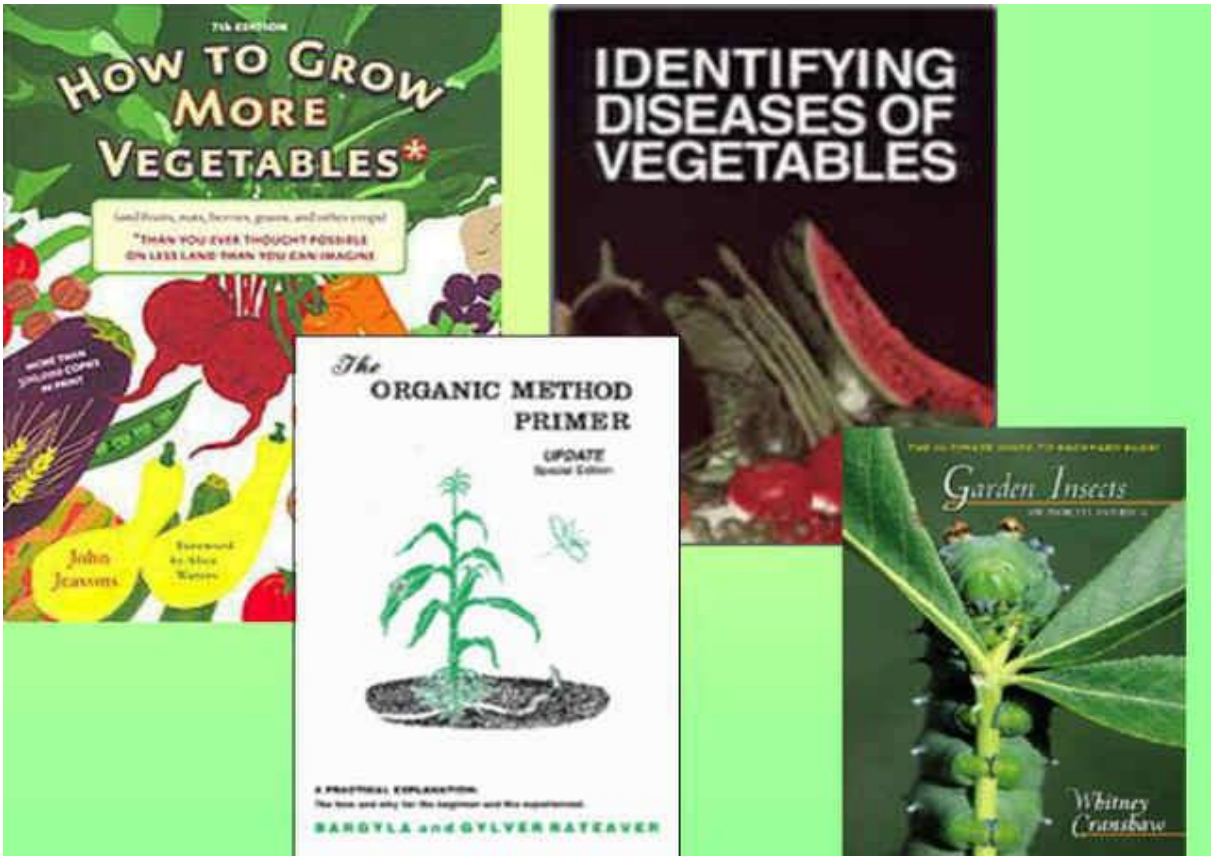
Below: Tania transplanting mache into our winter greenhouse bed with her favorite tools: English forged spading shovel and spading fork, Felco pruners, hori-hori trowel, Atlas gloves and good kneepads.

