

The Synergistic Vegetable Garden

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We have inherited an agriculture which has always disturbed the soil in order to prepare the next crop. The ancient agricultures of the Inca, the Maya, and the Orient also prepared fields in such a way. Culturally, that gesture has been honored and sung by poets. Ecologically, pedologically, it is a catastrophe.

A natural, non-traumatized soil presents a subtle balance of thousands of diverse organisms. From friendly bacteria to fungi, the presence of all these invisible subtle lives allows interactions according to the "Synergetic Effect." Among the dynamic processes in the soil, I think that the Ethylene-Oxygen cycle is a good example of this wonderful world. The entire availability of mineral nutrients from the soil depends upon the alternation of aerobic and anaerobic conditions at microsites throughout the soil mass, yet the act of plowing destroys the very anaerobic conditions that allow ethylene gas to be produced and which make mineral uptake by plants possible. Our conventional agriculture remains ignorant of this fundamental science.

What could we give back to the soil that would bring back its wildness? We cannot recreate that quality if we keep on destabilizing the rhizosphere. The only way is to learn an agriculture that will reconcile the maintenance of soil wilderness and the production of crops.

This I have endeavored to do for over 20 years, and as the system evolved, using the self-fertility of the wild soil as fertilizer, I have given it the name Synergistic Agriculture. This can be practiced at any scale. The machinery used in the U.S. and Canada for no-till agriculture can be used for Synergistic Agriculture.

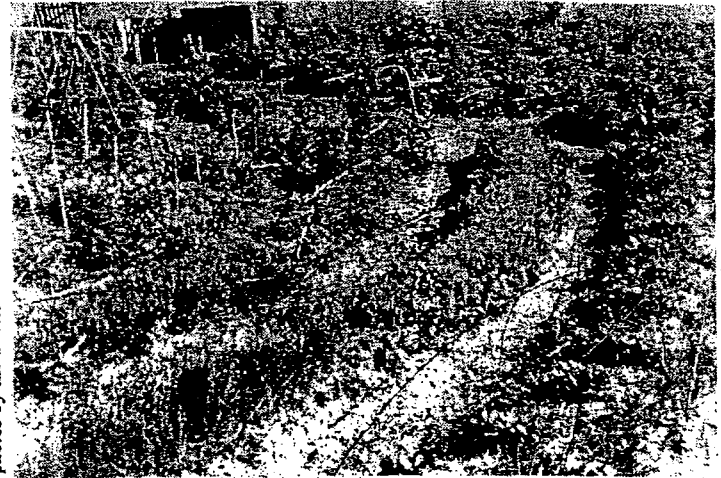
Evolution of the Method

The foundation of my research is the system described by Masanobu Fukuoka, whose book, *The One Straw Revolution*, changed my life in 1977 when it was published in English and I read it. He described a way of cultivating cereals, vegetables, and fruits which was free of the plow and of chemicals. Nothing was added to the soil except the straw from the crops which had grown in it, seed for the next crop, and the manure of ducks allowed to glean and graze following each harvest. Instead, he used a leguminous crop such as clover to suppress weeds and fix nitrogen. The animals hastened the breakdown of organic material which fed a lively community of soil organisms: this was the basis of fertility. Fukuoka harvested two crops per year from his land in southern Japan and achieved yields equivalent to the best returns of chemical agriculture in the district. At the time he wrote he had already done this for 30 years with no loss of fertility in the soil.

In Fukuoka's Natural Agriculture, no machines are used, nor greenhouses, nor all these things we have to do when working in difficult climates. To me, what seemed the most important was to be able to obtain crops without "exploiting" or exhausting the soil, even if a compromise were needed regarding machines.

Before finding Fukuoka's work, I had been working around Alan Chadwick in Santa Cruz, California in the late 60s, learning his methods of biodynamic and French Intensive gardening (double-dug beds).

From reading Ruth Stout's books (also in the 60s) (5, 6), I learned to cover the garden beds with diverse materials. She used deep mulch, renewed it frequently and fed the soil under the mulch with everything from her kitchen and all the weeds of her yard. Try to get her books if you are interested in soil self-fertility—she is truly a pioneer in this field.



photos by the author

Garden layout showing mulched paths, raised beds, and trellis.

Since then, in all my gardens I have made raised beds, though the difference in volume comes only from the soil taken off the paths and put onto the beds—no double-digging stuff for me.

