Part 1 – Planning and Record-keeping

Tools for crop planning: Create Your Own Field Manual. *The Fundamental Four*

1. Descriptive month-by-month Calendar
2. Maps of the layout of the crops
3. Field planting schedule

### 2014 OUTDOOR PLANTING SCHEDULE

<table>
<thead>
<tr>
<th>Transpl or Sow</th>
<th>Actual Transpl or Sow</th>
<th>Vegetable</th>
<th>Variety</th>
<th>Row Ft</th>
<th>Pl/100 Ft</th>
<th>Inrow Space</th>
<th>between rows</th>
<th>Locatio n</th>
<th>Plants</th>
<th>Success?</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-Jan</td>
<td>Shallots</td>
<td>Ambition</td>
<td>90</td>
<td>220</td>
<td>5</td>
<td>DE?</td>
<td>0</td>
<td>235</td>
<td>plant all the bulbs we have</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-Jan</td>
<td>Shallots</td>
<td>Armador</td>
<td>0</td>
<td>220</td>
<td>5</td>
<td>DE?</td>
<td>16</td>
<td>plant all the bulbs we have</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-Feb</td>
<td>Spinich spr</td>
<td>Tyler</td>
<td>filter</td>
<td>200</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>If not and up for 2/21, direct sow now</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14-Feb</td>
<td>Carrots #1</td>
<td>Danvers</td>
<td>450</td>
<td></td>
<td>8</td>
<td>0</td>
<td></td>
<td>5 recorded Germ ~day 15-26</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Seedling schedule for greenhouse production of transplants

### SEEDLINGS SCHEDULE 2014

<table>
<thead>
<tr>
<th>Sow on</th>
<th>Sow and Variety</th>
<th>Row Ft</th>
<th>Pl/100 Ft</th>
<th>Plants</th>
<th>Sow</th>
<th>Unit</th>
<th>Germ.</th>
<th>Spot</th>
<th>Actual Transplant</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-Jan</td>
<td>Cabbage #1 Early Jersey Wasey</td>
<td>90</td>
<td>67</td>
<td>72</td>
<td>0.3</td>
<td>flat</td>
<td>1.8</td>
<td>10-Mar</td>
<td>1/2 raised bed, set mouse traps</td>
<td></td>
</tr>
<tr>
<td>17-Jan</td>
<td>Cabbage #1 Ferman #1d</td>
<td>90</td>
<td>67</td>
<td>72</td>
<td>0.3</td>
<td>flat</td>
<td>1.8</td>
<td>10-Mar</td>
<td>1/2 raised bed</td>
<td></td>
</tr>
<tr>
<td>17-Jan</td>
<td>Lettuce #1</td>
<td>120</td>
<td>100</td>
<td>144</td>
<td>0.6</td>
<td>flat</td>
<td>3.6</td>
<td>10-Mar</td>
<td>Sow cold hardy spring varieties</td>
<td></td>
</tr>
<tr>
<td>17-Jan</td>
<td>Onions - mini Red Marble 56d</td>
<td>80</td>
<td>280</td>
<td>176</td>
<td>1.0</td>
<td>spd</td>
<td>21-Mar</td>
<td>3-4 plants/cell. Grow as small bulb onions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-Jan</td>
<td>Tomatoes #1 Amya Apricot Ind 75d</td>
<td>4</td>
<td>50</td>
<td>2</td>
<td>3 cells</td>
<td>15-Mar</td>
<td>Hips Other Use deep 8-packs4-packs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-Jan</td>
<td>Tomatoes #1 Amya Sugar Sun 56d</td>
<td>6</td>
<td>50</td>
<td>4</td>
<td>4 cells</td>
<td>15-Mar</td>
<td>Hips Other Use deep 8-packs4-packs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-Jan</td>
<td>Tomatoes #1 Black Cherry Ind</td>
<td>4</td>
<td>50</td>
<td>2</td>
<td>3 cells</td>
<td>15-Mar</td>
<td>Hips Other Use deep 8-packs4-packs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part 2 – Feed the Soil

Cover crop opportunities

- Undersowing at last cultivation (oats and soybeans in corn shown here.)
- After vegetable crops in summer or fall, for the winter
- Frost-seeding of small seeds such as clover: Broadcast in the early morning when ground is frozen. As it thaws, the water draws the seeds down into the soil.
- Late winter or early spring, if the area will not be planted with vegetable crop until late spring. We use oats.
- In spring, between an early vegetable crop and a later one
- To replace a crop failure.

