

Bhaskar Save, the Gandhi of Natural Farming

On the 27th January, 2015, Bhaskar Save, *aka* Save-guruji – the acclaimed ‘Gandhi of Natural Farming’ – completed 93 years. He has inspired and mentored 3 generations of organic farmers. Masanobu Fukuoka, the legendary Japanese natural farmer, visited his farm in 1997, and described it as “the best in the world, even better than my own farm!” It is a veritable food forest and a net supplier of water, energy and fertility to the local eco-system, rather than a net consumer.

Save’s way of farming and teachings are rooted in his deep understanding of the symbiotic relationships in nature, which he is ever happy to share freely (and still very enthusiastically!) with anyone interested. In 2010, the International Federation of Organic Agriculture Movements (IFOAM) – the world-wide umbrella body of organic farmers and movements – honoured Save with the ‘One World Award for Lifetime Achievement’. Its jury declared, “He is one of the most outstanding personalities in the organic world.”

Bhaskar Save’s 14 acre orchard-farm, Kalpavruksha, is located on the Coastal Highway near village Dehri, District Valsad, in southernmost coastal Gujarat, a few km north of the Maharashtra-Gujarat border. The nearest railway station is Umergam on the Mumbai-Ahmedabad route. About 10 acres are under a mixed natural orchard of mainly coconut and chikoo (sapota) with fewer numbers of other species. About 2 acres are under seasonal field crops cultivated organically in traditional rotation. Another 2 acres is for a nursery for raising coconut saplings that are in great demand. The farm yield – in all aspects of total quantity, nutritional quality, biological diversity, ecological sustainability, water conservation, energy efficiency, and economic profitability – is superior to any farm using chemicals, while costs (mainly labour for harvesting) are minimal, and external inputs almost zero.

Natural farming and its fruit

Natural farming is holistic and bio-diverse organic farming in harmony with nature. It is low-intervention, ecological, sustainable and economically rewarding. In its purest advanced form, it is a ‘do-nothing’ way of farming, where nature does everything, or almost everything, and little needs to be done by the farmer. This can best be achieved in a progressive manner with tree crops. As Bhaskar Save explains, “When a tree sapling planted by a farmer is still young and tender, it needs some attention. But as it matures, it can look after itself, and then it looks after the farmer.”

With annual or seasonal field crops, more continuing attention and work by the farmer are needed, but even here, the work and input needed progressively diminishes as the soil regains its health and symbiotic biodiversity is re-integrated.

“*Who* planted the great, ancient forests? Who tilled the land? Who provided seed, manure, irrigation, or protection from pests?” asks Bhaskar Save. “In our forests, untended by man, the (human) food trees – like *ber* (jujube), *jambul* (jambolan), *amba* (mango), *umbar* (wild fig), *mahua* (butter tree), *imli* (tamarind), *raini* (‘jungle sapota’) – yield so abundantly in their season, that the branches sag with the weight of the fruit. The annual fruit yield per tree is commonly over a tonne, year after year, carried away by forest dwellers, including man. But the earth around each tree remains whole and undiminished. There is no gaping hole in the ground! If anything, the soil is richer. From where do the trees – including those on rocky mountains – get their water, their nitrogen, phosphorous,

potash? Though stationary, Nature provides their needs right where they stand. But arrogant modern technology, with its blinkered, meddling itch, is blind to this.

“Our ancient sages understood Nature’s ways far better than most modern day technologists. The Upanishads say:

‘*Om Purnamadaha
Purnamidam Purnat Purnamudachyate
Purnasya Purnamadaya Purnamewa Vashishyate*’

This creation is whole and complete.
From the whole emerge creations, each whole and complete.
Take the whole from the whole
(respectfully, as many times as you need)
the whole yet remains,
undiminished, complete!”

“Not so long ago,” adds Bhaskar Save, “the poet and writer, Bankim Chandra, paid lyrical tribute to our *sujalam, sufalam* land. Ours indeed was a remarkably fertile and prosperous country – with rich soils, abundant sunshine and water, thick forests, wondrous bio-diversity; and gentle, peace-loving people with a vast store of farming know-how and wisdom. For generations beyond count, this land sustained one of the highest densities of population on earth -- without chemical ‘fertilizers’, pesticides, exotic dwarf varieties of grain, or any of the new, expensive ‘bio-tech’ inputs now being promoted.

“Gandhi believed in *gram swaraj* (or village self-governance),” says Save. “Central to his vision was complete self-reliance at the village level in all the basics needed for a healthy life. He had confidence in the strength of organic farming in this country... but we have strayed far from this path. Vinoba Bhave too pointed out that industries merely *transform* ‘raw materials’ sourced from Nature. They cannot create anew. Only Nature is truly creative and self-regenerating – through synergy with the fresh daily inflow of the sun’s energy.

“There is on earth, a constant inter-play of the six *paribals* (key factors) of Nature, interacting with sunlight. Three are: air, water and soil. Working in tandem with these, are the three orders of life: *vanaspati srushti*, the world of plants; *jeev srushti*, the realm of insects and micro-organisms; and *prani srushti*, the animal kingdom. These six *paribals* maintain a dynamic balance. Together, they harmonise Nature’s grand symphony – mystic grace!

