

Teaming with Nature - Yards without Chemicals and Growing Nutrient-Dense Vegetables

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Introduction

For centuries there was little difference between the manner in which nature thrived and man cultivated land for domestic uses. Starting in the 1850's with advent of synthetic fertilizers, and especially during the 1900s, farming became more technical. Farmers began using chemical pesticides, chemical fertilizers, genetically modified plants, new machinery, and new tillage practices. Almost all new technology was designed to grow plants and food efficiently. This indeed achieved large scale efficiencies never seen before. Unfortunately, many of those practices led to significant losses and degradation of soils. Homeowners' yards, vegetable gardens and agricultural lands were all compromised. For a large part of the world, we lost our natural way of gardening and farming and the derived benefits.

Fortunately, we have recaptured an understanding of how nature works. Understanding the following and other natural principles will provide guidance on how to make the chemical-to-natural conversion.

- Everything in nature is connected, i.e. what effects one factor effects another -- treat the plant-soil system as one entity.
- Plants and animals are designed to be healthy, i.e. they have an inherent immunity to insects and disease – treat the cause not the symptoms.
- Optimal plant development occurs with a continuous flow of nutrients – use slow release fertilizers, including foliar sprays.
- Biological diversity is nature's insurance system -- use heirloom seeds and companion plantings.

In this presentation, we outline how homeowners can return to a natural way of caring for yards and gardens with the results of healthier plants, fewer insects and diseases, and nutrient-dense vegetables. References to 'synthetic' or 'chemical' refer to products that are man-made and references to 'organic' or 'natural' refer to products that are naturally occurring and/or minimally processed.

Part 1 – Yards without Chemicals

Three-step Conversion Process

The chemical-to-natural conversion is best accomplished by following a simple 3-step process. Although simple in concept, diligence to the practical details of each step is required for complete success.

Step 1 – Get your Yard off 'Drugs'.

Stop using synthetic fertilizers, insecticides, herbicides, fungicides and all other 'cides'. Almost all are harmful to the beneficial organisms in healthy soil. Note: Recently (March 20, 2015) the herbicide Glyphosate (RoundUp), and insecticides Malathion and Diazinon were classified as "probably carcinogenic to humans" by the International Agency for Research on Cancer, the specialized cancer agency of the World Health Organization. For personal safety avoid human contact.

Step 2 – Change your Yard's Diet to Natural Products

A common characteristic of organic/natural fertilizers and amendments is that they do not destroy beneficial microbes in the soil but rather enhance them. In addition they provide the slow and continuous release of nutrients for optimal feeding of plants. These features distinguish natural/organic products from the more water-soluble synthetic fertilizers and pesticides that are detrimental to soil microbes and provide uneven flow of nutrients to plants.

Before deciding on your natural products, obtain a soil analysis to determine which minerals are needed and in what amounts. Then use natural products like:

- Compost, alfalfa meal, feather meal, or blood meal for Nitrogen (N)
- Soft Rock Phosphate for Phosphorus (P)
- Green Sand, Kelp or natural potassium sulfate for Potassium (K) Dolomitic
- Limestone for Calcium (Ca) and Magnesium (Mg)
- Borax for Boron (B)
- Azomite (volcanic ash) for 60-70 trace minerals

The amount and frequency of use will be guided by your soil analysis.

Step 3 –Improve the Soil Biology (Increase the Organic and Microbial content)

Healthy soil contains a wide variety of living species that include bacteria, fungi, protozoa, nematodes, and arthropods, many of which are microscopic in nature. An acre of healthy soil typically contains 1-2 tons of these species. These organisms function in a manner analogous to the food chain that exists in our above-the-ground environment. Importantly, the microbes generate nutrients from the organic matter and minerals in the soil and then ‘feed’ them to the plants. Healthy populations of these microbes are maintained by adding grass clippings, compost, compost tea, and/or dried molasses to the soil. Mycorrhizal fungi, one of thousands of these microbial species, are unique in that they attach to the roots of plants and provide a biological extension of plant roots for extraction of water and minerals from the soil quite distant from the plant. These fungi also produce enzymes that serve as ‘antibiotics’ to control many harmful microorganisms. Soil microbes help generate healthy soil and healthy soil leads to healthy plants. That’s the power of natural/organic systems. That’s the way it was created. It’s Nature’s way and it works.

Managing Insects and Diseases

Insects and diseases are the appropriate response to the existing conditions. The conditions may be environmental stress but are often a nutritional and/or pesticide issue – too little, too much, toxic types, etc. Pesticides typically kill more beneficial than targeted pests. Research has shown that insects are attracted to weak, unhealthy plants which are often the result of using toxic pesticides and fertilizers. Should pests persist, environmentally friendly products like neem oil, soybean oil, insecticidal soaps, diatomaceous earth, and Bacillus thuringiensis (BT), may be used for control. Four major types of living organisms generally cause plant diseases: fungi, bacteria, viruses and pathogenic nematodes. Disease problems are situations in which these microorganisms have gotten out of balance. Natural, disease-controlling products don’t kill disease organisms but rather stimulate beneficial organisms that bring harmful organisms into balance. For example, powdery mildew can be controlled with applications of compost tea that contains bacteria and fungi. Applying biologically active compost or corn meal will control Brown Patch, a fungal disease.

