WASATCH COMMUNITY GARDENS

ORGANIC STANDARDS FOR A SMARTER, MORE SUSTAINABLE FOOD SYSTEM

Wasatch Community Gardens (WCG) uses natural and biological farming methods that nourish the health of people and the land. Commercially, this type of agriculture is regulated as "organic" by the US Department of Agriculture. While our programs are not certified organic, **we do not permit anything that does not meet organic standards in our gardens (with the exception of non-organic seeds and plant starts).** For community gardeners, use of non-organic products may result in loss of gardening privileges and forfeiture of crops, so please ask your WCG Garden Coordinator if you have questions about which products meet our standards.

Organic agriculture is often described as "sustainable," because it maximizes the use of local and renewable resources while producing many environmental benefits, such as improved soil fertility, enhanced water retention, pollinator-friendly habitat, and increased biodiversity. Within WCG programs, we also create spaces for physical exercise, time spent outdoors, and social connections – all essential to human well-being.

The reverse is often true of modern industrial agriculture (usually called "conventional"), which grows vast fields of genetically uniform crops and relies heavily on petroleum, patented seeds, synthetic fertilizers, and toxic pesticides. While driving substantial growth in crop yields, the benefits of the industrial approach have mostly favored large machinery and chemical companies, at the expense of small family farms and rural communities. Industrial practices also entail many environmental *disservices*, such as harming beneficial insects, loss of biodiversity, contamination of waterways, depletion of soil and aquifers, and higher greenhouse gas emissions[1].

In a world of exponential population growth (as well as rising meat consumption and food waste), industrial farms are said to be necessary because they produce more food on the same amount of land than organic farms – around 10-20% more, on average[2]. However, industrial practices require far more energy to achieve those yields[3], and continue to deplete resources such as fossil fuels, groundwater and topsoil at unsustainable levels. As our culture shifts toward more efficient appliances, transportation, and energy production, agriculture must learn to do better with less. Highly resource-efficient organic practices can offer farmers high profits and competitive yields over the long term[4], while enhancing soil quality and the resiliency of crops to handle drought conditions[5] – something we can anticipate in a warming global climate.

As an organic gardening organization, WCG recognizes that agriculture has more to offer than a temporary boost in yields. Organic growers are tasked not only with feeding people in the short term, but creating a healthy environment and food system that is viable in the long run. Such an approach requires more than just substituting chemical fertilizers and pesticides with organic ones. It requires practices that are more "knowledge-intensive" than "resource-intensive," and demands a better understanding and reliance on the natural cycles and relationships within local farm ecosystems. This document serves as a primer for that knowledge, but whole volumes could be written on the subject. **Please explore the world of sustainable agriculture further by attending WCG workshops, or with the following suggested readings:**

The Essential Urban Farmer, Novella Carpenter
The New Organic Grower, Eliot Coleman
How to Grow More Vegetables, John Jeavons
Gardening – an Ecological Approach, Fred Montague
A Guide to Common Organic Gardening Questions, Utah State University Extension
Secrets to Great Soil, Elizabeth Stell
Seed to Seed, Suzanne Ashworth
Organic Gardeners Handbook of Natural Pest and Disease Control, Barbara Ellis and Deborah Martin
What's Wrong with My Vegetable Garden, David Deardorff and Kathryn Wadsworth

Pesticides and Ecosystem Management

Personal health concerns lead many people to choose organic food, because industrially grown produce contains more pesticide residues than organic produce[6]. Even though these pesticides are probable carcinogens, suspected hormone disruptors, neurotoxins, and developmental or reproductive toxicants, their residue on foods can exceed government safety limits (1-3% of domestic foods and 9-13% of imported foods exceed the limits according to recent FDA Pesticide Reports). Concerns also remain over how the limits themselves are established, the effects of exposure on children and pregnant women, the long-term effects of multiple agrochemical exposures[7], and the so-called "inert" ingredients within pesticides that may also be harmful[8].

The widespread environmental contamination caused by pesticide use – the effects of which are unknown to regulators in some cases – are often more concerning. For example, Atrazine, the most commonly used weed killer in the US, is found at high levels in many drinking water sources, requiring tremendous resources to remove (In 2013, over 1000 Midwestern water districts won a $105 million settlement against the manufacturer as compensation for the cost of filtering the chemical). Frequent pesticide use also increases populations of chemical-resistant pests, while harming the beneficial insects we actually want in the garden, such as honeybees.

