for the Gardener

UCSC Farm & Garden
Center for Agroecology & Sustainable Food Systems, UC Santa Cruz

French Intensive Gardening: A Retrospective

"The skin of the Earth must be approached with great sensibility. It is alive and it contains a spirit. It is easily bruised or damaged. In some respects, it is even more delicate than the bloom on the surface of a plum. Approach it without sensitivity, or at the wrong time, and you will damage it." – Alan Chadwick

History of the French Intensive System

The system of gardening we use here at the UCSC Farm and Garden has many names—biodynamic/French intensive; French intensive; raised bed gardening; the deep bed system; the wide bed system; Chinese intensive; bio-intensive—and many proponents. There are also a number of books about it, the best known of which is John Jeavons's *How to Grow More Vegetables than You Ever Thought Possible in Less Space than You Can Imagine,* and numerous period pieces (see *References*).

This system of raised bed, intensive gardening was essentially started here at UC Santa Cruz's upper garden (née the Garden Project) by English master gardener Alan Chadwick in 1967. Keep in mind that at the time, raised bed gardening and even organics (let alone an organic food industry) were virtually unknown in the U.S. Now these techniques are commonplace, even to the point of the mechanized spader, which simulates single and double digging on a field scale.

The system was pioneered, not invented, by Chadwick. As he might have said, "There is nothing new under the sun" (only with a more dramatic, baroque flourish). It was Chadwick's synthesis based on his experiences and studies. He often talked of the literature and historical records of ancient cultures: Egypt, Mesopotamia (Iraq), China, and particularly the Greeks and Romans (the Roman poet Virgil's *Georgics* is a tome to agriculture and husbandry), and their various intensive cultivation techniques.

The most specific and oft-repeated analogy from Chadwick was from the early Greeks and their observations: that crops grew well in the river bottom valleys and floodplains, with their alluvial soil deposits. However, crops flourished and grew even more "lushly" at the edge of the valley, where there were "mini landslides" and slightly disturbed, better-aerated soil. This effect was even more pronounced on south-facing slopes. Whether this analogy was literal or apocryphal, it serves as a good image or metaphor for raised bed gardening, and the benefits of microclimate and site selection.

A mixture of diverse elements from Chadwick's personal experience, as well as his studies, also contributed to the amalgam he entitled biodynamic, French intensive horticulture. The principal determinants were: 1) The techniques of the French market garden phenomenon in and around Paris starting in the 1500s and peaking in the late 1800s and early 1900s (French intensive); 2) traditional European garden-scale cultivation techniques, which had always been more intensive than their U.S. counterparts; 3) his own apprenticeships in English and French market garden operations; 4) tutelage under Rudolf Steiner, his spiritual philosophy as well as biodynamics—an attempt to look at a farm or garden as a living organism while studying cosmic rhythms and their effect on plant growth, soil quality, and nutritious food; and 5) a strong personal infatuation with art, attention to detail, and beauty. Chadwick was an aesthete, having sensitivity to all that was beautiful and a disdain for that which was ugly and dehumanizing. As he said, "The reason for all of it is simply that I love beauty . . . I adore beauty and I absolutely detest ugliness."

Alan Chadwick began the Student Garden at UCSC in 1967.

In the 1970s, after Chadwick's departure from UCSC, the Farm and Garden staff quickly dropped the biodynamic portion of the system. The reasons being we had only a passing familiarity with the philosophy and, quite frankly, it seemed a little too abstruse and not empirical enough. So it became French intensive gardening. John Jeavons came along and put a reductive spin on the complex system Chadwick espoused, coined it biointensive gardening, and made it more palatable to a mainstream audience. Under the axiom "You can't teach an old dog new tricks," we've persisted in calling it French intensive.

BUILDING SOIL WITH THE FRENCH INTENSIVE SYSTEM

At this point, an overview statement might be helpful—let's define terms. The French intensive, raised bed style of gardening is a handworked system featuring deep cultivation (at least in the initial phases; see below). The primary techniques used are: single digging (12"–15" deep) and double digging (18"–24" deep).

This technique's primary effect is on the physical properties of a soil: the aim is to rapidly improve soil structure and fertility. Improved physical properties can positively influence the biological and chemical properties of a soil as well. The main idea is to create a well-drained, well-aerated, fertile soil struc-

ture by digging deeply and placing nutrients at specific levels. This gives rise to a profile that enables plant roots to probe/penetrate throughout the bed with ease, especially in a downward direction. Such an arrangement has a continuous system of large and intermediate pore spaces from the surface to the subsoil. Pore space is where soil air (to fuel aerobic growth) is located and where plant roots actually grow. Plants' needs for air, water and nutrients are best met with such a continuous system of pores.

The French intensive system (i.e., deep digging) is not appropriate in all soils and in all climatic situations. For instance, on deep, improved soils, it's superfluous, even deleterious. On sandy soils and in hot, windy situations it can "burn up" precious organic matter and cause water losses both through surface evaporation and excessive drainage. It is most effective on heavy clay soils and at rapidly deepening shallow soils.

