

The Practice of Synergistic Agriculture

For Home and Commercial Gardens

In an earlier article for this magazine I tried to suggest how our preconceived ideas, the very common sense of our agricultural practice, have resulted and continue to result in the destruction of great swathes of even the most fertile soils worldwide. But words are cheap. How many words have already been and will continue to be raised against this destruction, yet it continues apace! It would seem that words themselves cannot teach. Perhaps, at best, they can only allow us to unlearn something because, as is becoming ever more obvious: **interpreting the world is not enough; it is also necessary to change it.**

In this article I hope to unlearn our reliance on the relentless round of activities we have developed for the growing of vegetables; digging, fertilizing, weeding and spraying by describing in clear detail the practice of Synergistic Agriculture. However, I also hope to suggest further simplifications of this agriculture developed by Emilia Hazelip, to continue the movement toward the Natural Agriculture of Masanobu Fukuoka. Indeed, as each synergistic gardener becomes more experienced, so the human input reduces and nature takes over. To adopt and adapt a Fukuokan metaphor drawn from the art of sword fighting, ‘Scientific agriculture uses all possible techniques at its disposal, ever-increasing the number of swords, while Synergistic Agriculture attempts to reduce techniques becoming the one-sword school, whereas Natural Agriculture tries to render all techniques useless, thereby becoming the no-sword school’.

First and foremost Synergistic Agriculture begins with the construction of raised beds by taking the topsoil from dedicated walkways. This is a one-off construction undertaken to produce the best possible conditions to create permanent beds where soil can find its natural balance. Fukuoka explains the importance of piling soil in this way;

“Another good method is to pile soil up to create high ridges. This can be done using the soil brought up while digging contour trenches with a shovel. The dirt should be piled around coarse organic material. Better aeration allows soil in a pile of this sort to mature more quickly than soil in a trench. Such methods soon activate the latent fertility of even depleted, granular soil, rapidly preparing it for fertilizer-free cultivation.” NWF p142

The practical detail of raised bed construction can be found in the sidebar below, however, I would like to discuss here what I consider to be the true heart of Synergistic Agriculture, the actual planting schemes developed by Fukuoka and Emilia. For permanent cultivation systematic rotation schemes must be set up to provide for soil enrichment by leguminous plants, the replenishment of organic materials by gramineous plants, the deep working and conditioning of the soil by cruciferous root vegetables and the pest and disease reduction and beneficial effects of the segregation or combination of the potato, gourd and mustard families with the interplanting of the lily, mint, carrot and daisy families. The aim is to change from the existing short-term, monoculture rotations designed to benefit man to long-term, polyculture rotations that benefit the earth. **By dispensing with the work of tilling, fertilizing, the spraying of synthetic chemicals and eventually even weeding, the**

ultimate aim of this agriculture is to return to the fertility of undisturbed nature itself.

Unfortunately, space constraints allow discussion of only one scheme in detail, however, it is hoped that this will provide the background by which readers can implement the other rotations given following typical planting densities, seeding procedures and plant care (see table below).

First it is necessary to understand the spatial orientation of a raised bed, this includes; a flat central surface up to 1m width, bordered by sloping edges of about 20cm, with the space above and below the soil surface adding another important dimension when considering planting schemes and also the length of the bed which dictates the number and type of scheme chosen. In small-scale home vegetable production the rotations given here can be mixed together, whereas on larger or commercial surfaces the rotations become more ordered and follow more closely the schemes below.

