Part 1 – Planning and Record-keeping

Be clear about your goals (before choosing tools).


1. **Descriptive month-by-month Calendar**
2. Field planting schedule
3. Seedling schedule for greenhouse production of transplants
4. Maps of the layout of the crops

**Planning is Circular, Just like Farming**

8. **Where to plant each sowing of each crop:** Maps

7. **When to sow for transplants:** Seedlings Schedule

6. **Calculate sowing dates to meet harvest dates:** Field Planting Schedule

5. **How much to grow to achieve your harvest goals**

4. **How much of what to harvest when:** Harvest Schedule

3. **Which crops to grow**

2. **Which markets to sell at**

1. **How much money do you need to earn?**

11. **What to do if something goes wrong:** Plan B

10. **Adjust to make your best possible plan**

9. **Packing more in: succession plantings, intercropping, relay planting, double cropping**

12. **Record results for next year’s Better Plan**

**Part 2 – Feeding the Soil**

**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

**Twin Oaks Vegetable Rotation**

Winter Squash followed by rye and Austrian winter peas/Late corn undersown with oats (1/2); sweet potatoes (1/2) followed by wheat/ March-planted potatoes, followed by fall-planted broccoli & cabbage, undersown with clovers/ All-year green fallow/ Early corn followed by fall garlic (1/2) and oats (1/2)/ Garlic followed by carrots (1/2); Spring broccoli & cabbage, then
rye, vetch and peas (1/2)/ No-till paste tomatoes then rye and crimson clover/ Watermelon then rye and crimson clover/ Mid-season corn, then rye & crimson clover/ June-planted potatoes then rye and crimson clover.

**Cover crop opportunities**
- Undersowing at last cultivation (oats and soybeans in corn example.)
- 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.

**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

**Organic mulches** - straw, hay, sawdust, woodchips, tree leaves, newspaper and cardboard all add organic matter

**Part 3 – Year Round Production**

**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

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Notes</th>
<th>Ideal Age at Transplanting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cucumbers/Melon/Squash</td>
<td>2 true leaves max (maybe less)</td>
<td>3-4 weeks</td>
</tr>
<tr>
<td>Watermelon</td>
<td>(older is OK)</td>
<td>3-4 weeks</td>
</tr>
<tr>
<td>Sweet Corn</td>
<td></td>
<td>3-4 weeks</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>age is less important</td>
<td>4-8 weeks</td>
</tr>
<tr>
<td>Lettuce</td>
<td></td>
<td>4-7 weeks</td>
</tr>
<tr>
<td>Brassicas</td>
<td>5 true leaves is ideal</td>
<td>6-8 weeks spring/3-4 weeks</td>
</tr>
<tr>
<td>Peppers, Eggplant</td>
<td>4 or 5 true leaves. Not flowering.</td>
<td>6-8 weeks</td>
</tr>
<tr>
<td>Onions (spring sown), Leeks</td>
<td></td>
<td>10-12 weeks</td>
</tr>
<tr>
<td>Celery</td>
<td></td>
<td>10-12 weeks</td>
</tr>
</tbody>
</table>