As is so often the case in life, there are no panaceas (one solution to all problems). We tend to be creatures of habits, creatures of dosages; that is, we want to do the same thing in the same way, with the same amount, repeatedly. The judicious use of deep digging for a few years to develop a soil, followed by lighter, less disruptive surface cultivation and perhaps periodic renewal via deep digging again might be more prudent. *Caveat emptor*: Digging is a radical act, potentially destructive of soil structure and biological processes. Do it skillfully and as infrequently as possible!

Conventional wisdom often states that it can take 1,000–2,000 years for 1 foot of topsoil to develop in place. With French intensive it is possible to simulate the creation of 1 foot of topsoil in 3–5 years (in conjunction with cover crops/green manures).

Primary Features of the French Intensive System

PERMANENT BEDS

Often when people hear French intensive, they automatically think of raised beds. In fact, the beds may be raised slightly (1"–2") or in an exaggerated sense (6"–8"), flat, or even sunken. The degree of "loft" is a function of climate, soil type, and seasonal weather. On a transect from Seattle to Santa Cruz to Santa Fe, the response might be: 1) Seattle, with its high annual rainfall and cool temperatures, can have dark soils with high organic matter and high clay content, and a tendency to remain cold and wet. Thus a raised bed would yield better growth, allowing the soil to warm more quickly. Santa Cruz, with its mild Mediterranean climate, dry summers and wet winters would feature a slightly raised bed during the rainy season and an almost flat bed in summer. Santa Fe might yield a flat or even sunken bed for water catchment, to minimize water loss and afford protection from wind.

Permanent beds, be they raised or flat, substantially reduce soil compaction. The bed equals the zone of maximum fertility—you could say "Don't tread on me," or only minimally and lightly. The path between beds equals the zone of degradation, with much foot traffic and resultant compaction. Permanent beds foster maintenance of ideal soil structure. While compaction is a primary problem in mechanized agriculture, it can be virtually eliminated in handworked permanent bed systems. In agriculture, it can be said that the back of the tractor (disc, rototiller, etc.) is simply undoing the work (compaction due to weight) of the front of the tractor.

Some common causes of soil compaction are: ploughing—a "plow pan" develops just below the depth of tillage; 2) machine and foot traffic (human and grazing animals)—the bigger the machine, the greater the number of passes, the greater the compaction; 3) the pounding action of rain drops on open soil, which can destroy surface soil aggregates and lead to crusting and erosion. Natural forces also cause compaction—over time, the fine particles of clay leach downward, accumulate in layers, and create subsurface compaction or a hard pan.

Compaction can be measured by an increase in bulk density. Bulk density is a measurement of the weight of a volume of soil. It includes pore space as well as solids. It is distinct from particle density, which simply measures the weight of a soil as if there were no pore spaces.

Permanent beds also focus efficient placement of fertilizers/nutrients only where plants will be growing.

Cathy Genetti Reinhard

Left to right: D-handle spade, tilthing fork, metal bow rake

STYLES/TOOLS/TECHNIQUES OF CULTIVATION

Deep digging (if prudent): single and double digging with the vertical placement of nutrients at appropriate depths. A mantra for nutrient incorporation could be: "Apply nutrients at and slightly above the eventual effective feeding root zone of the crop being grown."

The hand tools of choice feature the D-handle spade for primary cultivation, i.e., digging; the tilthing fork for secondary cultivation, i.e., creating a particulate seed bed; and a metal bow rake for shaping the bed.

INTENSIVE SPACING OF PLANTS AND HIGH YIELD/AREA

French intensive can feature as great as 4–5x the plant density of traditional agriculture (alliums at 4–5x density, leaf crops at 2–3x density). An associated increase in yield/area can be expected. With greater plant density, it is essential to create an environment for root growth that allows a vertical (not horizontal) zone of exploration. Associated with this is a high rate of compost application (up to 1–2 lbs/sq. ft.) initially. Trying to put more plants in a given area without adequate soil preparation will only lead to stunted plants and poor yields.

INTERCROPPING

Intercropping is an emblematic symbol of French intensive gardening. Intercropping is the growing together, simultaneously, of 2–3 crops so that they growth of one does not interfere with the growth of the others. This can also contribute to higher yields/area. Intercropping can also be a strategy for creating favorable microclimates:

A bean fence (6'–8' tall) edged with one or two rows of lettuce (or any quick-maturing leaf crop). The shade of the beans moderates the heat of summer for the lettuces. Similarly, a bed planted with sunflowers at low density (2'–3' apart), underplanted with the lettuce.

Relay cropping is a variation on intercropping, e.g., a row of basil side-planted on the outside of a pepper bed. The basil can be cropped for 1–2 months until the peppers take over above- and below-ground space. Another possibility is rows of radishes seeded between rows of carrots. The radishes emerge in 3–5 days and are cropped at 20–30 days. The carrots come up in 10–14 days, grow slowly post-emergence and crop in 60–70 days. The possibilities are endless.