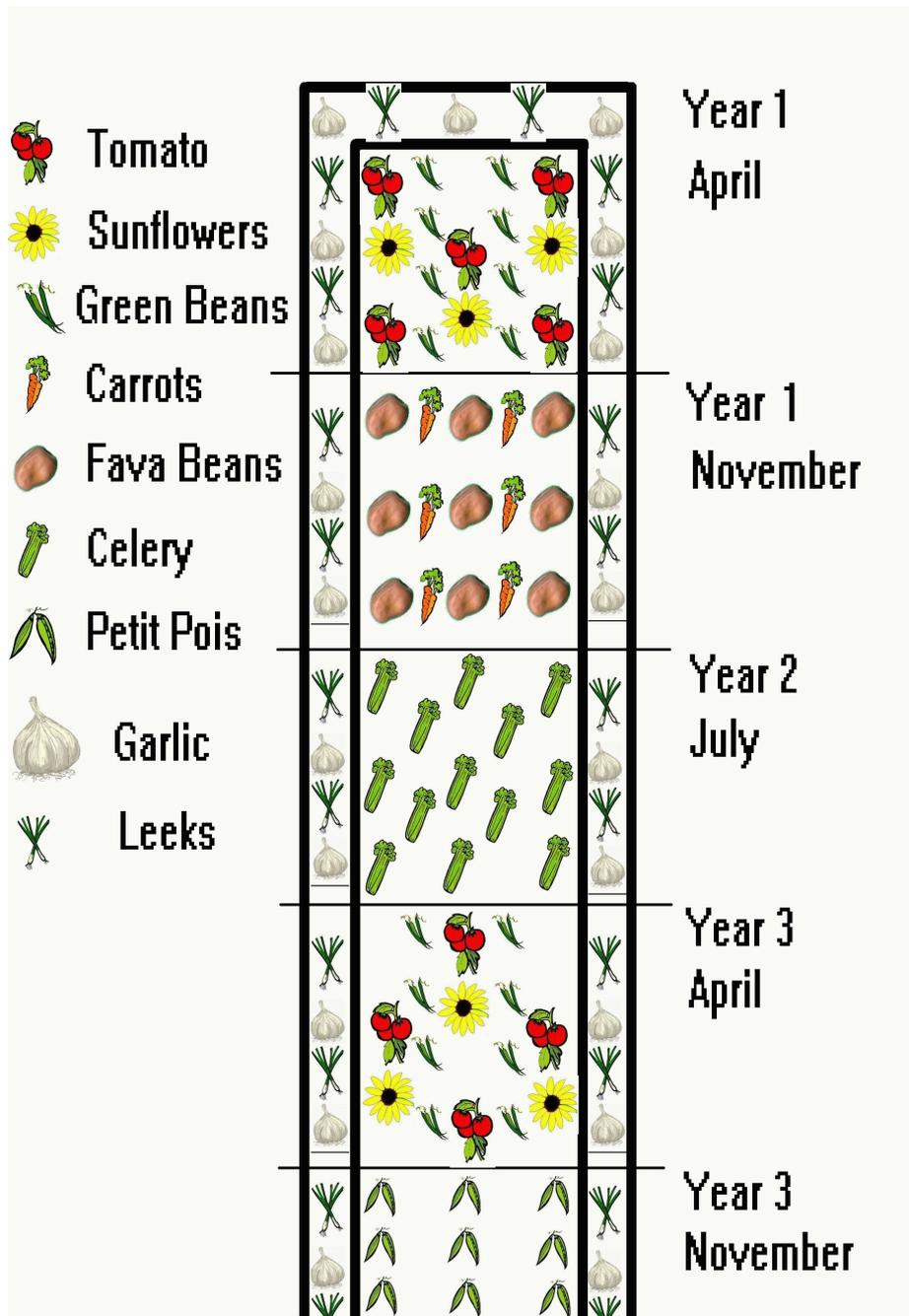
Synergistic Agriculture also relies on one further dimension for overall health; time.

Edges – Irrespective of the choice of main crop on the central surface the plants to grow on the edges remain the same. The allium family is the most useful because they naturally exude fungicides, antibiotics and insecticides which helps protect all the other crops. The alliums can be interplanted with crops of fast growth such as lettuce and chicory and with nitrogen fixing crops such as lentils and chickpeas. On the border between the edges and the central surface cultivate a line of green beans or climbing peas. If you should find volunteers of the leguminous family growing in the edges do not pull them unless they become invasive. Weeds have been described as simply plants growing in the wrong place or similarly as plants we have not yet found a use for. However, these volunteers help tell gardeners something of the state of their soil and are part of the total equilibrium of the garden – **the incidence of weeds reduces as the soil moves toward a mature balance.**

<u>Edge Plants</u>	<u>Orientation</u>
Garlic	South, East and West
Onions	South, East and West
Leeks	North and East
Chives	All
Spring Onions	All
Shallots	All
Lettuces	All
Chicory/Endive/Witloof	All
Lentils/Chick Peas	All

Tomato Rotation (see illustration below) – Year 1: Plant tomatoes after the last frost in 3 lines 40cm apart and 80cm between each plant within line; seed sunflowers within line 20cm from each tomato, allowing vining tomatoes to climb. Seed the remaining central surface with pockets of green beans in 2 lines offset 20cm from the tomato lines and 30cm apart within line. For small seeds the mulch should be drawn aside for the soil to warm and the seeds to germinate. For larger seeds it is just necessary to place them under the mulch for germination. In this and all synergistic rotations herb and flower plants are seeded here and there into the main rotation crops

to create a more diverse and natural planting - **beneficial plants include; basil, borage, marigold, calendula, nasturtium, tansy and lemon balm; plants such as rue, wormwood and nicotinia work well planted on the bed borders to discourage pests.**



