

Organic and Intensive Gardening

ASPI Technical Series

INTRODUCTION

In organic gardening vegetables and other produce are grown using methods which are environmentally safer than mainstream farming techniques. Instead of synthetically compounded agri-chemicals (fertilizers, pesticides, herbicides, growth hormones, etc.) organic methods rely on the use of natural additives and variations in cultivation techniques to control pests, nourish plants and maintain the health of soil. Good land husbandry of the past included many organic practices such as the addition of green and animal manures and the use of composted materials and nitrogen-fixing cover crops.

In recent years the increased use of agri-chemicals has resulted in the rapid decline of soil fertility and produce quality. Soils treated frequently with pesticides and herbicides, as well as those with a low volume of organic matter (due largely to wind erosion resulting from the use of heavy farm machinery) tend to be sterile, grow weeds and disease-prone crops. Of greater environmental impact are the pesticides which can leach out and contaminate surface and groundwater. There is also concern about the health effects on humans and animals who consume chemically treated produce.

Continuous chemical treatments can be addictive to soil, requiring increasing doses to achieve the same results. Soil, like humans, can become chemically dependent. Indiscriminate use of agricultural chemicals can greatly reduce the populations of beneficial organisms in soil. This soil must go through a period of recovery (withdrawal) before life once more returns.

In central Appalachia arable land is scarce, and gardening space, especially uncontaminated soil is at a premium. The fertile bottomlands can benefit from intensive gardening techniques, which produce needed vegetables in small areas. A variety of useful methods exist including raised-bed gardening, double-dug plots, inter-cropping, season extension (see ASPI Technical Paper 7) and proper spacing of pathways and beds.

Organic and intensive gardening enable us to raise nutritious food with the least environmental impact and the greatest yield while keeping the land healthy and productive.

ORGANIC PRACTICES

Soil Enhancement

Mulching -- Covering surface areas around plants with a layer of plastic, wood shavings or chips, paper shreds or other inert materials can reduce weeds, keep the soil loose and aerated, and prevent moisture evaporation during hot dry seasons. We have not found black plastic to be the best method as it leads to burnt roots due to the heat of the sun. However, other Appalachian gardeners report good results from its use.

In addition to dead and inert materials it is possible to use living mulch in the garden. Dwarf white clover is often used. It can help suppress weeds as well as fix nitrogen. Mowing can speed up nitrogen addition, create grown-in-place mulch and reduce moisture uptake during dry periods.

mulching



Manuring and Nutrient Addition -- Green manure is a crop grown to be tilled into the soil. If leguminous, it will add nitrogen as well as organic matter. Use the proper inoculant for maximum nitrogen fixation. Non-leguminous plants add organic matter but no nitrogen. Both types make mineral nutrients more available.

Greensand, a naturally occurring mineral, is commonly used as a source of potassium. Colloidal (clay) and rock phosphate are natural mineral sources of phosphorus.

Soil testing can determine a soil's level of acidity and whether basic nutrients such as nitrogen, phosphorous or potassium are needed. Growing nitrogen-fixing cover crops through the fall (such as Austrian winter peas), or growing peas and beans during the year will add nitrogen provided the azo bacteria are present and able to work. Addition of wood ashes to a limited degree will add potassium and other nutrients and also help control pH at the desired 6.8 to 7.0 range.

Manuring and Nutrient Addition cont...

In turning under leaves in the fall BioActivator inoculation can speed the process and save nutrients. Adding manure to the soil in the spring is a traditional organic gardening practice. The manure is often made into a tea or buried within the plots in order to conserve nutrients. This preserves its quality and keeps nutrients from leaching into the waterways. Green manure can be turned under in time for the beginning of the growing season.

WEED AND INSECT CONTROL

Cultivation -- Instead of herbicide or chemical weed control agents, plowing, tilling, hoeing, and weeding are recommended. A well dug and cultivated piece of ground can yield excellent chemical-free crops. Knowing the characteristics and growth patterns of various weeds also helps. At ASPI we sow the same crops (kale, mustard, spinach, endive, lettuce or radishes) in rows in the spring and broadcast in the fall. This is because the "pink weed" so overtakes the garden in the earlier part of the year that cultivation between the rows is required. Before crops such as potatoes are peeping through the surface a good raking of the soil will disturb the weeds and give an added growth advantage to the cultivar.

Crop Furlough -- Rotating crops and not growing certain crops in alternate years are other approaches to reducing the damage done by pests. Raise a designated garden product for no more than one or two years in succession on a given plot. Rotating the crops within a garden year by year is also helpful.