Thoughtful garden design can prevent many pest issues from occurring in the first place. For instance, choose **disease-resistant vegetable varieties** that thrive in our region, plant them in **soil rich in organic matter**, and establish them well before the summer heat**.** Always **rotate crop locations** each year to prevent insects and diseases from getting out of control. Crop rotations can have the additional benefit of conserving soil nutrients while increasing nitrogen to the soil. For example, planting "nitrogen-fixing" crops like peas, favas, and beans can resupply the soil with some of the nitrogen that will be used by a future crop such as corn. **Succession planting** applies these concepts in a single year. For example, peas are grown in spring, followed shortly after by cucumbers, and then replanted with garlic in the fall, all in the same location.

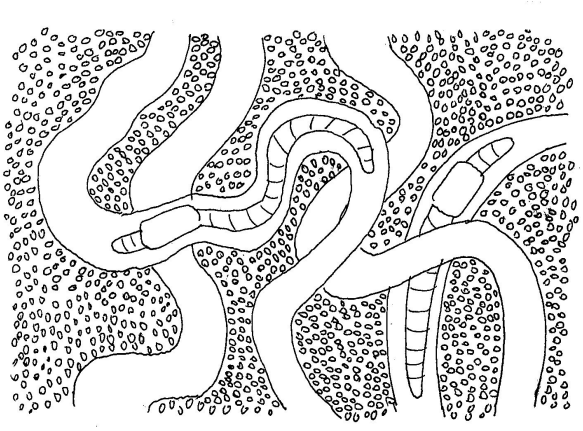
Companion planting uses vegetables with different qualities – height, pest resistance, leaf canopy, etc. – to suppress weeds and pests. One traditional example is the "three sisters" of corn, beans, and squash. The corn provides a trellis for the soil-enriching beans to grow on, with the broad-leafed squash crowding out potential weeds. This kind of **"polyculture"** – especially when using different varieties of each vegetable type – greatly enhances disease-resistance, with companion plants creating alternative targets for pests or attracting helpful predators and parasites to your garden. For instance, many beneficial insects are drawn into gardens by flowering perennial herbs or native plants. An intentional planting of such crops is called an **insectary. Trap crops** can be planted on the perimeter of your garden to provide a tastier meal to pests than the vegetables you want to eat yourself.

The preventative practices above are essential as a first line of defense, but your garden will still require regular monitoring throughout the growing season. While some degree of pest presence is normal, prompt diagnosis at the first sign of infestation is important to catch pest issues before they get out of control. We highly recommend using the **Utah State University (USU) Extension's Plant Diagnostic Hotline** at (385) 468-4828. If **immediate organic measures** are needed, the best practices below can be an effective strategy against a variety of pests, and are safest to use. However, many organic products can still be highly toxic to you, beneficial insects, or plants. Take precautions and follow directions.

Pest Issue	Recommended Best Practice	Meets Organic Standards	NOT ALLOWED
Aphids	Spray with jets of water; introduce beneficial insects (ladybugs, praying mantids, etc)	Neem oil	Bifenthrin (Bug B Gon), etc
Earwigs or Slugs	Traps (beer for slugs, cardboard rolls for earwigs); diatomaceous earth	Phosphate for slugs	Metaldehyde (Slug and Snail Bait), etc
Spider Mites or Flea Beetles	Spray with water; Homemade garlic-oil-pepper sprays; insecticidal soap spray	Nicotine for spider mites; Spinosad for flea beetles	Acetamiprid, Permethrin, etc
Squash bugs	Regularly hand-pick eggs and adults; trap crops; floating row covers	Pyrethrins	imidacloprid (Alias), Carbaryl (Sevin), etc
Powdery Mildew	Remove infected leaves; increase air circulation by staking and not overcrowding	Neem oil; preventative applications of sulfur	Penthiopyrad, quinoxyfen, etc
Weeds	Hand-weeding; thick mulch; allelopathic cover crops; cardboard (on pathways)	Solarization; Vinegar spray; Ascetic acid concentrate	Trilluralin (Preen'n Green), Roundup,etc

Fertilizers and Soil Health

Pesticides may receive the most public attention, but the environmental effects of fertilizers deserve equal concern. Through a process known as Haber-Bosch, the Hydrogen from natural gas is combined with Nitrogen from the air, under intense heat and pressure, to create synthetic fertilizers. As the human population doubled during the last fifty years, these fertilizers played a central role in unlocking the potential of crops to produce more food.