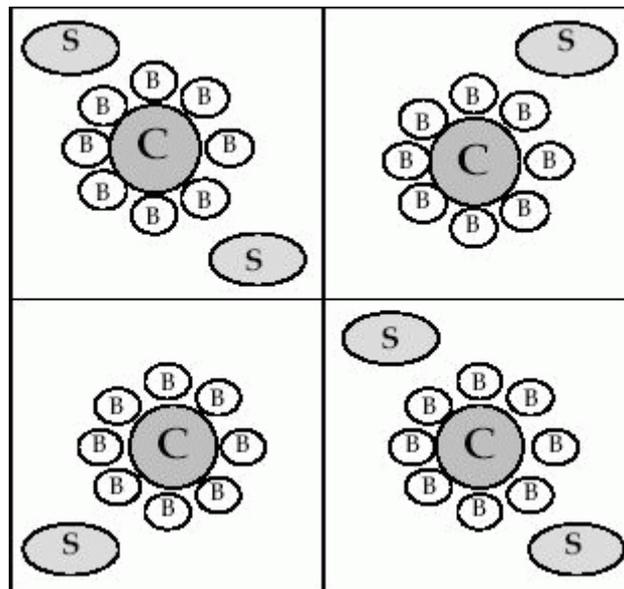
From late summer as the crops begin to fade seed fava beans into the central surface within the tomato lines in pockets of 3 beans every 60cm. Seed carrots amongst the green beans as they fade, making 2 rows 20cm wide between the fava. The old plants should be cut above the soil and used as mulch – **plants should never be pulled as this disturbs the soil and this includes any weeds.**

Year 2: Seed celery in 5 lines corresponding to the preceding cultures and mulch as it grows and harvested continually.

Year 3: In the following year the celery should be cut just below the ground to kill it and then tomato, sunflower and green beans should be transplanted and interseeded into this mulched bed as before, but each line of tomatoes/sunflowers should be offset within line by 40cm and the green beans by 10cm. From late summer again as the crop plants fade, seed petit pois thickly within the tomato lines. Seed within the green beans lines with winter radish or turnip. **Harvest some root crops and leeks by cutting above the surface encouraging new growth and enabling several croppings. To kill the plants cut below the surface of the soil or allow them to go to seed.**

Year 4: The combined tomato culture can be planted again and the whole cycle of succession continued indefinitely.

It is worth noting here that such planting schemes have a long and successful history, the use of ‘ The Three Sisters’ of North America is a good example. The Zuni Indians of the South West of the USA developed a simple mixed planting scheme called a Zuni Waffle (see illustration below) combining a main crop of maize that helped support the climbing runner beans, which in turn fed through nitrogen fixation the hungry squash – and, of course, in the tomato scheme described above maize can easily be exchanged for sunflowers.



Zuni Waffle

But Synergistic Agriculture, in its movement toward Natural Agriculture, attempts to simplify and refine its approach in order to reduce human work so that natural processes dominate. Tomatoes are a good example of how rotations can be reduced and permanent beds created because they like to grow in soil where tomatoes have already been grown. This allows for the maximisation of companion plants for tomatoes, both in the preceding crop, such as alliums, celery, chicory, lettuce, spinach, radish or fava beans, and in contemporaneous crops such as alliums, parsley, basil, borage or haricot. Where pest and disease problems are not a problem, and this agriculture reduces such problems because of its reliance on diverse life, other plantings schemes (see table below) can be reduced to in-bed successions e.g. melons, courgettes, peppers, broccoli, aubergines. **Remember the heavy feeding main crop is planted into the root systems of the preceding leguminous crop.**