Although this sounds counterintuitive, intercrops work best when combining opposites:

- The fast with the slow (radishes/leeks)
- The tall with the short (beans/lettuce)
- The deep rooted with the shallow rooted (climbing peas/arugula)
- The heavy feeders with light feeders (leeks/radishes)
- The fibrous rooted with tap rooted (salad mix/carrots)

THE USE OF FULLY MATURE COMPOST

The more mature and particulate (fine) the compost, the greater and quicker the nutrient availability. This system is predicated on the ability to skim—remove a crop, prepare the bed and seed or transplant on the same day, leading to efficient, intensive use of available land. This is only possible with fully mature, particulate compost.

A SOIL ETHIC, OR AN INSANE REVERENCE FOR SOIL

As is so often the case in gardening, we are trying to emulate and amplify natural systems in such areas as plant diversity, intercropping, watering, soil structure, fertilizing, and creating of micro-climates.

Bare soil is not a natural phenomenon; mulches can conserve and enhance both surface soil structure and organic matter content. In the case of French intensive, the close spacing of the plants creates a living mulch canopy. Additionally, the concept of permanent beds and minimal stepping on the beds radically reduces compaction. But behind a fundamental understanding of the science behind the physical and chemical properties of soil lies the notion of becoming a soil sleuth—a Sherlock Holmes of soil. Everywhere you go, you look, feel, touch, dare I say taste and think about soil. What type is it, sand, silt or clay, how deep is it, what color is it, how was it formed, how did it come to be here (movement, deposition, etc.)? Make some judgments as per its "value" or best use. Make it come alive and accessible to you—become a soil steward.

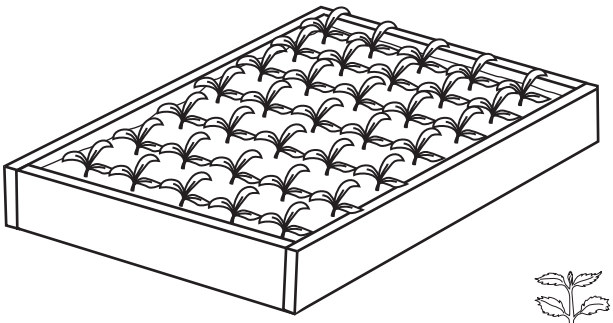
EXTENSIVE USE OF TRANSPLANTS

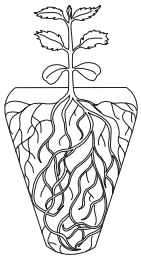
One hallmark of French intensive is that transplants make up a lion's share of plants grown, with direct seeding relegated to the root crops. On average, the transplants are slightly bigger than the norm (this necessitates skill and care in transplanting). Transplanting has several advantages for the intensive gardener:

- More intensive use of land available by more precise placement of transplants and elimination of skips and gaps that often result from direct seeding
- Transplants tie up the ground for a shorter period of time than direct seeding.

Example: A crop of lettuce is harvested from a bed. On the same day the bed is prepped, fertilized, and planted with broccoli transplants that are 6–8 weeks old.

- Transplants also give plants a head start over weed pressure.
- It takes less labor and water to tend the transplants than seeds and small seedlings in the ground.





Above: Wooden tray used for starting seeds.

Right: transplant from cell tray/6 pack showing well-developed root system.

• Transplants allow a head start on the growing season.

Example: It takes 12 weeks to produce a transplantable allium (onion, leeks, scallions, etc.). Your first safe planting date for alliums is April 1. By starting the allium of your choice in containers in a greenhouse or cold frame January 1, you can transplant a sizeable seedling on April 1, thus hastening the time to maturation by 3 months over an April 1 direct-seeded allium.

EVENNESS PRINCIPLE

The concept of evenness begets an environment that is uniform throughout the bed, the garden that is all plants from the center to the edge receive a similar growing environment. The old adage is "Mind the corners and edges and the middle takes care of itself." The goal is to do everything evenly:

• Watering–spread and depth
• Cultivation (digging, loft, edging, tilling, raking and shaping)
• Compost application and depth of incorporation
• Seed sowing (distribution)
• Seed coverage
• Transplanting
• Weeding, hoeing
• Anon, anon, anon.

This applies to a flat, a bed, a field, a garden, a farm, or . . .

LABOR AS WELL AS PLANT INTENSIVE

Whatever name you choose to call it, this approach to gardening demands a finely attuned, highly skilled practitioner (that's us). Labor inputs are high, especially in developing poor soils. Hopefully this is a labor of love. We are all rank amateurs (one who practices a thing only our of love from the Latin–*lover of*). Alan Chadwick's view was that gardens were an extension of the home and that gardening was an artistic, physical, spiritual discipline, a touchstone for a healthy culture.

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