“Man has no right to disrupt any of the *paribals* of Nature. But modern technology, wedded to commerce – rather than compassion – has proved disastrous at all levels. We have despoiled and polluted the soil, water and air. We have wiped out most of our forests and killed its creatures. And relentlessly, modern farmers spray deadly poisons on their fields, massacring Nature’s *jeev srushti*, or micro-organisms and insects – the unpretentious, but tireless little fertility workers that maintain the vital, ventilated quality of the soil, recycling all life-ebbed biomass into nourishment for plants. The

noxious chemicals also inevitably poison the water, and Nature's *prani srushti* or animal kingdom, including humans.

“Gandhi declared, ‘Where there is *soshan*, or oppression, there can be no *poshan*, or nurture!’ Vinoba Bhave added, ‘Science wedded to compassion can bring about a paradise on earth. But divorced from *ahimsa*, or non-violence, it can only cause a massive conflagration that swallows us in its flames.’

“Trying to increase Nature's ‘productivity,’ is the fundamental blunder that highlights the arrogant ignorance of agricultural scientists. Nature, unspoiled by man, is already most abundant in her yield. When a grain of rice can reproduce a thousand-fold within months, where is the need to increase its productivity! What is required at most is to help ensure the necessary natural conditions for optimal, wholesome yield.

“In all the years a student spends for an M. Sc. or Ph.D. in agriculture, the only goal is short-term – and narrowly perceived – economic (rather than nutritional) ‘productivity’. For this, the farmer is urged to *buy* and *do* a hundred things, greatly increasing his costs. But not a thought is spared to what a farmer must *never* do so that the land remains unharmed for future generations and other creatures.”

A quarter century ago, ‘Poison in your Food’ – a well-researched, lead feature in ‘India Today’, 15th June, 1989 – starkly exposed that “Indians are daily eating food laced with some of the highest amounts of toxic pesticide residues found in the world. In the process, they are exposed to the risk of heart diseases; brain, kidney and liver damage; and cancer”. More recently, even the Food Safety and Standards Authority of India, Union Ministry of Agriculture, reported last year that the toxic pesticides and chemicals contained in the foods we commonly buy are hugely in excess of permissible limits, exposing consumers to unacceptable risk of myriad diseases. Such poisons are even more dangerous for pregnant women, the babies they bear, and young children, as well as the ill and diseased.

The differences between chemical farming and organic farming

Bhaskar Save lists 18 major points of difference between chemical farming and organic farming in harmony with nature:

- 1) Chemical farming fragments the web of life; organic farming nurtures its wholeness.
- 2) Chemical farming depends on fossil oil; organic farming on living soil.
- 3) Chemical farmers see their land as a dead medium; organic farmers know theirs is teeming with life.
- 4) Chemical farming pollutes the air, water and soil; organic farming purifies and renews them.
- 5) Chemical farming uses large quantities of water and depletes aquifers; organic farming requires much less irrigation, and recharges groundwater.
- 6) Chemical farming is mono-cultural and destroys diversity; organic farming is poly-cultural and nurtures diversity.
- 7) Chemical farming produces poisoned food; organic farming yields nourishing, poison-free food.

- 8) Chemical farming has a short history and threatens a dim future; organic farming has a long history and promises a bright future.
- 9) Chemical farming is an alien, imported technology; organic farming has evolved indigenously.
- 10) Chemical farming is propagated through schooled, institutional misinformation; organic farming learns from Nature and farmers' experience.
- 11) Chemical farming benefits traders and industrialists; organic farming benefits the farmer, the environment and society as a whole.
- 12) Chemical farming robs the self-reliance (and self-respect) of farmers and villages; organic farming restores and strengthens it.
- 13) Chemical farming progressively leads to bankruptcy and misery; organic farming liberates from debt and woe.
- 14) Chemical farming is violent and entropic; organic farming is non-violent and synergistic.
- 15) Chemical farming is a hollow 'green revolution'; organic farming is the true green revolution.
- 16) Chemical farming is crudely materialistic, with no ideological mooring; organic farming is rooted in spirituality and abiding truth.
- 17) Chemical farming is suicidal, moving from life to death; organic farming is the road to regeneration.
- 18) Chemical farming is the vehicle of commerce and oppression; organic farming is the path of culture and co-evolution.

Bhaskar Save's plea for India's agro-ecological resurgence

On 29th July, 2006, Bhaskar Save addressed a detailed 8 page Open Letter (along with six annexures) to M.S. Swaminathan, then chairman of the National Commission on Farmers. This was at a time of an unrelenting wave of farmer suicides in various parts of India, particularly Vidarbha and Andhra Pradesh, but also Punjab, the frontline state of India's 'green revolution', now turned black.

Bhaskar Save's Open Letter – widely circulated and translated all over the world (just google and check) – presented a devastating critique of the government's agricultural policies favouring chemical farming, while making an eloquent plea for urgent and fundamental reorientation. Save states, "I say with conviction that only by mixed organic farming in harmony with Nature, can India sustainably provide abundant wholesome food and meet every basic need of all – to live in health, dignity and peace."

Swaminathan wrote back to Save, "I have long admired your work and am grateful to you for the detailed suggestions... valuable comments and recommendations. We shall take them into consideration in our final report."