Next Page: Table of Example Vegetable Rotations

yr	Bed 1	Bed 2	Bed 3	Bed 4	Bed 5	Bed 6
1	May	May	May	May	July	March
1	Tomatoes	Melons	Courgettes	Peppers	Broccoli	Cabbages
1	Green Beans	October	Green Beans	Petit Pois	Green Beans	Petit Pois
1	Sunflowers	Onions	September	September	Onions	June
1	Nov	Petit Pois	Spinach	Onions		Leeks
1	Fava		November			
1	Carrots		Petit Pois			
2			Garlic			
2	July	June	July	July	May	April
2	Celery	Beetroot	Swiss Chard	Rocket	NZ Spinach	Petit Pois
2		March	November	Green Beans	Petit Pois	June
2		Spinach	Fava	September	August	Celeriac
2		Fava		Lettuces	Radishes	
2				Chicory		
3	April	July	July	March	March	March
3	Tomatoes	Sprouts	Mustard	Parsnips	Petit Pois	Spinach
3	Green Beans	Leeks	September	Petit Pois	Lettuces	Fava
3	Sunflowers		Swede	September	Chicory	July
3			Turnip	Spinach	August	Lettuce
3					Leeks	Chicory
3					Turnips	
4	Oct	April	March	May	March	May
4	Petit Pois	Lettuces	Petit Pois	Peppers	Fava	Sorrel
4	Beetroot	Green Beans	May	Green Beans	Lettuce	Petit Pois
4		June	Green Beans			
4		Radishes	Courgettes			
4		Chervil				

Permanent Tomato Succession (see illustration) – Transplant tomatoes every 1,40m with parsley interseeded close to the tomatoes and green beans within line every 30cm in pockets. Cabbages can be interplanted between the lines of tomatoes every 80cm with celery interplanted between the cabbages. Each approaching winter season fava beans or petit pois can be seeded into this ‘tomato’ bed, only excepting where the green beans were growing. On the borders between the edges and the central surface climbing peas can be seeded.

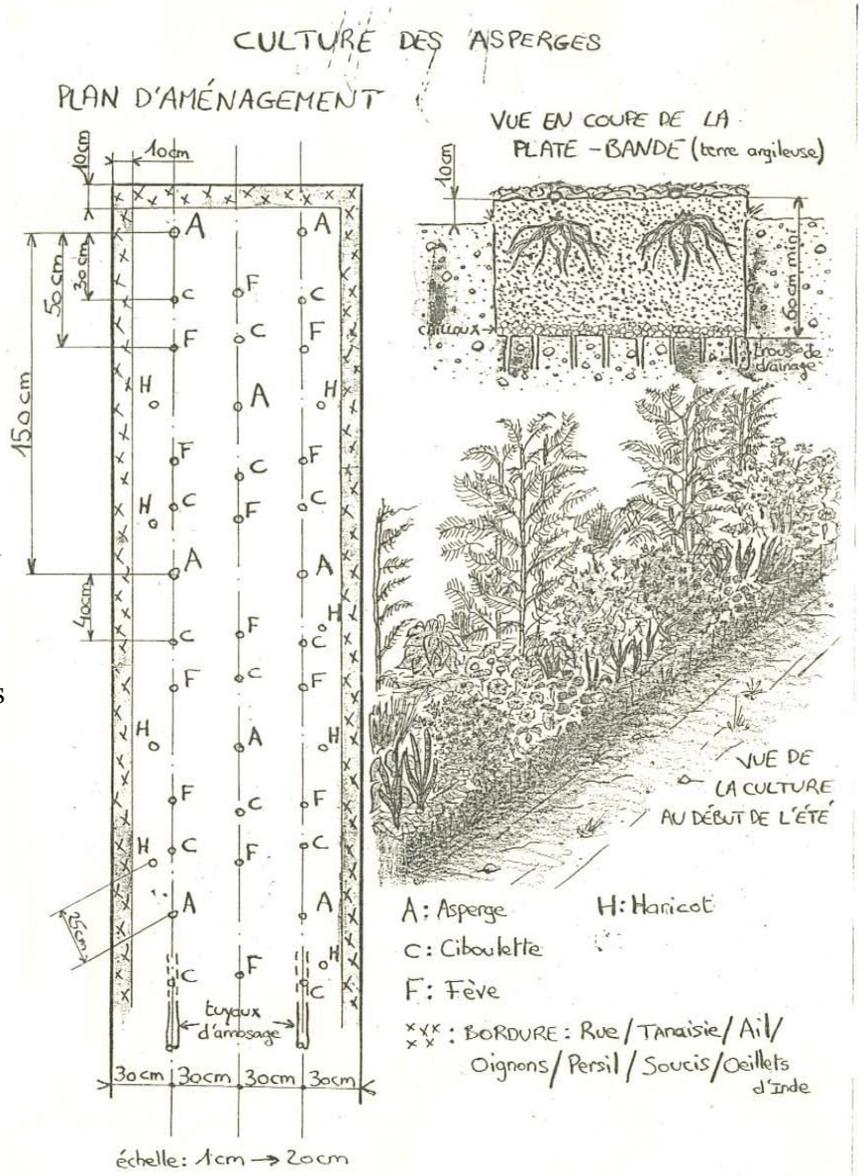
This routine can then be repeated annually, only remembering to offset the tomato transplants by 70cm each year so that they can then take advantage of where the nitrogen fixing beans have been and then offsetting the other plants taking their positions from the tomatoes. The cabbages can be replaced by another type of brassica such as Brussels sprouts, mustard, rape, kale or cauliflower.