Managing Weeds

Thick healthy turf significantly reduces weeds. In non-turf areas, mulching will greatly reduce the germination of weed seeds. For weed control use the following combination of ingredients: 1 gallon 10% vinegar, 1 oz. orange oil, 1 tablespoon of molasses and 1 teaspoon of liquid soap. Use only on weeds in dormant grass or weeds in mulched areas. It will kill actively growing turf. Do not apply in vegetable gardens.

Watering

Organically amended soils retain more moisture. For example, by increasing the organic content by 1 percent, a 10,000 square foot area will retain an additional 4000 gallons of water. In addition, the organic content significantly increases the soil’s ability to retain cationic nutrients like Calcium, Magnesium, Potassium and Sodium. It’s a win-win situation for the plant and the homeowner.

Summary – Observed Benefits of Going Natural/Organic

- No turf thatch, no aeration required, no winter kill, no turf replacement
- Healthier plants – reduced pests
- Reduced watering needs, reduced overall costs
- Reduced human and pet exposure to toxins
- Reduced pollution of the environment

Keys to Success

- Diligence to the process Patience
- Learning as you proceed Good
- Record keeping

References Books

Organic Lawn Care Manual by Paul Tukey

Organic Management for the Professional by Garrett, Ferguson and Amaranthus
Teaming with Microbes by Lowenfels and Lewis

Teaming with Nutrients by Lowenfels

Organic gardening is an adventure with many benefits...for both you and your plants. Give it a try. It's fun and rewarding!

Part 2 - Growing Nutrient-Dense Vegetables

It's not surprising that the general public is mostly unaware of what constitutes nutrient-dense produce. Nutrient-dense vegetables generally are not available in grocery stores and markets. Conventional farmers are mainly concerned about yields, not high nutrition, so they are of little promotional help. Their standard practices include chemical fertilizers, pesticides, and genetically modified seeds, with high production goals. Fortunately, we already know a lot about how to grow nutrient-dense produce. The core practices go beyond just growing organic produce. Reaching the nutrient-dense goal is most often a long-term process but can be achieved by most gardeners.

Definition Nutrient-dense produce has high levels of minerals, and the appropriate nutrient balance. Produce that is grown in toxin-free soils, with ideal mineral, organic matter, and biological diversity conditions will generally be more nutrient-dense. The produce will have higher sugar and protein content, and a greater specific gravity. These factors will contribute to longer shelf life, and increased resistance of the plants to insects and disease. The higher sugar content will also impart increased frost resistance. The plants will have stronger stems (more solid), with less lodging, and have improved flavor.

Nutrient Density is measured with a refractometer. It measures the solids, i.e. the density of the minerals in the plant juice. Specifically, it's the amount of sucrose, fructose, vitamins, minerals, amino acids, proteins, and other solids that are found in the juice of the produce. As a rule, you measure the part of the plant that you eat, or the most recent mature leaves. We call the readings the Brix levels, named after a German chemist, who developed it.

Although testing produce for nutrient density is a relatively simple process, getting the organic matter, microbial populations and all the minerals in the proper amounts and ratios is far more challenging. Note in the examples below the big differences in nutrient content between the Bey Entry and the USDA Composite Standard.

Butternut Squash	Bey Entry	USDA Composite Standard
Brix Level	12.9	8.4
Dry Matter %	25.6	13.6
Protein (grams)	4.4	1.0
Free Nitrates	360	210
Ca, mg	53	48
P	166	33
K	1025	352
Mg	51	34
Cu	.50	.07
Fe	.80	.70
Zn	.48	.15
Mn	.10	.20
Final Score (Weighted by Daily Requirements)	132.8	61.7

Getting Started Many people have limited gardening space, so plan, plan, plan. First, based on space and what you like and will eat fresh, decide on what you will grow. Second, grow some crops that store well, or that you will can, freeze, or dry. If space allows, grow and eat a variety of vegetables. As you gain gardening proficiency, consider crops that do well under season extension techniques.

A very important step is selecting the best garden site possible. Most people won't have many options on this, but go with the area with the most sun. Stay away from the drip line of trees and find the area with the deepest top soil and fewest stones. Ideally, you

also want an area that has not had pesticides and chemical fertilizers applied in the past. Use non-contiguous areas. The garden can be a single plot or many small plots. Produce can be grown as a border around your house.

Specific Gardening Techniques It is the soil, and the soil nutrition that primarily determines the nutrient density of fruits and vegetables. Weather factors are important, but the soil must be healthy if it is to perform its primary functions. A healthy soil functions effectively in water infiltration and storage, digestion of organic matter, recycling of nutrients, and supplying plants with water and nutrients. Healthy soils must also contain major and trace minerals at the proper levels. The techniques that help the soil fulfill these functions are explained in the 10 steps listed below. John Jeavon's book, *How To Grow More Vegetables*, is an excellent source for details on gardening (growing soil) in a sustainable manner.