A further independent Open Letter from Bhaskar Save, dated 1st November, 2006, was sent to the Prime Minister. Save asks in his letter, "In this vast nation, does any government agricultural department or university have a single farm run on modern methods, which is a net supplier of water, energy and fertility to the local eco-system, rather than a net consumer? But where there is undisturbed synergy of Nature, this is a reality! By all criteria of ecological audit, my farm has only a

positive contribution to the health of the environment. Economically too, I get a manifold higher income than ‘modern’ farmers.”

The success demonstrated by Bhaskar Save in decreasing and eliminating external fertility inputs while achieving high productivity, is thus a model for promoting food security; and his method of tree-cropping – integrating short lifespan, medium lifespan and long lifespan species – has been hailed as potentially revolutionary for wasteland regeneration, while also offering sustainable and rewarding livelihoods to large numbers of people.

Natural Abundance at Kalpavruksha

About twenty steps inside the gate of Bhaskar Save’s farm is a sign that says: “Co-operation is the fundamental Law of Nature.” – A simple and concise introduction to the philosophy and practice of natural farming! Further inside the farm are numerous other signs that attract attention with brief, thought-provoking *sutras* or aphorisms. These pithy sayings contain all the distilled wisdom on nature, farming, health, culture and spirituality, Bhaskarbai has gathered over the years, apart from his extraordinary harvest of food!

If you ask this farmer where he learnt his way of natural farming, he might tell you – quite humbly -- “my university is my farm.” His farm has now become a sacred university for many, as every Saturday (Visitors’ Day) brings numerous people. These have included farmers from all over India, as also agricultural scientists, students, senior government officials, city folk, and occasional travellers from distant lands, who have read or heard of Bhaskar Save’s work.

Kalpavruksha compels attention for its high yield easily out-performs any modern farm using chemicals. This is readily visible at all times. The number of coconuts per tree is perhaps the highest in the country. A few of the palms yield over 400 coconuts each year, while the average is closer to 350. The crop of *chikoo* (sapota) – largely planted more than forty-five years ago – is similarly abundant, providing about 300 kg of delicious fruit per tree each year.

Also growing in the orchard are numerous bananas, papayas, areca-nuts, and a few trees of date-palm, drumstick, mango, jackfruit, toddy palm, custard apple, *jambul*, guava, pomegranate, lime, pomelo, *mahua*, tamarind, neem, *audumber*; apart from some bamboo and various under-storey shrubs like *kadipatta* (curry leaves), crotons, tulsi; and vines like pepper, betel leaf, passion-fruit, etc.

Nawabi Kolam, a tall, delicious and high-yielding native variety of rice, several kinds of pulses, winter wheat and some vegetables and tubers too are grown in seasonal rotation on about two acres of land. These provide enough for this self-sustained farmer’s immediate family and occasional guests. In most years, there is some surplus of rice, which is gifted to relatives or friends, who appreciate its superior flavour and quality.

The diverse plants in Bhaskar Save’s farm co-exist as a mixed, harmonious community of dense vegetation. Rarely can one spot even a small patch of bare soil exposed to the direct impact of the sun, wind or rain. The deeply shaded areas under the *chikoo* trees have a spongy carpet of leaf litter covering the soil, while various weeds spring up wherever some sunlight penetrates.

The thick ground cover is an excellent moderator of the soil's micro-climate, which – Bhaskar Save emphasizes – is of utmost importance in agriculture. “On a hot summer day, the shade from the plants or the mulch (leaf litter) keeps the surface of the soil cool and slightly damp. During cold winter nights, the ground cover is like a blanket conserving the warmth gained during the day. Humidity too is higher under the canopy of dense vegetation, and evaporation is greatly reduced. Consequently, irrigation needs are very low. The many little insect friends and micro-organisms of the soil thrive under these conditions.”

Excluding the two acres under coconut nursery, and another two acres of paddy field, the remaining ten acres of orchard have consistently yielded an average food yield of over 15,000 kg per acre per annum! (This has declined in the past 15-20 years following pollution from progressive industrialization of the area.) In nutritional value, this is many times superior to an equivalent weight of food grown with the intensive use of toxic chemicals, as in Punjab, Haryana and many other parts of India.

Nature's Tillers and Fertility Builders

It is not without reason that Charles Darwin declared a century ago: it may be doubted whether there are many other creatures that have played so important a part in world history as have the earthworms. Bhaskar Save confirms, “A farmer who aids the natural regeneration of the earthworms and soil-dwelling organisms on his farm, is firmly back on the road to prosperity.”

Earthworms flourish in a dark, moist, aerated soil-habitat, protected from extremes of heat and cold, and having an abundance of biomass. These tireless workers digest organic matter like crumbling leaf litter along with the soil, while churning out in every cycle of 24 hours, one and a half times their weight of rich compost, high in all plant nutrients.

Vermi-compost is a treasure of fertility. In relation to the surrounding ‘parent soil’ of the area, the intricately sculpted worm castings may contain twice as much magnesium, five times as much nitrogen, seven times as much phosphorous, and eleven times as much potash. Moreover, the bacterial population in such castings is nearly a hundred times more than in the surrounding soil.

The earthworm's burrowing action efficiently tills the land, imparting a porous structure to the soil. This increases its capacity to hold air and moisture, the most important requirements of plant roots. The worm castings too are well aerated and absorbent, while allowing excess water to drain away. They form stable aggregates, whose soil particles hold firmly together, resisting erosion.