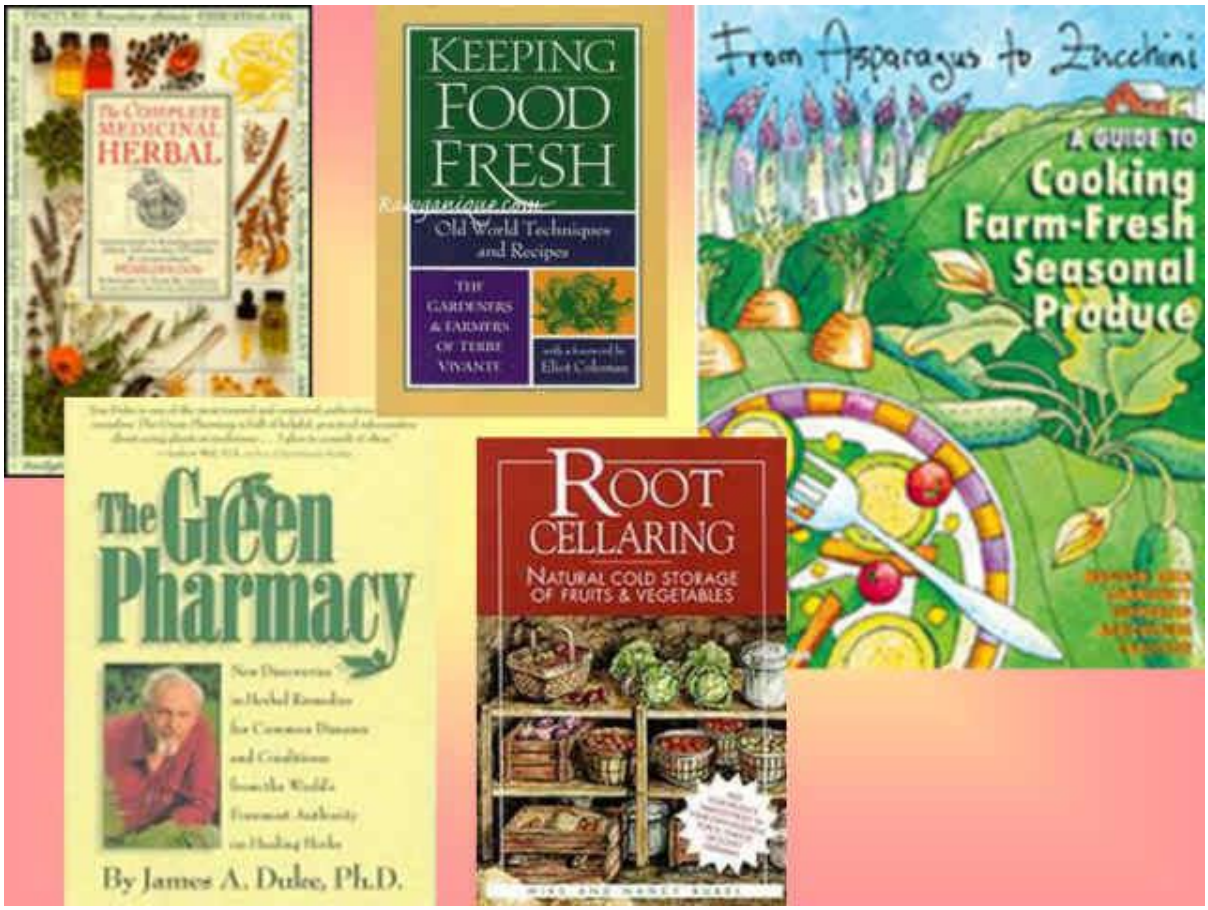
b) **Our most useful devices we made:** our mini and winter greenhouses, hog wire cages for tomatoes and tomatillos that double as plant protectors in the winter, our collapsible pea trellis, our drying rack, and a sturdy workbench on wheels.

Below: Garden devices we have built. Upper left: tomato cages from hog wire fencing (foreground), 8' stakes for pole beans (middle), pea trellis (background). Lower left: drying rack with garlic. Right: our two mini-greenhouses for starting seedlings.

c) **Our most-used references:** Bargyla Rateaver's "Organic Method Primer Update," John Jeavons "How to Grow More Vegetables," Whitney Cranshaw's "Garden Insects of North America," Lee Reich's "Uncommon Fruits for Every Garden," The Madison Area CSA Cookbook "From Asparagus to Zucchini," MacNab, Sherf and Springer "Identifying Diseases of Vegetables," Penelope Ody's "The Complete Medicinal Herbal" together with James Duke's "The Green Pharmacy," and Eliot Coleman's "Keeping Food Fresh." Our favorite seed catalog is Fedco.

Below: some of our most-used references.





11) **Lastly, create a place of beauty.** We believe the beauty of your place will creep up on you as you master these and other lessons. In retrospect, the following three aspects have helped us. First, adding edging to perennial beds keeps invasive weeds and grasses out. Second, we prefer the look of grassy paths to dirt, straw, mulch or boards. Third, we aim for **all** the senses: visual, fragrances, tactile, sounds, and of course taste.

Below: using plastic edging to separate grassy paths from perennial beds reduces weeding.

A place of beauty ….

We hope you'll dig in! Please visit the rest of our website to learn more about our work and offerings. Contact us at NeoTerraExpts@aol.com or via our contacts webpage if you have any questions on our PASA 2010 presentation.