However, there is a further step that can be taken to lessen and simplify the work and draw closer to nature. This is the production of perennial crops in permanent raised beds.

Permanent Asparagus Production -

Year 1: Asparagus fits this style of permanent production perfectly because it can be interplanted with chives and green beans in summer, and fava or petit pois in winter (see illustration). Other dedicated main crop beds can be created using perennial plants such as artichokes, cardoon, tuberous sunflowers and strawberries.

In the same manner permanent beds of biennial and annual plants can be created if those plants easily reseed themselves. The best example of this type of permanent bed is parsley.



Permanent Parsley Production (see illustration) – Year 1: The synergistic culture of parsley begins with seeding the parsley on the entire central surface and planting alliums and interplanting lettuces in the edges. To harvest cut each plant 10cm from the soil without cutting the crown where new growth appears.

Year 2: Continue cutting as new leaves form until the following year when the plant goes to seed. In a second bed seed and transplant the central surface and edges as for year 1. In this way permanent parsley cropping can be maintained even though one bed goes to seed each summer. Annuals such as miners lettuce can be grown in the same way but without the need for a second bed.

List of Common Steps to set up Synergistic Gardens

1. Raised beds are constructed by piling topsoil taken from pathways
2. Make the beds when the soil is not too wet, too dry, or frozen
3. All parts of the bed should be accessible from the pathways - about 1,20 – 1,40m wide
4. Pathways should be about 50cm wide
5. Bed shape is limited only by reach from the pathways and imagination
6. To clear overgrown gardens in preparation for digging raised beds a crop of potatoes works well
7. Cut existing growth to the ground, lay cardboard and then mulch deeply with straw and then, cutting holes in the cardboard, seed potatoes on soil surface before covering once again with straw
8. Once constructed beds should be covered by mulch - straw works well
9. Any biodegradable organic material can be used as mulch
10. Pathways should be filled with organic matter such as sawdust to prevent dehydration, which, once well rotted, can then be used to mulch the beds
11. In poor soils it can be necessary to add well-rotted organic matter when constructing the beds
12. This 'force feeding' of soil is only advised if absolutely necessary and only at this initial stage
13. Where no organic matter is available a pure form of Synergistic Agriculture can be undertaken entirely through the concentrated and diverse occupation of the beds
14. A good combination of plants for soil restoration is white mustard, daikon radish, turnips, seeded in the early autumn, followed by cereal rye in early winter, which is then cut and laid on the beds a good two weeks before seeding begins the following spring – rye's noted allelopathic effect helps produce a weed free soil into which to seed and transplant summer crops
15. These first year summer vegetables should only be lightly cropped because it is important to first feed the soil well in order to eat well
16. Good soil can be produced in from 3-5 years from even the poorest soil
17. After construction the soil's self-fertility depends on the soil in the beds being left undisturbed
18. Remember: This agriculture relies upon feeding the soil through the surface
19. Plants should never be pulled but cut at soil level and then laid on the beds as mulch
20. Beds can be constructed to accommodate fruit or nitrogen fixing trees
21. Trees act as buffers to the extremities of sun, wind and rain

22. Care should always be taken when making raised beds around existing trees to protect shallow feeder roots
23. Trellises should be used, e.g. plants such as sunflowers and maize, or the use of reeds, bamboo, or even construction rod (rebar) fixed over the beds
24. Each plant is attached by string, freeing space and keeping fruits off the ground to improve quality and avoid disease and pest problems as well as maximizing plant cover
25. Reliance on rainfall is possible due to deep mulches, high organic content, tree protection and a robust soil life encouraged in synergistic beds
26. Where economics or food security is of primary importance drip irrigation is best
27. This can be installed simply by the use of cheap, semi-rigid (Polyethylene, PE) black plastic pipe with small holes made every 20-25cm on its underside
28. Gravity fed water is sufficient to keep these pipes unblocked
29. The pipes should be laid two to a bed, each spaced 10cm from the edges
30. Long rotations favour the health of the soil by disrupting pest and disease life cycles
31. Mixed plantings of vegetable and fruit crops, herbs, flowers, green manures, cover crops and companion plants all help create and preserve diverse soil micro and macroorganisms
32. Companion plants should be allowed to self-seed freely in the raised beds