In 1985 during the first Permaculture Design Course in the Pyrenees with Seigo Jackson, Marc Bonfils gave a presentation on cereal production in a self-fertile way. His method is based on the use of traditional varieties suited to winter dormancy and a long cycle of growth, surface sowing of the seed at wide intervals (to eliminate competition between plants for water and nutrient) into a living mulch of perennial clover, timing of the sowing to coincide with summer availability of nutrients in order to establish for the plant a strong root system capable of carrying it through the winter, encouragement of tillering and side shoots, and the return of all straw and organic wastes to the field. The soil is never plowed after establishment of the system. And all fertility is generated by the activity of microorganisms in the soil.

Today, microbiologists like Alan Smith and Elaine Ingham are presenting much needed evidence of the reasons to stop altering soil's structure and stressing it to exhaustion by plowing.

A Succession of Cultures

I could not call any of this "do-nothing" agriculture since on the contrary there is much to do to establish a succession of cultures where what you are harvesting is as important as what

you are leaving behind. A detailed plan indicating the plants, mixtures, and successions is a must. The cultivator must also pay attention to the kind of root residue the soil is receiving, and be ever mindful of combining the crop with nitrogen-fixing plants of the legume family.

Although to begin, a big upside-down job could be done, once we start the garden, we pay dear attention not to disturb the soil deeper than the sowing depth and only where it is sown.

Organic matter in the soil is consumed by the chemical reaction that follows when atmospheric gasses are mixed with the soil by plowing. Although by mineralizing humus, a quick, instant fertilizer may be produced, the price to pay for this is much too high. Plant growth and health depend on other substances like ethylene gas which enhances the assimilation of iron and other essential nutrients; and ethylene is only generated and conserved in soil which is not disturbed. Plants will be healthy if all the digestive flora of the soil are present.

Transforming Carbon to Humus

Soil and plants are a single organism. Plants are the "antennae" of the soil, capturing light and creating solid, organic, vegetable matter in the space above the ground. Fully 95% of needed nutrients come from a synthesis of gas and light. In other words, the plant is only taking from the soil 2.5% of its needs in the form of minerals and trace elements. The remaining 2.5% of nutrients is the nitrogen which can be obtained in a symbiotic way by interplanting with nitrogen-fixing plants, mainly from the legume family, like beans, chickpeas, fava beans, lentils, and peas.

Harvesting is as important as the rest. The soil is a living mass of interacting beings and they all eat just like everything alive on this planet. Their food chains are wonders of intricate relationships covering the mineral, the vegetable, and the animal/insect/bacteria worlds.

Even in agricultural conditions, from the moment we stop creating stress in the soil with our "well-intentioned" plowing disturbances, we can organize our garden in such a way that the soil functions as if "in the wild." The great bulk of what has grown in the soil must be left in it, either by its roots (if it is an above-ground crop), or by following a root crop with another crop which will leave a generous amount of root matter in the soil, like Swiss chard.

Those residues, together with a biodegradable mulch, amount to surface composting, leaving more organic matter in the soil than the crop has removed. From the moment we stop mineraliz-



Uneven aged plants together

ing humus (by eliminating the plow), litter accumulates on the soil; and at a myriad of microsites within it, happy bacteria, cycling back and forth between ethylene and oxygen, release biological gas essential to the wellbeing of all types of roots, as continuously access the mineral fertility of the soil in the rhizosphere precisely where the plant roots can best assimilate it.

The Model of Nature

The less we disturb the soil, the more diversity and intensity of interactions will take place in its mass, the healthier the plants and the fewer problems for us. It is time for us to acknowledge that the soil needs to be itself while we produce our crops; to respect this organism enough to let it function in its natural way although "domesticated" by our technical care.

The organisms in the soil are like the bloodstream of the human body, carrying nutrients and participating in the assimilation of the minerals present.

Above the ground, leaves act like photovoltaic cells, capturing light and producing energy. The only bridge between the inorganic chemistry of the atmosphere and the organic world is this fantastic alchemy performed by plants. And all life depends upon it.

It always struck me as funny, that in the wild, plants are the first link of food chains and are seen as responsible for the creation of "soil," but in agriculture, they are accused of exhausting the soil. Very typical of *Homo occidentalis*, a scapegoat has been made responsible for the negative effect of plowing: the crops!

The soil should never be opened up and force-fed, not even with the best made compost, ever. Leave to the soil only what has grown in it, and the rest put above the soil, as mulch. And let the whole of the soil occupants bring this inside its mass.

I truly believe that as long as we have not made peace with the soil, we won't find peace above it either. As long as we justify the exploitation of this organism, other exploitations will follow. And we will remain parasites, consuming more than participating in the miracle of life.

Further Readings

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