Planning is Circular, Just like Farming
Compost making
1. Hot (aerobic) compost combines 1 to 3 parts high-C materials with 1 part high-N materials in a 25:1 to 40:1 C:N ratio, and enough water to make the piles damp, enough air to keep the bacteria alive.
2. The first 2–3 days: Mesophilic bacteria active at 90°F–110°F (32°C– 43°C) begin to break down the sugars, fats, starches and proteins.
3. The next several weeks: Thermophilic bacteria increase, and keep working as long as decomposable materials remain available and the oxygen supply is adequate. Temperatures in the middle of the pile can reach 120°F–150°F (48°C––66°C). Pathogens, weed seeds and fly larvae are destroyed. Whenever the pile starts to cool, turn it because more oxygen or more water is needed. This remixes the material – ensuring all gets composted. Turning prevents the pile from overheating – above 150°F (66°C), thermophilic bacteria can die
4. When the compost stops heating, even if you turn it, the compost materials have all been consumed by bacteria and the N is converted to nitrates. The pile cools to around 100°F (37.7°C) The C is now resistant to further breakdown, and the N slowly becomes available for crops
5. Leave it to cure for about 30 days, so beneficial microorganisms can move back in. It is then ready to be used.
6. Finished compost ideally has a C:N (carbon:nitrogen) ratio of 10:1. If the C:N ratio is greater than about 25:1, almost no N is available from the compost and it is unable to mineralize. Between 16 and 20:1, about 10% of the N is available. Even at a C:N ratio of 10:1, only 50% of the N is available in the near term

Crop rotations
1. Figure out how much area is needed for each major crop (the ones needing the largest amount of space).
2. Measure and map the land available
3. Divide into equal plots
4. Group compatible crops together to fill each plot
5. Determine a good sequence
6. Include cover crops, Include no–till crops
7. Try it for one year, then make improvements
Organic mulches – straw, hay, sawdust, woodchips, tree leaves, newspaper and cardboard all add organic matter

Part 3 - Year Round Production

Direct sowing

- **Pros**
  - Less work than transplanting
  - Less money compared to buying starts
  - No need for a greenhouse and equipment
  - Better drought tolerance – roots grow without damage
  - Some crops don’t transplant easily

- **Cons**
  - Some crops have millions of plants! (Carrots)

Transplanting

- **Pros**
  - Start earlier than outside, get earlier harvests
  - Start seed in more ideal conditions in greenhouse, better germination, more fun!
  - Easier to care for new seedlings in a greenhouse
  - Protected plants grow quicker
  - Select sturdiest plants, compost the rest
  - More flexibility if weather turns bad. Plants still grow!

- **Cons**
  - Extra time caring for the starts
  - Transplant shock can delay harvest
  - More attention needed to watering new plants

Crop spacing

<table>
<thead>
<tr>
<th>Crop</th>
<th>Row spacing</th>
<th>In-row spacing</th>
<th>Notes</th>
</tr>
</thead>
</table>

### Flowchart Diagram

- June-planted Potatoes
  - Mid-season Corn, then rye & crimson clover
  - No-till past Tomatoes
  - Garlic followed by Carrots (1/2). Spring Broccoli & Cabbage, then rye & vetch (1/2)
  - Early Corn followed by fall Garlic (1/2) and oats (1/2)
- Late Corn undersown with oats (1/2), Sweet Potatoes (1/2)
- March-planted Potatoes, followed by fall-planted broccoli & cabbage, undersown with clovers
- All-year Green Fallow
- Watermelon