However, fertilizer manufacture also represents the single largest non-renewable energy cost in industrial farm production – and contributes significant greenhouse gas emissions in the process. Unfortunately, most of this energy is wasted, because synthetic fertilizers readily leach out of soils, and only a fraction are absorbed by the crops they were intended for. The remainder drains into waterways, causing "dead zones" where agrochemicals spur the growth of vast blooms of algae, which in turn remove the oxygen in the water that aquatic organisms depend on. Nearly half of surveyed US rivers and streams are considered "impaired" – with agricultural cited as the main cause. As the most pervasive chemical contaminant in the world's aquifers, fertilizer Nitrate is a potential health concern for people as well, although there is substantial disagreement among scientists on the issue.

In addition to nitrogen, the two other macronutrients essential for plant growth are phosphorous and potassium. However, in Utah it is usually unnecessary to amend with phosphate sources (like **Soft phosphate [colloidal]** and **bone meal)** or potassium sources (like **greensand** and **wood ash**). In fact, you can do harm to your crops by having too much of a good thing, so consider **testing your soil** for deficiencies before amending. USU Extension offers soil testing for a small fee.

There are many organic alternatives to the immediate shot of plant nutrition provided by synthetic fertilizers. **Composted plant materials** feed soil organisms with organic matter first, releasing nutrients slowly as they break down into forms that plants can use. Carbon-rich compost also improves your soil structure by increasing water retention and aeration. **Mulches** of leaves, spent crop residues, and even some commercial waste products like coffee grounds can be allowed to break down on the soil surface, while feeding the worms too.

Cover crops of winter rye, peas, buckwheat, hairy vetch, etc are grown to improve soil conditions in the garden when it is not being used for active vegetable production. Cover crops are also called "**green manures**" because they can provide the same benefit as animal manure (organic matter and nitrogen), but from a plant source. Like mulches, cover crop residues can be left on the surface, tilled in, or harvested and composted to add their nutrients. When incorporated into annual garden rotations, cover crops provide added benefits of suppressing weeds, preventing erosion, conserving moisture, increasing biodiversity, and attracting beneficial insects.

Herbivore manures are high in nitrogen and other nutrients. Make sure that the manure has had time to age, because fresh manure can burn your plants with high nitrogen levels, and may harbor harmful organisms like e. coli. Also, be careful of adding manure each year - it can be high in salts that need time to leech out of the soil. **Worm castings** (poop) are an excellent source of slow-release nutrients. **Compost tea** is a liquid solution formed by submerging compost in water, and is a general-purpose fertilizer with high concentrations of nutrients and beneficial microbes. **Fish emulsion** is another liquid fertilizer, and like compost tea, is applied directly to plant leaves or the soil. **Alfalfa meal, soy meal, feather meal, fish meal,** and **blood meal** are useful general purpose fertilizers, but take special care with applying too much, as you may "burn" your plants. **Kelp meal** can provide a boost of **micronutrients**.

Recommended Best Practice	Meets Organic Standards	NOT ALLOWED
Locally-sourced amendments such as compost; cover crops; aged herbivore manure; worm castings; compost tea	Fish emulsion; blood meal; fish meal; feather meal; Non-GMO alfalfa and soy meal; Kelp meal; soft phosphate or bone meal (if tested soil is deficient)	All synthetic chemical fertilizers (ammonia, urea, Miracle Grow, etc); GMO or pesticide treated alfalfa/cottonseed/soil meal; treated sewage; acid-treated phosphates (superphosphate)

Genetically Modified Organisms and Farm Biodiversity

In addition to synthetic fertilizers, much of the gains in food production over the last half-century have come from plant breeding techniques that cross two distinct, but inbred, plant varieties. These high-yielding "hybrid" crops perform vigorously in the first growing season only, so their seeds need to be repurchased annually. Such commercialized seeds were well suited to the industrial farming package of high off-farm inputs, and largely ended the ten millennia-long practice of farmers saving their own heirloom seeds to adapt them to their particular growing conditions.

Recently, genetically-modified (GM) crops took this development even further by applying bioengineering techniques. Their adoption by nearly all US non-organic corn, soy, sugarbeet, canola, and cotton growers has resulted in some mixed results compared to previous industrial farming methods. For example, GM crops containing the natural pesticide *Bacillus thuringiensis* (Bt) have decreased the spraying of synthetic insecticides, and "Roundup Ready" GM crops have reduced the soil erosion caused by tilling for weed control, even while encouraging the skyrocketing use of the Roundup herbicide.