Various other soil-dwelling creatures – ants, termites, many species of micro-organisms – similarly aid in the physical conditioning of the soil and in the recycling of plant nutrients; and there are innumerable such helpful creatures in every square foot of a natural farm like Kalpavruksha.

In stark contrast, modern agricultural practices have proved disastrous to the organic life of the soil. Many of the burrowing creatures are killed by the toxic effect of the chemicals used, or crushed under the weight of heavy tractors. The consequent soil compaction, resulting from their death, has reduced soil aeration and the earth's capacity to absorb moisture. Often, this is further aggravated by soil-surface salinisation, caused by excessive irrigation and poor drainage.

By ruining the natural fertility of the soil, we actually create artificial ‘needs’ for more and more external inputs and unnecessary labour for ourselves, while the results are inferior and more expensive in every way. “The living soil,” stresses Bhaskar Save, “is an organic unity, and it is this entire web of life that must be protected and nurtured. Natural Farming is the Way.”

Weeds as friends

“In nature, every humble creature and plant plays its role in the functioning of the eco-system. Each is an inseparable part of the food chain. The excrement of one species is nutrition for another. In death too, every organism, withered leaf, or dry blade of grass leaves behind its contribution of fertility for bringing forth new life.” Consequently, pleads Bhaskar Save -- if we truly seek to regain ecological harmony, the very first principle we must learn to follow is, ‘Live and let live’.

In a country like India, a variety of weeds rapidly cover bare ground with the first showers of the rainy season. When torrential downpours follow as the monsoon progresses, the weeds buffer the hammering force of the raindrops, while their roots bind the soil against erosion. Such soil erosion could otherwise be severe in our tropical conditions, particularly on sloping terrain. Bhaskarbhai thus observes – it is our foolish ignorance that we fail to understand how great a blessing the weeds are!

The roots of the weeds also improve aeration in the passages they make in the soil. Moisture absorption and retention are higher. By shading the ground, the weeds moderate the temperature of the earth, reducing evaporation and maintaining suitable conditions for soil organisms. And when the weeds die, the earthworms, ants and decomposer-bacteria that feed on their dead leaves and roots, return their mineral nutrients to the soil to help the next generation of plants, and the long life-span trees.

Weeds may additionally perform a variety of specialised functions. As soil conditions change, there is a natural progression of different kinds of weeds that inhabit the earth. Some are excellent pioneers that steadily work to improve the soil where little else yet grows. Some are leguminous, and provide nitrogen. Yet others may function as reproduction inhibitors of the little insects that sit on them, thereby checking the plant damage that some of these creatures might cause.

“The variety of plants in nature is amazing, and there is no end to learning in the university of the natural farm or forest,” says Bhaskar Save. “I have seen at Kalpavruksha hundreds of different kinds of species appear on their own in different years and seasons. Among these are plants with known medicinal value. For example, a large number of *punarnava* (or *satodi*) plants appeared in 1992.” These are believed to be excellent for health, and ‘*punarnava*’ literally means ‘rejuvenation’.

Bhaskarbhai points out that the irrational and violent prejudice against weeds in modern tree cropping can be traced back to our colonial past. In colder, temperate conditions, the bacteria in the soil are fewer and less active. Consequently, the decomposition of residual plant matter in it is much slower. For this reason, most Englishmen were not conscious of the vital importance of weeds and leaf litter in periodically replenishing the fibrous cushion of organic matter in the soil – and also checking erosion – in warm, high rainfall conditions, like ours.

When weed control is needed and how

While weeds, in general, are friends of a farmer, in certain unnatural conditions, some species may become stubbornly rampant. Such weeds may then be a nuisance if they rapidly overgrow the crops planted by the farmer, blocking off sunlight. However, here too, the weeds help check and heal a more fundamental problem – that of soil erosion or impoverishment. They persistently signal to the farmer that s/he is planting a wrong crop in the given circumstances, or growing it in a wrong way, hurting the earth and her creatures.

The only sensible and lasting ‘root-cure’ to situations of weed rampancy among field crops is to adopt mixed planting and crop rotation, while discontinuing chemicals and deep tillage. Since the problematic weeds will only phase out gradually as the soil regains its health, they may still tend to over-shade the food crops in the interim period of recovery. The way to manage this is to periodically cut the weeds (before they flower), and mulch them at least 3-4 inches thick on the soil under the crops. Without any sunlight falling on the weed seeds buried in the soil, their fresh germination is effectively checked.

There may thus be some competition between crops and weeds for sunlight, though not for soil nutrients. If the crops emerge taller, says Bhaskar Save, their shade will suppress the weeds, which will then be unable to cause any problem. This happens naturally in healthy, living, non-acidic soils. Our ancestors have been farming for many generations. But because their soil was healthy, they never faced any serious problem from weeds, even as recently as a few decades ago.

There is thus a thumb-rule for seed spacing while planting your crops. If your soil is poor/weak, increase the quantum of seeds you plant. In other words, plant closer. By this stratagem, the crops cast shade on the ground more rapidly, retarding the weeds. If, however, your soil is fairly healthy, plant fewer seeds, that is, keep a larger gap between them.