1. Use Minimum-Tillage to Produce a Living Soil. Minimum-tillage makes sense from the viewpoint of reducing energy costs, improving soil quality, and increasing productivity. Minimum-tillage results in more beneficial bacteria, fungi, earthworms, etc. -- the organisms that are continuously digesting and relocating organic matter. Tilling can negatively impact the physical properties of the soil by destroying the soil structure, i.e. the way soil particles are held together.

2. Keep the Soil Covered at all Times. Where the soil is continuously covered by plants and/or their residues is likely a garden as nature intended. Soil covers protect the soil aggregates from beatings by the rain, suppress weeds, keep the soil cool and moist in warm summers, and promote soil microbial activity.

3. Grow Diverse Crops Throughout the Year. Growing many different species of plants, over time and space, increases the number and varieties of soil microbial populations and is an insurance program against disease and pest problems. Sugars, made from the diversity of plants, are released from plant roots into the soil. In the soil, the sugars serve as food for soil microbes, which in turn decompose organic matter into nutrients that support plant growth. This is the natural soil development process. Diversity includes using cover crops (e.g. oats, Austrian winter peas, buckwheat, clover, and rye) for soil improvement as an essential part of the crop rotation system. Always keep a cover crop on the garden over the winter.

The three practices listed above are aimed at maximizing the physical and biological activity in the soil. They speed up the natural soil development processes and will lead to healthy soils, healthy plants, healthy produce and healthy consumers. These steps take little or no input from outside the garden area. While not entirely free, they are low-cost gardening techniques, that move us in the direction sustainable gardening.

4. Mineral and Nutrient Management. The kind and amount of supplements to apply to your garden soil will depend primarily on the original rock material and past fertilizer practices. In general, remineralization will mean adding mined and minimally processed rock and organic minerals. Materials like alfalfa meal, soft rock phosphate, lime, kelp, wood ashes, epsom salts (for Magnesium), borax, and many others may help to correct mineral shortages. Do not add fertilizers unless until you know they are needed. Excess of any mineral can create a deficiency in another. A soil test is absolutely needed to determine the necessary soil additives. This is a topic that deserves additional attention. See book, *The Intelligent Gardener (Growing Nutrient-Dense Food)* by Steve Solomon with Erica Reinheimer. For additional help, see the following web sites: www.growabundant.com www.AdvancingEcoAg.com and www.IntAgLabs.com

Most garden soils will benefit by adding compost. In addition to organic wastes from the kitchen and dead garden materials, consider growing grains and other plants strictly for making compost. Use the compost sparingly and wisely. Excessive amounts of compost can lead to higher than necessary nitrogen levels in the soil, excess nitrates in the produce, and encouragement of insects. Four to five percent organic matter in the soil is sufficient.

5. Raised Beds are optional, but a very useful technique. Raised beds drain more quickly and warm up faster in the spring. They have better aeration, which promotes better microbial activity and growth.

6. Double-Digging improves aeration and biological activity in most soils. This results in deeper soils and deeper plant root development.

7. Energy Enhancement with Paramagnetic Rock. Plants require magnetic energy to grow. Obviously, the sun is a major energy source, but don't ignore energy enhancements that come from planting by the signs of the moon. Likewise, take advantage of enhancing magnetic energy (required for all living things to grow), through the use of (sometimes called lava sand) for increased growth rates, earlier maturity, and improved cold hardiness in all plants.

8. Structured Water is another excellent energy enhancement. Simple, but effective devices that create vortices, is all that is required for adding energy to water. These flow-forms have been used for centuries. In short, water molecules that flow through these devices becomes less clustered (thus softer), the energy of any "pollutants" is neutralized, and the energy of the good minerals in

the water are enhanced. As a result, plants grow faster and remain more healthy than plants with city water, often loaded with chlorine. See www.harmonygardens.blogspot.com for details on experiments with these water structuring units.

9. Use Heirloom Seeds and Save Seeds. Heirloom seeds exist for the major garden crops. Once you have them, take the extra effort to save seeds or vegetative starts for subsequent years. The fruits and vegetables from the heirlooms will generally be more nutrient-dense. Work with neighbors and friends and plan for sharing seeds.

10. Become a Careful Observer, Study, and Share Information with Others. If you have the impression that all gardening practices and biological processes are interrelated, you have it correct. Interconnectedness is the way Mother Nature has designed the system to work. That may be disconcerting to you as you try to understand what is happening in your garden, or it may be troubling as you try to prioritize your gardening activities. Do not become overwhelmed with understanding all the interconnections. Just remember, they serve as an insurance program for how your plants grow and survive. Nature's system is designed so that life might flourish. Our job is to work in harmony with Nature, to help the world move to the goal of living sustainably and providing people with 3 healthy meals a day. With diligence and persistence, all those who share in the adventure will be blessed.

None of us can outsource our responsibility to take care of ourselves and the earth. When we work to breathe life back into the soil, we take one big step to improving our health, and that of others. Start the process by visualizing the whole world as a garden, and taking care of it as our stewardship imperative. We have a finite and limited opportunity -- one chance, one lifetime to do it right.