---

**Organic mulches** – straw, hay, sawdust, woodchips, tree leaves, newspaper and cardboard all add organic matter.
Beets
7" (18 cm)  4" (10 cm)  For early harvest
12" (30 cm)  1" (2.5 cm)  For max total yield (small).
2" (5 cm)  For bigger beets

Beans, fava
18" (45 cm)  4.5" (11 cm)  For tall varieties.
Beans, green
18" (45 cm)  2" (5 cm)  12" (30 cm)x3" (7.5 cm) gives same area/plant
Broccoli (Calabrese)
12" (30 cm)  6" (15 cm)  For equal amounts of heads and side shoots
Cabbage
14" (35 cm)  14" (35 cm)  For small heads
18" (45 cm)  18" (45 cm)  For large heads
Carrots
6" (15 cm)  4" (10 cm)  For early crops, limiting competition
6" (15 cm)  1.5" (4 cm)  For maincrop, medium size roots
Celery
11" (28 cm)  11" (28 cm)  For high yields and mutual blanching
Cucumber (pickling)
20" (51 cm)  3" (8 cm)  Max yield of hilled up leeks, average size
Leeks
12" (30 cm)  6" (15 cm)  Early crops under cover
Lettuce
9" (23 cm)  8" (20 cm)  Head lettuce
12" (30 cm)  12" (30 cm)  Baby lettuce mix
Onions
12" (30 cm)  1.5" (4 cm)  For medium size bulbs
12" (30 cm)  0.5" (1 cm)  For boiling, pickling, kebabs
Parsnips
12" (30 cm)  6" (15 cm)  For high yields of large roots
7.5" (19 cm)  3" (8 cm)  For smaller roots
Peas, shelling
18" (46 cm)  4.5" (11.5 cm)  Can sow dbl or trpl bands 4.5" (11.5 cm) apart
Potatoes
30" (76 cm)  9-16" (23–41 cm)  Depends on size; small pieces closer
Sweet Corn
30–36" (76–90 cm)  8" (20 cm)  < 8" (20 cm) plants shade each other.
Tomatoes, bush
19" (48 cm)  19" (48 cm)  For early crops
Watermelon
66" (168 cm)  12–24" (30–60 cm)  For small varieties. 5–10 ft2 (0.5–1 m2) each
66" (168 cm)  30–84" (76–215 cm)  For large varieties. 13–40 ft2 (1.2–3.7 m2) each

**Sustainable Pest Management**
4 steps of Integrated Pest Management:
1. prevention (reduce chance of problems)
2. avoidance,
3. monitoring (is action needed?)
4. suppression (using least toxic solution)

**Sustainable Disease Management**
Diseases need
- a susceptible host,
- the presence of a pathogen,
- suitable environmental conditions

**Sustainable Weed Management**
- annuals and perennials;
- stationary perennials (docks) and invasive perennials (Bermuda grass);
- cool-weather and warm-weather types;
- quick-maturing and slow-maturing types;
- “Big Bang” types (pigweed) versus “Dribblers”

**Succession crop scheduling graphs - 6 Steps**
1. Gather sowing and harvest start dates for each planting of each crop
2. Make a graph for each crop: sowing date along the horizontal (x) axis; harvest start date along the vertical (y) axis. Mark in all your data.
3. Mark the first possible sowing date and the harvest start date for that.
4. Decide the last worthwhile harvest start date, mark that.
5. Divide the harvest period into a whole number of segments, according to how often you want a new patch.
6. Figure the sowing dates needed to match your harvest start dates

### Season extension

- Growing earlier crops in spring:
  - Choose fast-maturing hardy varieties
  - Warm microclimates
  - Transplants
  - Rowcovers, low tunnels, Quick Hoops, high tunnels (= hoophouses)
- Extending the growth of cool-weather crops into summer:
  - Learn how to germinate seeds in hot weather
  - Shadecloth
  - ProtekNet to keep bugs off
  - Intercropping allows a new crop to establish in the shade of the old one
- Using spring and fall for carrots, beets, broccoli, cabbage, kale, spinach
- Extending the survival of frost-tender crops beyond the first fall frosts
- Growing cold-hardy winter vegetables