When farmers shift back to organic farming, their soil steadily improves in health each year. Correspondingly, crop growth gets better, while weed growth declines. In just 2-3 years, there should be no need for any weeding at all. Until then, the farmer is better advised to cut and mulch the weeds.

The cutting of weed growth above the land surface – without disturbing the roots – and laying it on the earth as ‘mulch,’ benefits the soil in numerous ways. With mulching, there is less erosion of soil by wind or rain, less compaction, less evaporation, and less need for irrigation. Soil aeration is higher. So is moisture absorption, and insulation from heat and cold. The mulch also supplies food for the earthworms and micro-organisms to provide nutrient-rich compost for the crops. Moreover, since the roots of the weeds are left in the earth, these continue to bind the soil, and aid its organic life in a similar manner as the mulch on the surface. For when the dead roots get weathered, they too serve as food for the soil-dwelling creatures.

The correct mulching method for weed control:

Mulching is effective in checking the rapid re-emergence of the cut weeds, only if the mulch layer is thick enough to block off sunlight. For example, the weeds cut from a plot of 100 sq. feet will never

provide a thick enough layer to fully cover the entire 100 sq. feet. It may be adequate for 25 sq. ft., or perhaps just 10 sq. ft., depending on the density of weed growth. If sunlight penetrates through a layer of mulch that is too thin (less than 3 inches), the weeds may grow back vigorously again. Moreover, with light mulching, the cut weeds will not come in close, direct contact with the soil, to enable the soil organisms to do their work of decomposition. In such condition, the weeds will just dry up in the air, without getting integrated in the soil as humus.

Thus, if 25 (or 10) sq. feet is the area that can be adequately mulched, at least 3 to 4 inches thick, with the weeds cut from 100 sq. ft., that is what the farmer should stick to, unless additional biomass can be obtained from an external source. The fresh weed growth from the balance unmulched land would again need to be cut and mulched in the selected area. In this manner, the mulch method of shading out weeds can be successful in 4 or 5 stages. The decomposition of the weeds may take several months, but the compost formed will be very helpful to the crop. What was viewed as an enemy, will now serve as friend!

It is also important that the cutting and mulching operation should be done before the weeds have flowered and become pollinated. If the farmer is too late, and the mulch contains pollinated weed seeds, a new generation of the same weeds will re-emerge strongly in the mulched areas.

Weed Control through Over-shading Plants

The *Dabbro* weed is considered a menace by most farmers. To control it, one needs to plant crops that thickly shade the ground, says Bhaskar Save. No matter how often you remove it, the *dabbro* comes up again from its deep reaching roots. You cannot destroy it this way. Rather, you should plant an over-shading crop like banana at 4 ft by 4 ft, or 5 ft by 5 ft. When these have grown a little, provide them a good quantity of dung manure. The leaves that emerge will span out such that the canopies of adjacent plants will touch, thickly shading the ground and thereby suppressing the *dabbro*, and gradually destroying it.

Multi-storey, Multi-function

Above the ground cover of weeds that constitute the lowest storey of vegetation in the orchard area (where any sunlight penetrates to the ground), there are numerous shrubs like the '*kadipatta*' (or curry leaf, *Murraya koenigii*) and the homely croton that line the pathways through the orchard. The latter plant, of various spotted and striped varieties, is relatively shallow rooted. It serves as a 'water meter', indicating by the drooping of its leaves that the moisture level of the soil is falling!

The shrubs of curry leaf contribute to moderating the population of several species of crop-feeding insects, while also providing an important edible herb widely used in Indian cooking. From this minor crop alone, Bhaskar Save earns an income of at least Rs 2,500/- each month, at zero cost. (Even the harvesting and bundling is done by the purchaser.)

Here and there, one might see climbers like the pepper vine or betel leaf in a spiral garland around a *supari* (arecanut) palm, or perhaps a passion fruit vine arching across a clearing. These provide additional bonus yield.

The Principles of Farming in Harmony with Nature

“The four fundamental principles of natural farming are quite simple!” declares Bhaskar Save. “The first is, ‘all living creatures have an equal right to live’. To respect such right, farming must be non-violent. The second principle recognizes that ‘everything in Nature is useful and serves a purpose in the web of life’.

“The third principle is: farming is a *dharma*, a sacred path of serving Nature and fellow creatures; it must not degenerate into a pure *dbandha* or money-oriented business. Short-sighted greed to earn more – ignoring Nature’s laws – is the root of the ever-mounting problems we face.

“Fourth is the principle of perennial fertility regeneration. It observes that we humans have a right to only the fruits and seeds of the crops we grow. These constitute 5% to 15% of the plants’ biomass yield. The balance 85% to 95% of the biomass, the crop residue, must go back to the soil to renew its fertility, either directly as mulch, or as the manure of farm animals. If this is religiously followed, nothing is needed from outside; the fertility of the land will not decline.”

Plant Needs – What? How Much?

Dispelling a common misunderstanding, Bhaskarbhai clarifies that the organic matter we add to the soil is not the ‘food’ of a plant, at least in any direct sense. Rather, it is food for the innumerable soil-dwelling creatures and micro-organisms, which function ceaselessly to maintain the fertility of the land. And there are more micro-organisms in half a cup of good soil than there are humans on earth!