## Optimal Plant Spacing for Vegetable Crops for Various Goals

<table>
<thead>
<tr>
<th>Crop</th>
<th>Row Spacing</th>
<th>In-Row Spacing</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beets</td>
<td>7” (18 cm)</td>
<td>4” (10 cm)</td>
<td>For early harvest</td>
</tr>
<tr>
<td></td>
<td>12” (30 cm)</td>
<td>1” (2.5 cm)</td>
<td>For max total yield (small). 2” (5 cm) in-row for big beets</td>
</tr>
<tr>
<td>Beans, fava</td>
<td>18” (45 cm)</td>
<td>4.5” (11 cm)</td>
<td>For tall varieties.</td>
</tr>
<tr>
<td>Beans, green</td>
<td>18” (45 cm)</td>
<td>2” (5 cm)</td>
<td>12” (30 cm) x 3” (7.5 cm) gives the same area/plant</td>
</tr>
<tr>
<td>Broccoli (calabrese)</td>
<td>12” (30 cm)</td>
<td>6” (15 cm)</td>
<td>For equal amounts of heads and side shoots</td>
</tr>
<tr>
<td>Cabbage</td>
<td>14” (35 cm)</td>
<td>14” (35 cm)</td>
<td>For small heads</td>
</tr>
<tr>
<td></td>
<td>18” (45 cm)</td>
<td>18” (45 cm)</td>
<td>For large heads</td>
</tr>
<tr>
<td>Carrots</td>
<td>6” (15 cm)</td>
<td>4” (10 cm)</td>
<td>For early crops, limiting competition</td>
</tr>
<tr>
<td></td>
<td>6” (15 cm)</td>
<td>1.5” (4 cm)</td>
<td>For maincrop, medium size roots</td>
</tr>
<tr>
<td>Celery</td>
<td>11” (28 cm)</td>
<td>11” (28 cm)</td>
<td>For high yields and mutual blanching</td>
</tr>
<tr>
<td>Cucumber (pickling)</td>
<td>20” (51 cm)</td>
<td>3” (8 cm)</td>
<td></td>
</tr>
<tr>
<td>Leeks</td>
<td>12” (30 cm)</td>
<td>6” (15 cm)</td>
<td>Maximum yield of hilled up leeks, average size</td>
</tr>
<tr>
<td>Lettuce</td>
<td>9” (23 cm)</td>
<td>8” (20 cm)</td>
<td>Early crops under cover</td>
</tr>
<tr>
<td></td>
<td>12” (30 cm)</td>
<td>12” (30 cm)</td>
<td>Head lettuce</td>
</tr>
<tr>
<td></td>
<td>5” (13 cm)</td>
<td>1” (2.5 cm)</td>
<td>Baby lettuce mix</td>
</tr>
<tr>
<td>Onions</td>
<td>12” (30 cm)</td>
<td>1.5” (4 cm)</td>
<td>For medium size bulbs</td>
</tr>
<tr>
<td></td>
<td>12” (30 cm)</td>
<td>0.5” (1 cm)</td>
<td>For boiling, pickling, kebabs</td>
</tr>
<tr>
<td>Parsnips</td>
<td>12” (30 cm)</td>
<td>6” (15 cm)</td>
<td>For high yields of large roots</td>
</tr>
<tr>
<td></td>
<td>7.5” (19 cm)</td>
<td>3” (8 cm)</td>
<td>For smaller roots</td>
</tr>
<tr>
<td>Peas, shelling</td>
<td>18” (46 cm)</td>
<td>4.5” (11.5 cm)</td>
<td>Can sow in double or triple bands; 4.5” (11.5 cm) apart</td>
</tr>
<tr>
<td>Potatoes</td>
<td>30” (76 cm)</td>
<td>9-16” (23-41 cm)</td>
<td>Depends on size of seed pieces. Small pieces closer</td>
</tr>
<tr>
<td>Sweet Corn</td>
<td>30-36” (76-90 cm)</td>
<td>8” (20 cm)</td>
<td>Closer than 8” (20 cm) the plants shade each other.</td>
</tr>
<tr>
<td>Tomatoes, bush types</td>
<td>19” (48 cm)</td>
<td>19” (48 cm)</td>
<td>For early crops</td>
</tr>
<tr>
<td>Watermelon</td>
<td>66” (168 cm)</td>
<td>12-24” (30-60 cm)</td>
<td>For small varieties. 5-10 ft² (0.5-1 m²) each</td>
</tr>
<tr>
<td></td>
<td>66” (168 cm)</td>
<td>30-84” (76-215 cm)</td>
<td>For large varieties. 13-40 ft² (1.2-3.7 m²) each</td>
</tr>
</tbody>
</table>
**Succession crop scheduling graphs - 6 Steps**

1. Gather sowing and harvest start and finish 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. Join with a line. Smooth the line.
3. From your first possible sowing date find the first harvest start date.
4. Decide the last worthwhile harvest start date, mark that.
5. Divide the harvest period into a whole number of equal segments, according to how often you want a new patch.
6. Mark in the harvest start dates and see the sowing dates that match those harvest dates