### Efficient production strategies

1. Plan ahead for success when growing a wide range of different crops and doing many different tasks each day.
2. Plant similar crops together to minimize time-consuming switching of tasks.
3. Plan roads and paths for your truck or carts to haul away the bounty.
4. Break long rows up into manageable chunks. Don’t ask anyone to haul a harvest crate more than 100ft. Keep container weight reasonable.
5. Get the tools ready before you start. Make sure there enough knives, scissors, crates, etc. for everyone
6. Set containers along the rows when you arrive. Put full ones near the path

**Harvest and Maturity Indicators**

- **Size:** Cow Horn okra at 5” (others shorter), green beans a bit thinner than a pencil, carrots at whatever size you like, 7” asparagus, 6” zucchini
- **Color:** Garden Peach tomatoes with a pink flush. The “ground spot” of a watermelon turns from greenish white to buttery yellow at maturity, and the curly tendrils where the stem meets the melon to turn brown and dry. *For market you may harvest “fruit” crops a bit under-ripe*
- **Shape:** cucumbers that are rounded out, not triangular in cross-section, but not blimps. Sugar Ann snap peas completely round
- **Softness or texture:** eggplants that “bounce back” when lightly squeezed, snap beans that are crisp with pliable tips. Harvest most muskmelons when the stem separates easily from the fruit (“Full slip”).
- **Skin toughness:** storage potatoes when the skins don’t rub off, usually two weeks after the tops die, whether naturally or because of mowing.
- **Sound:** watermelons sound like your chest not your head or your belly when thumped. Try the “Scrunch Test” – press down firmly on the melon

**Resources – General**

- [Growing Small Farms](http://growingsmallfarms.ces.ncsu.edu), Click Farmer Resources. Debbie Roos keeps this site up to the minute. Includes Farm Planning and Recordkeeping
- The Center for Environmental Farming Systems at North Carolina State University has good information on compost-making, such as Composting on Organic Farms
- Compost recipe software is available from Cornell University [www.cfe.cornell.edu/compost/science.html](http://www.cfe.cornell.edu/compost/science.html)
- Southwest Florida Research and Education Center, [www.imok.ufl.edu/programs/vegetable-hort/research-extension-ozores/veg-transplant/](http://www.imok.ufl.edu/programs/vegetable-hort/research-extension-ozores/veg-transplant/) (Information on age of transplants, container size, biological control for pests, diseases, hardening off, plant size, planting depth and temperature.)
- Jean-Paul Courtens, Roxbury Farm [www.roxburyfarm.com](http://www.roxburyfarm.com). Click the Information for Farmers tab