Through the digestive processes of the soil dwelling creatures, including earthworms, the organic matter added to the soil gets decomposed into a progressively more inorganic or mineral form. The mineral rich excreta of these creatures must then dissolve in moisture, before being absorbed by the roots of plants.

More serious yet is the misconception about *how much* of the minerals or water is needed. Bhaskar Save never tires to emphasize that plants are actually *mitabari*, or very small consumers of the nutrients in the soil. Sunlight and air are what they need in abundance, while the moisture requirement of most plants – barring aquatic and semi-aquatic species like mangroves and rice – is best met when the soil is just damp rather than soaked.

Since India has no lack of sunlight, it is the porous, humus-covered soils that absorb and hold more air and moisture, which are the most productive in giving a sustained, high yield of biomass. This is ancient knowledge, though less understood these days.

Scientific analysis confirms that approximately 88% of the weight of a plant – or any organic matter – consists of just carbon and oxygen, with roughly equal contributions of about 44% each. Much of these two elements is drawn by the plant from atmospheric carbon dioxide, absorbed through minute pores or stomata in the underside of leaves.

Hydrogen, drawn from moisture, is third in the list and contributes about 6% of the plant's weight. The moisture also provides some of the oxygen, as does the air contained in the pores of the soil.

These three main elements – carbon, oxygen & hydrogen – obtained from air and moisture, together form about 94% of the entire weight of a plant! They are combined together into living matter in the presence of sunlight by a process called photosynthesis.

It is important to understand that though the principal needs of plants are originally derived from air and moisture, a considerable part of these may be drawn via the soil and the root system. Hence, the physical condition and absorptive quality of the soil is far more vital than its chemical or mineral composition typically over-emphasized by modern agriculture.

Where the porosity, or internal pore space of the soil is high – as in all good, living soils characterized by a granular, ‘crumb structure’ – this enables it to hold enormous reserves of both air and moisture. Such a condition – known to local farmers as *naafsa* – where dampness and air (also warmth) are simultaneously present in the soil, is ideal for plant growth.

This was recognized by outstanding agricultural scientists like Sir Albert Howard. His book, ‘An Agricultural Testament’ (1940), is hailed as a classic, but its contents were too inconvenient for the agribusiness interests of his time to acknowledge. While today, many in western countries look upon Howard as a ‘pioneer’ in sustainable, organic farming, he himself confessed that he learnt it all from simple, peasant farmers in India.

Continuing with the list of the ‘building-blocks’ required by a plant, nitrogen comes a distant fourth, contributing between 1 to 2 per cent of its weight. This element, abundant in the air, is made available in the soil through the action of billions of rhizobia -- the micro-organisms that dwell in the root nodules of leguminous plants. Nitrogen is also supplied when dead organic matter is broken down in the soil, under the action of even larger numbers of decomposer bacteria.

Less than 5 per cent of the weight of a plant originates in the various other mineral nutrients provided by the soil itself. These are elements like phosphorous, potassium, calcium, silicon, magnesium; and a number of trace elements or micronutrients required in very minute quantities, such as iron, copper, zinc, boron, cobalt, manganese, etc.

The earthworm castings in a mixed natural farm or forest provide an abundant supply of these minerals and trace elements. Myriad other animals, birds, insects and micro-organisms (bacteria, fungi, molds etc.) add their contribution in recycling nutrients to the soil. In fact, every creature – in excretion and in death – is an integral part of the continuous fertility cycle of nature.

Additionally, deep-rooted trees draw up fresh supplies of minerals dissolved over time from the underlying parent rock or sub-soil. Thus a farmer, who is mindful of the natural, biological processes of fertility regeneration, scarcely needs to bother about the chemical analysis of his soil. The important thing is to religiously return all crop residues and bio-wastes to the earth. Any pronounced ‘nutrient deficiency’ in the topsoil – often caused by cash-cropping monocultures – then becomes largely corrected in a few years by reverting to mixed cropping. Of course, checking soil erosion and shunning agro-chemicals is also essential.

Unfortunately, in present times, much of our bio-wastes are literally wasted, instead of being returned to the farmlands. And all the plants grown in monocultures – year after year, in the same

plot – draw the same mineral nutrients from the same level of the soil, depleting these. Most problems of ‘nutrient or micro-nutrient deficiency’ in the soil today, unimaginable in most parts of the world just a hundred years ago, are a direct result of these two factors. And we must remember that farmers in India, China, Japan, Korea, ... have been growing their crops for well over forty centuries. India, according to some, has a 10,000 year old history of sustainable agriculture!

In tropical and sub-tropical regions, the rate of decomposition of organic matter is much faster than in the temperate climates of Europe or most of USA. In particular, the hot, humid conditions in the wet tropics cause high bacterial activity in breaking down the bio-residues that come in contact with the soil. Thus an abundance of mineral nutrients is recurrently available for the plants. However, during tropical monsoons, the newly recycled nutrients near the surface of the topsoil are also prone to rapid erosion and leaching under strong rain or wind. This makes it all the more imperative to have a protective ground cover of vegetation, and to constantly replenish the organic matter (leaf litter, crop residues, etc.) on the surface to bind the soil under a carpet of humus.