Host Planting -- In rare cases certain pests have very specific appetites. Planting or allowing the growth of plants that the target insect particularly prefers can help save the vegetables. For example, we at ASPI allow wild primrose to continue to grow so that Japanese Beetles will congregate on them before moving to grapes or beans, especially pole beans (the beetles like heights) that would be a second choice. If there aren't enough substitute plants to feed the ravaging hordes of beetles they can be removed and destroyed manually.

Flowers -- Certain flowers such as marigolds ward off various insects that prey on garden plants. These can be beautiful as well.

Beneficial Insects and Parasitoids (Biologicals) -- Lady bugs, praying mantises, and other predatory insects can be used to control pests. These can be bought from several

sources for major outbreaks. Timing is critical. They can also be encouraged through the use of perennial plantings for protection. Parasitoids (parasites that kill their host) can also be effective. These include tiny wasps for caterpillars, and nematodes for a wide variety of larvae in the soil. Other biologicals include bacteria for caterpillars (*Bacillus thuringiensis*), and Milky Spore for Japanese Beetle grubs.

Manual Pest Harvest -- Careful observation will generally allow one to discover when pests make their first appearance. Potato bugs (Colorado potato beetle) should be observed early and definitive steps taken to avoid a major infestation. Hand removal of the bugs can be very effective. Some oldtimers speak of keeping geese to pick off potato bugs. As a child this author was (as I'm sure some of our readers were) sent to the fields to pick tobacco worms from the plants and destroy them. In essence, the secret to a successful manual campaign is to get there early. If the clusters of eggs are destroyed at the start of the season, the infestation can be reduced or eliminated. Allowing the pests to multiply may make manual control almost impossible.



Lures and Traps -- Some insects can be controlled with lures and traps. These range from sticky traps to bags and cans. Many of these use specific colors or sexual pheromones to attract the pest.

Soaps -- Safer's has developed selected soaps that will effectively kill insects, weeds, powdery mildew, moss, and algae. They are safe and selective, organic and biodegradable. They are often available locally.

Botanical Controls -- There are many natural pesticides, made from plants, that are effective against a wide array of pests. In place of chemical pesticides botanicals break down quickly in the environment through natural biological activity. These include Pyrethrin, Rotenone, Ryania, and Sabadilla. As they are from natural sources they are organic and biodegradable.

One of the most popular botanicals is "Sabadilla", a natural, broad-spectrum insect killer for everything from cabbage worms and cucumber beetles to citrus trips and leafhoppers. It is made from the pulverized seeds of a lily-like Caribbean plant. Products of this type can be obtained from Necessary Trading Company P.O. Box 305 New Castle, Virginia 24127.

INTENSIVE GARDENING

Planning the Garden -- It takes planning for a gardener to grow large amounts of vegetables on a very small amount of land. Drawing up a garden plan is a good exercise for a cold winter's night. Plot out the amount of land needed per person (we have a one-twentieth of an acre plot on which we seek to meet the produce needs of one person). What vegetables are preferred? Variety is essential for ecological balance so do try to grow about 40 plant types if possible. Divide these varieties into three classes (2-3 staples, 5-6 middle use and preserved vegetables, and a large number of herbs and small use items for seasoning and occasional dishes each year. ASPI has determined that potatoes and turnips are root crop staples with tomatoes as a third staple; beans, lettuce, onions, peppers (sweet and hot varieties), squash, and cucumbers are middle use items and a host of others are small use items. In addition permanent plots or settings of rhubarb, strawberries, horseradish, mint, comfrey, and raspberries are at the boundaries of the garden for additional occasional delights.

Note that corn is omitted. However, if the garden is slightly more extensive, we suggest a combination of American Indian origin. Allow beans and squash to climb corn stalks while providing lower story ground cover. Also, note that early spring dandelion, which provides about 10 percent of our greens for the year is not cultivated nor exterminated from the beds. When the spring turning of the soil occurs, the naturally occurring dandelions are harvested plot by plot, while the tap root is allowed to continue for the following year. Another wild plant, poke, grows in beds or along the boundaries for an early spring equivalent to asparagus.

Jerusalem artichokes, (sunchokes) can be a good staple. They are perennial like horseradish. You never get all the roots and those you miss will grow the next year. Sunchokes are a native plant extensively utilized by the Cherokee.

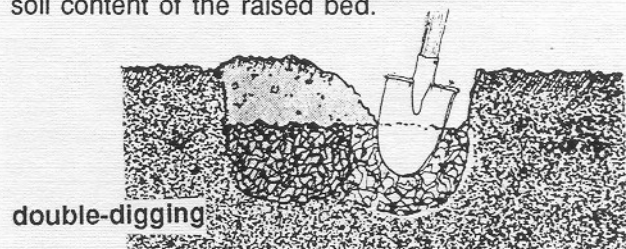
By nature some crops are more intensive than others, so determine the quantity of basic staples desired and the space required to raise that amount. When planning for small spaces, remember that root crops are more intensive in production than grains. However, some root crops like parsnips take the entire growing season while others grow in far shorter periods. With a short harvest time two or three crops can be grown on the same plot each year. If one wishes to make potatoes and turnips the staples, then plot yield per bed or garden unit. Each year allow for 1/6 of the land to be furloughed.