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**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 establishes a new crop 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**

**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** Ways to consider weeds: 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"

**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

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**Resources – Books**

- *Sustainable Vegetable Production from Start-up to Market*, Vern Grubinger,
- *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
- *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 ([www.cog.ca](http://www.cog.ca))
- *Garden Insects of North America*, Whitney Cranshaw
- *Market Farming Success: The Business of Growing and Selling Local Food*, Lynn Byczynski
- *High-Yield Vegetable Gardening*, Colin McCrate and Brad Halm, Storey Publishers
- *How to Grow More Vegetables*, John Jeavons. Has charts: *Pounds Consumed per Year by the Average Person in the US and Average US Yield in Pounds per 100 Square Feet.*

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**Resources – General**

- SARE [sare.org](http://sare.org) -A searchable database of research findings. Available to download: *Using Cover Crops Profitably and Crop Rotations on Organic Farms, A Planning Manual*
- [articles.extension.org/organic_production](http://articles.extension.org/organic_production) and [https://eorganic.info/](https://eorganic.info/) The organic agriculture community with eXtension. Publications, webinars, videos, trainings and support.
- *Growing Small Farms: growingsmallfarms.ces.ncsu.edu* Click Farmer Resources.
- 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, [https://swfrec.ifas.ufl.edu/](https://swfrec.ifas.ufl.edu/) or [https://swfrec.ifas.ufl.edu/programs/veg-hort/transplant/](https://swfrec.ifas.ufl.edu/programs/veg-hort/transplant/) (All about transplants)
- Jean-Paul Courtens , Roxbury Farm roxburyfarm.com/. Regenerative Farming Practices tab: *Soil Fertility Practices; Biodynamic Practices; Whole farm Approach; Harvest Manual; Crop Manual; Purchasing Equipment; Crop Plan for a 100 Member CSA, including a CSA Share List, Greenhouse Plan, Field Plan* (with charts of possible crop yields).
- *Growing for Market* magazine [www.growingformarket.com](http://www.growingformarket.com)
Resources – Slideshows are available at www.Slideshare.net
Search for Pam Dawling. If that doesn’t work, search my name, name of slideshow and “slideshow”

- Cold-hardy Winter Vegetables
- Cover Crops for Vegetable Growers
- Crop Planning for Sustainable Vegetable Production
- Crop Rotations for Vegetables and Cover Crops
- Diversify your Vegetable Crops
- Fall and Winter Hoophouses
- Fall Vegetable Production
- Feeding the Soil
- Growing Great Garlic
- Growing Sweet Potatoes from Start to Finish
- Hoophouse Production of Cool Season Crops
- Lettuce Year Round
- Many Crops, Many Plantings, to Maximize High Tunnel Production Efficiency
- Producing Asian Greens
- Production of Late Fall, Winter and Early Spring Vegetable Crops
- Season Extension
- The Seed Garden: Planning for seed saving and lots of vegetables to eat
- Seed Growing
- Sequential Planting of Cool Season Crops in a High Tunnel (Hoophouse)
- Spring and Summer Hoophouses
- Storage Vegetables for Off-Season Sales
- Succession Planting for Continuous Vegetable Harvests
- Sustainable Farming Practices.
- Year Round Vegetable Production
- Year Round Hoophouse Vegetables

- Mark Cain Planning for Your CSA: www.Slideshare.net (search for Crop Planning)
- Planning the Planting of Cover Crops and Cash Crops, Daniel Parson www.slideshare.net/parsonproduce/southern-sawg

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
- 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.
- www.Weatherspark.com weather and climate
- Tables of likely crop yields johnnyseeds.com/assets/information/vegetablecharts.pdf
- Clif Slade’s 43560 Project: Virginia Association for Biological Farming newsletter vabf.files.wordpress.com/2013/08/clif-slade-43560-demo-project.pdf
- USDA annual vegetable consumption www.usda.gov/factbook/chapter2.pdf
- 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_crop_plan.pdf

Resources – Season Extension

- 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
- www.motherofahubbard.com Winter Vegetable Gardening