In contrast, the problems caused by agro-chemicals are less severe and show up more slowly in the temperate conditions of Europe or USA. Not only are there fewer decomposer bacteria in the soil, the snowfall in winter conserves organic material underneath, further retarding its break-down into inorganic minerals. This is why the organic matter status of soils in temperate countries is much higher. Because of this extra cushion of carbonaceous material, the soils have a larger capacity to absorb artificial nitrogen.

While chemical inputs hasten the decomposition process in temperate lands as well, they do not deplete the soil of its organic content as rapidly as they do in the tropics and sub-tropics, where the natural rate of decomposition is already high. Nor are there torrential monsoon downpours, as in many parts of India. Consequently, both the eroding and polluting effects of chemical fertilizers are much slower and less visible in temperate climates.

Caution was recommended even in temperate countries through the combined use of considerable quantities of organic manure along with the chemicals. The farmers were moreover taught to exercise precision in the dosages and ratios of their inputs. Nonetheless, the West seems to be witnessing a significant turn-around from chemical methods. The movement towards organic farming is picking up faster than one would have imagined a few decades ago.

Do Nothing?

While the physical work on a natural farm is much less than in a modern farm, regular mindful attention is a must. Hence the saying: “The footsteps of a farmer are the best fertilizer to his plants!” In the case of trees, this is especially important in the first few years. Gradually, as they become self-reliant, the work of the farmer is reduced – till ultimately, nothing needs to be done, except harvesting. In the case of coconuts, Bhaskarbhai has even dispensed with harvesting. He waits for the coconuts to ripen and fall on their own, and merely collects those fallen on the ground!

For growing field crops like rice, wheat, pulses, vegetables, etc., some seasonal attention, year after year, is unavoidable. This is why Bhaskarbhai terms his method of growing field crops – organic farming, while a fairly pure form of ‘do-nothing natural farming’ is only attained in a mature, tree

crop system. However, even with field crops, any intervention by the farmer should be kept to the bare minimum, respecting the superior wisdom of nature, and minimizing violence.

The Five Concerns of Farming

Bhaskar Save summarizes the key practical aspects of his approach to natural farming with reference to the five major areas of activity that are commonly a preoccupation of farmers all over the world. These are tillage, fertility inputs, weeding, irrigation, and crop protection.

- **Tillage** - Tillage in the case of tree-crops is only permissible as a one-time intervention to loosen the soil before planting the saplings or seeds. Post planting, the work of maintaining the porosity and aeration of the soil should be left entirely to the organisms, soil-dwelling creatures and plant roots in the earth.
- **Fertility Inputs** - The recycling of all crop residues and biomass on the farm is an imperative for ensuring its continued fertility. Where farm-derived biomass is scarce, initial external provision of organic inputs is helpful. However, no chemical fertilizer whatsoever should be used.
- **Weeding** - Weeding too should be avoided. It is only if the weeds tend to overgrow the crops, blocking off sunlight, that they may be controlled by cutting and mulching, rather than by uprooting for 'clean cultivation'. Herbicides, of course, should never be used.
- **Irrigation** - Irrigation should be conservative, no more than what is required for maintaining the dampness of the soil. Complete vegetative cover – preferably multi-storied – and mulching greatly reduce water needs.
- **Crop Protection** - Crop protection may be left entirely to the natural processes of biological control by naturally occurring predators. Poly-cultures of healthy, organically grown crops in healthy soil have a high resistance to pest attack. Any damage is usually minimal, and self-limiting. At most, some non-chemical measures like the use of neem, diluted *desi* cow urine, etc may be resorted to. But this too is ultimately unnecessary.

By thus returning to Nature many of the tasks that were originally hers, a weighty burden slips off the back of the half-broken, modern day farmer. And the land begins to regenerate once more.

Why the Agro-chemical Path is Suicidal

As mentioned earlier, organic matter decomposes much faster into inorganic minerals in our tropical conditions, compared to temperate lands. The artificial supply of chemical nutrients is thus not only quite unnecessary; it is particularly harmful. Adding a nitrogenous fertilizer like urea further hastens the process of decomposition, depleting the soil's fibrous cushion of organic matter. The loss of this protective buffer then heightens the susceptibility of the soil to erosion and the leaching of nutrients, which assume alarming proportions during torrential downpours of the tropical monsoon.

In any case, the inorganic compounds in synthetic fertilizers contain just a few of the chemical elements required by plants. These few are supplied in a concentrated form. Since the plants cannot immediately absorb all that is provided, the nutrients are subject to high losses. But far more significantly, the toxic chemicals harm the organic life of the soil. Pesticides, in particular, are murderous to the soil micro-fauna, earthworms, etc. As an inevitable consequence of the loss of the

soil conditioning (tillage) action of these creatures, the porous granular structure of the soil collapses, expelling all the air from it.

Numerous other problems follow. Artificial tillage and irrigation needs are increased; 'pests' multiply. With spraying, they soon develop resistance to the pesticides, leading to the use of stronger poisons. But the natural predators of the pests get wiped out. Helpful pollinating agents like the bees are similarly exterminated. Micronutrient deficiencies and plant 'diseases' increase in incidence; while toxic residues in the food harvested reach dangerous levels. Where before, everything worked smoothly in Nature, man's 'cleverness' now brings upon him a lot more work and worry.