**Resources – Slideshows**

- Many of my presentations are available at [www.Slideshare.net](http://www.Slideshare.net). Search for Pam Dawling. You’ll find Crop Rotations; Cold-hardy Winter Vegetables; Fall Vegetable Production; Succession Planting for Continuous Vegetable Harvests; Crop Planning for Sustainable Vegetable Production; Spring and Summer Hoophouses; Fall and Winter Hoophouses
- [Planning for Your CSA](http://www.slideshare.net/pamela_dawling/Planning-for-Your-CSA): [www.slideshare.net](http://www.slideshare.net) (search for Crop Planning)
- [Planning the Planting of Cover Crops and Cash Crops](http://www.slideshare.net/danielparson/Planning-the-Planting-of-Cover-Crops-and-Cash-Crops), Daniel Parson SSAWG 2012 [www.slideshare.net/danielparson/Planning-the-Planting-of-Cover-Crops-and-Cash-Crops](http://www.slideshare.net/danielparson/Planning-the-Planting-of-Cover-Crops-and-Cash-Crops)
- [Farm Planning for a Full Market Season](http://www.slideshare.net/PamelaDawling/Farm-Planning-for-a-Full-Market-Season): Tom Peterson, Appalachian Farmers Market Association and Appalachian Sustainable Development [http://vabf.files.wordpress.com/2013/02/tom-peterson-farm-planning-for-a-full-market-season.pdf](http://vabf.files.wordpress.com/2013/02/tom-peterson-farm-planning-for-a-full-market-season.pdf)
Resources – Books
- The Market Gardener, Jean-Martin Fortier, New Society Publishers
- The Complete Know and Grow Vegetables, J K A Bleasdale, P J Salter et al.
- Knott’s Handbook for Vegetable Growers, Maynard and Hochmuth
- The New Seed Starter’s Handbook, Nancy Bubel, Rodale Books
- The Organic Farmer’s Business Handbook, Richard Wiswall, Chelsea Green
- Sustainable Vegetable Production from Start–up to Market, Vern Grubinger,
- The New Organic Gardener, Eliot Coleman, Chelsea Green
- Extending the Season: Six Strategies for Improving Cash Flow Year–Round on the Market Farm a free e-book for online subscribers to Growing for Market magazine
- Sharing the Harvest, Elizabeth Henderson and Robyn Van En
- Gardening When it Counts, Steve Solomon
- Grow a Sustainable Diet: Planning and Growing to Feed Ourselves and the Earth, Cindy Conner, (worksheet based), DVD/CD set Develop a Sustainable Vegetable Garden Plan
- Crop Planning for Organic Vegetable Growers, Daniel Brisebois and Frédéric Thériault (Canadian Organic Growers www.cog.ca)
- Garden Insects of North America, Whitney Cranshaw

Resources – Planning
- The Twin Oaks Harvest Calendar by Starting Date and by Crop are available as pdfs on my website sustainablemarketfarming.com/2013/11/07/growing-for-market-articles-2/
- AgSquared online planning software: agsquared.com
- COG-Pro record-keeping software for Certified Organic Farms: cog-pro.com
- Free open-source database crop planning software code.google.com/p/cropplanning.
- Interactive Vegetable Garden Planner, free for 30 days: motherearthnews.com/garden-planner.
- Target Harvest Date Calculator: (Excel spreadsheet) johnnyseeds.com/t-InteractiveTools.aspx
- Growing Small Farms: growingsmallfarms.ces.ncsu.edu click Farmer Resources, Farm Planning and Recordkeeping to download Joel Gruver’s spreadsheets.
- Mark Cain www.drippingspringsgarden.com under the CSA tab, you can download their Harvest Schedule.

Resources – Detailed Planning
- Tables of likely crop yields johnnyseeds.com/assets/information/vegetablecharts.pdf.
- gardensofeden.org/O4%20Crop%20Yield%20Verification.htm two charts, one of organic crops from The Owner–Built Homestead by Ken & Barbara Kern, one from California.
- Determining Prices for CSA Share Boxes Iowa State U extension.iastate.edu/agdm/wholefarm/pdf/c5-19.pdf
- Clif Slade’s 43560 Project: Virginia Association for Biological Farming newsletter vafb.files.wordpress.com/2013/08/clif-slade-43560-demo-project.pdf.
- USDA annual vegetable consumption www.usda.gov/factbook/chapter2.pdf
- John Jeavons How to Grow More Vegetables has charts: Pounds Consumed per Year by the Average Person in the US and Average US Yield in Pounds per 100 Square Feet.
- The Center for Agroecology and Sustainable Food Systems at the UC Santa Cruz Crop Plan for a Hundred–Member CSA, for a range of 36 crops in its Unit 4.5 CSA Crop Planning: casfs.ucsc.edu/education/instructional–resources/downloadable-pdf–files2 or directly at 63.249.122.224/wp-content/uploads/2010/05/4.5_CSA_crap_plan.pdf
- Jean–Paul Courtens , Roxbury Farm www.roxburyfarm.com Information for Farmers tab, 100 Member CSA Plan, including a Weekly Share Plan, Greenhouse Schedule, and Field Planting and Seeding Schedule (with charts of possible crop yields). Courtens is also willing to send you their 1,100-member schedule.