Although regulators consider GM crops to be "substantially" similar to non-GM plants in terms of nutrition and toxicity, the long-term health effects of GM crops are still unknown[9] and the chemicals used to grow GM crops deserve as much scrutiny as other industrial practices. For example, the World Health Organization now classifies glyphosate, the active ingredient in Roundup, as a probable human carcinogen[10]. Environmentally, the spread of GM genetic contamination to non-GM crops through cross-pollination is an ongoing concern, as well as effects of GM crops on beneficial insects and wildlife, even if they are less harmful than other conventional insecticides.

At the same time, the control of seed resources has become increasingly concentrated in the hands of a few multinational agribusinesses (most notoriously Monsanto, which aggressively targets farmers for patent infringement who knowingly save and replant seeds with GM traits). The widespread adoption of genetically uniform hybrid and GM seeds, and the monocultures in which they are grown, has resulted in a steep loss of genetic diversity on the farm. In most cases, only a handful of genetic ancestors account for the entire national harvest of major cash crops such as corn. And over the last century, an estimated 90% of commonly grown vegetable and grain varieties have been lost. Such declines are troubling because diverse plant species and varieties form a vast reservoir of inheritable traits – from disease resistance to salinity tolerance to ability to handle drought – that are indispensable as plant pests and climate patterns continue to shift.

Growing a **diversity of plant varieties and species** can reduce pest concentrations while promoting genetic vibrancy. **Saving your own seeds** each year can further contribute to crop resiliency, as you select for varieties that do best in your area – and even breed new ones! C**ertified organic seeds and starts** are bred to excel under organic conditions.

Recommended Best Practice	Meets Organic Standards	NOT ORGANIC, BUT *IS* ALLOWED BY WCG
Locally-adapted, organically grown heirloom ("open pollinated") seed	Certified organic heirloom and hybrid seed; organic starts	Non-GM conventionally grown heirloom or hybrid seed; conventionally grown starts

Notes:

1 Gomiero, Tiziano, et al. "Environmental Impact of Different Agricultural Management Practices: Conventional vs. Organic Agriculture," Critical Review in Plant Sciences, 2011. www.biobio-indicator.org/publications/Gomiero_2011.pdf

2 Ponisio, Lauren, et al. "Comparing the yields of organic and conventional agriculture," Proceedings of the Royal Society B, 2015. http://rspb.royalsocietypublishing.org/content/282/1799/20141396

3 Lynch, Derek, et al. "The Carbon and Global Warming Potential Impacts of Organic Farming: Does it Have a Significant Role in an Energy Constrained World?" Sustainability, 2011. www.mdpi.com/2071-1050/3/2/322/htm

4 Delate, Kathleen, et al. "A Review of Long Term Organic Comparison Trials in the U.S.", Sustainable Agrriculture Research, 2015. www.ccsenet.org/journal/index.php/sar/article/download/50095/26951

5 Pimentel, David, et al. "Environmental, Energetic and Economic Comparisons of Organic and Conventional Farming Systems," Bioscience, 2015. http://bioscience.oxfordjournals.org/content/55/7/573.full.pdf

6 Smith-Spangler, Crystal, et al. "Are Organic Foods Safer or Healthier Than Conventional Alternatives?: A Systematic Review," Annals of Internal Medicine, 2012. http://annals.org/aim/article/1355685

7 Jaeger, James, et al. "Endocrine, Immune and Behavioral Effects of Aldicarb (Carbamate), Atrazine (Triazine) and Nitrate (fertilizer mixtures at Groundwater Concentrations," Toxicology and Industrial Health, 1999. http://journals.sagepub.com/doi/abs/10.1177/074823379901500111

8 Cox, Caroline, et al. "Unidentified Inert Ingredients in Pesticides: Implications for Human and Environmental Health," Environmental Health Perspectives, 2006. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1764160/

9 Domingo, Jose "Safety Assessment of GM Plants: An Updated Review of the Scientific Literature." Food and Chemical Toxicology, 2016. http://www.sciencedirect.com/science/article/pii/S0278691516301934

10 Portier, Christopher, et al. "Differences in the carcinogenic evaluation of glyphosate between the International Agency for Research on Cancer and the European Food Safety Authority (EFSA)," Journal of Epidemiology and Community Health, 2016. http://jech.bmj.com/content/early/2016/03/03/jech-2015-207005.full

Illustrations by Natalie Allsup-Edwards