After the British quit India, and the partition trauma eased somewhat, Indian farming had a 15 year respite. India's first agriculture minister, K.M. Munshi, inspired by Gandhi's vision of *gram swaraj* or village self-governance and self-reliance, emphasized the paramount importance of restoring the nutrient (fertility) cycle and hydrological (water) cycle in each village and bioregion. But after Munshi, from the mid sixties, India slipped relentlessly into the path of monocultural chemical farming.

Randhawa – retired vice president of ICAR, who himself promoted this method – adds, “As (this) crop production technology is mainly dependent on *progressively larger* use of fertilizers, the gap between the availability and demand is going to widen.”

In his first Open Letter to Swaminathan dated 29-7-06, Bhaskar Save draws attention to the engineered erosion of crop diversity, the consequent scarcity of organic matter, and the progressive degradation of our soils. He states, “Our numerous tall, indigenous varieties of grain – adapted over millennia to local conditions and needs – provided more biomass, shaded the soil from the sun, and protected against its erosion under heavy monsoon rains. But in the guise of increasing crop production, exotic dwarf varieties were introduced and promoted.

Wendell Berry, a perceptive thinker, organic farmer and writer states: “When we change the way we grow our food, we change our food, our values, our society. ... Natural farming is about healing our relationships.”

Bhaskar Save adds: “Non-violence, the essential mark of cultural and spiritual evolution, is only possible through natural farming.”

The mind-boggling cost of soil erosion

Presently in India, when rivers are in spate as the monsoon intensifies, many of them turn murky brown or red. This is the colour imparted by the huge amounts of topsoil bled from higher catchments of the river valley. Most of such eroded soil is flushed down to the sea and is irretrievably lost. Only a small fraction of it gets deposited in deltas. And what gets deposited on the riverbed reduces its water holding capacity, increasing the possibility of the river over-spilling its embankments and aggravating floods during heavy rains.

Already a couple of decades ago, India's Sixth Plan document observed that 150 million hectares of land are seriously affected by soil erosion caused by rain and wind. The current figure is perhaps closer to 200 million hectares.

'The Gaia Atlas of Planet Management' estimated in 1984 that Asia as a whole is losing 25 billion tonnes of topsoil each year! Closer home, the Indian Council of Agricultural Research reported that in the state of Maharashtra, more than 70% of the cultivated land has been affected by erosion in varying degrees, and 32% of the land is so highly eroded that it is no longer cultivable.

On sloping land, unprotected by vegetation, more than one hundred tonnes of soil per hectare can be eroded in a single monsoon, especially in high rainfall zones like the Konkan belt! With acceleration under gravity, there is a rapid build-up of momentum as eroded soil moves down-slope. A mere doubling of velocity can then multiply sixty-four times the size of the soil particles that can be dislodged and transported by the floodwater.

Dr. Murthy and Dr. Hirekerur, directors at the National Bureau of Soil Survey, ICAR (now retired), lament that "if erosion is permitted to continue at this rate, it is possible that all future work will be the reclamation of soil, rather than the conservation and management of soil and water!"

According to B.B. Vohra, former Indian Minister of Water Resources, this nation's loss of topsoil, eroded by water run-off alone, was around 12,000 million tonnes per annum in 1985. The current figure probably exceeds 15,000 million tones. At a notional token value of just ten paise (or one-fifth of a cent!) per kg of topsoil – though even lifeless sand used for construction costs much more – the consequent loss works out to Rs 150,000 crore *every year*, making a total mockery of this country's balance sheets presented at annual national Budgets and Five Year Plans!

Since topsoil loss represents a permanent depletion of a vital natural resource, a slightly more sensible valuation at Re 1 (or barely two cents) per kg would indicate that we are losing soil capital worth a staggering Rs 15 lakh crore or *over 350 billion dollars – every year!*

According to Drs. Murthy & Hirekerur, the available data on run-off and soil loss under different soil, climatic and slope conditions clearly indicate that if the land is left undisturbed under a natural cover, the run-off and soil loss are the least. But once the vegetation is removed and the land is ploughed (especially for chemical mono-cropping), the soil loss may increase a hundred fold (10,000%) under conditions like sloping terrain receiving heavy rainfall.

“Children,” reminds Save, “have a birth-right to suckle the sweet, wholesome milk from their mother’s bosom! But tragically, our modern, rapacious way of farming, rampant industrialism and consumerist culture draw on Mother Earth’s life-blood and flesh. How then can we hope to receive her continuing nourishment?”

More urgently than ever before, we need to heed the exhortation of K.M. Munshi, the first Agriculture Minister of free India. Five decades ago, he repeatedly emphasized: Restoring the soil nutrient cycle and hydrological cycle in every village and bio-region is the paramount challenge we face for safeguarding the well-being of this land and her inhabitants!

By far the most efficient in conserving and regenerating both our soils and our groundwater – while also mitigating climate change – are our natural forests, and the mixed organic tree-cropping systems, like those grown by Bhaskar Save and his family.

In conclusion, says Save – “Natural farming is blessed by Annapurna, the mother goddess of abundant food for all that lives.”

-Bharat Mansata (bharatmansata@yahoo.com)

(adapted from ‘The Vision of Natural Farming’ by Bharat Mansata, 277 pages, Earthcare Books, www.earthcarebooks.com)