Since potatoes and turnips may be grown and harvested at different times it is possible to grow both on the same land within a growing season. Potatoes are planted about March 17 and harvested in July whereas turnip seed is sown in mid-August and harvested in middle autumn. The ASPI experimental plot has about one fifth of the growing space allotted to potatoes/turnips. Since tomatoes, the third staple, are grown from about the first of May and harvested until frost in mid or late October, early spring greens could be interplanted with tomatoes.

Mapping the Garden -- Some prefer to be spontaneous in setting up the garden each year. Others are more meticulous. For the planner we suggest a map of the property with the beds numbered. The position of vegetables relative to each other can be recorded at the beginning of each month. Planning for multiple crops on the same plot could be a determining factor.

Raised-Bed Gardening -- One basic method of bio-intensive gardening is to keep soil loose. Raised beds are ideal for getting air to roots. These beds can be tended easily and allow for border plantings to overlap the surrounding paths eliminating the need for further mulching. Borders may be wood, plastic, rock or other materials

Double-dug Plots -- This technique consists of digging down one spade length and then a second for loosening effects. While the topsoil is turned over, the lower level is simply loosened in place. [See Diagram] Note that combined double-dug, raised bed gardening is also possible. Consider removing topsoil from the path way and using that material for some of the soil content of the raised bed.



Paths and Proper Spacing -- Some think addition of pathways in an intensive garden cuts space, but that may not be true. Crops such as beans, peppers and tomatoes can hang over the pathways allowing for movement through without stepping on the beds. (A cardinal rule is "stay off the beds".) We at ASPI fill the pathways with sawdust, which decomposes in a relatively short period of time and can then be raked back into the beds as a soil amendment the following year. Thus the path becomes a compost area.

Placement of Vegetable Varieties -- Placing vegetables in certain areas of the garden according to height and size may be a necessity when space is tight. Usually taller plants such as pole beans, okra, sunflowers, and some staked tomatoes are placed to the north with smaller plants to the south. This develops a staircase pattern.

Other factors to consider in placement include sun requirements. Care should be taken to place those in need of the most sun, such as celery, in sunny spaces and those that need less (cucumbers, etc.) in shaded areas. Also of importance are moisture requirements. Note: overly wet soils may require drainage.

Inter-planting -- Spacewise, a number of crops can grow well with others. This involves starting a new crop while the older one comes to maturity. Lean tall plants combine well with squat and spreading ones, provided there is enough variation in rates of maturity. For instance, onions nearing maturity can be surrounded by beans. Salsify is a slow growing crop and again beans can be inter-planted and harvested sometimes before the salsify is ready late in the fall. Celery is a slow growing plant and can be inter-planted with mid-summer beans before it is harvested. Radishes are good candidates for inter-planting with a variety of greens and other vegetables and herbs.

Season Extenders -- Reemay is a loosely woven polyester fabric which can be used to prevent frost from gathering on plants and keep the ground warm at night in chilly climates. It can also lessen the intensity of sunlight during hot periods if needed. Reemay is recommended for covering strawberry beds all winter long.

In general any method of extending a garden either backward into late winter or forward into the late fall or early winter will increase yields. We at ASPI have found that Japanese radishes are an excellent extended crop. If the top of the root is covered with soil or mulch a late summer planting could be harvested well into the winter. The same is true for turnips, carrots, parsnips, garlic, and potatoes.

Demonstrating the Garden -- A demonstration site needs to be marked at times when people have difficulty recognizing the plants in each plot. A map posted at the entrance or an observation point keeps visitors out and yet allows them to monitor the garden's progress. Inter-planting with flowers always enhances the garden aesthetics.

SOURCES

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EKAT, 150 Gravel Lick Rd, Dreyfus, KY 40426-9700.

Rincon Vitova Insectaries, P.O. Box 95, Oak View, CA 93022.

Safer's Soaps, 189 Wells Ave., Newton, MA 02159, (800) 544-4453.

Pest Management Supply, P.O. Box 938, Amherst, MA 01004, (800) 272-7672,

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Ecological Agriculture Projects, P.O. Box 191, Macdonald College, 21,111 Lakeshore Rd., Ste-Anne de Bellevue, Quebec H9X 1C0, CANADA publishes information on organic gardening and farming.