

# 14.

## **Water-efficient trench irrigation for horticulture**

### **1. GENERAL INFORMATION**

#### *1.1 Title of practice or experience*

Water-efficient trench irrigation for horticulture

#### *1.2 Category of practice/experience and brief description*

For those keenly interested in discovering yet more ingenious methods of producing food – while conserving water or using smaller quantities of it - Bhaskar Save, the seasoned natural farmer from the state of Gujarat on the west coast of India, has developed some extremely efficient and low-cost water-use strategies and systems.

Bhaskar Save has special expertise in growing horticultural crops and in orchard development. His trees give him profuse yields and a very good income. However, he is also self-sufficient in growing cereals (mainly rainfed, indigenous rice) and unirrigated pulse legumes – on post-monsoon subsoil moisture – in traditional crop rotation. He also grows some vegetables and onions, which are largely for self-consumption by his family of 7 adults and 3 children.

Bhaskar Save, now aged 78 years, was born in a family whose ancestral occupation for many generations has been farming. From childhood, he has closely observed a broad range of agricultural practices from traditional farming to modern chemical agriculture. For the last 36 years, he has not used any chemicals at all, and has been enjoying excellent yields and profits each year, without any decline. The fertility of the humus-rich topsoil at his farm, and its capacity to absorb moisture has also steadily improved, unlike other farms using chemicals. Particularly noteworthy is the very highly efficient use of water in his method of farming.

Bhaskar Save confidently asserts from his long, personal experience that efficient, sustainable farming requires very little irrigation – a small fraction

of what is commonly used in modern agriculture. Whether one measures irrigation efficiency in litres per kilogram of food produced, or in tonnes per annum for each acre of land irrigated, the water requirement at his farm, 'Kalpavruksha', is between one-third and one-twentieth of that used in most modern farms today. Moreover, the earth under the thick cover of vegetation is a big natural reservoir that holds water all year round. The porous structure of the soil is like a sponge that enables it to absorb and to percolate to the aquifer, or ground-water table, an enormous quantity of rainwater each monsoon. This annual renewal of groundwater is many times more than the total amount drawn from the well for irrigation in the months when there is no rain. Thus, the farm is a net supplier of water to the ecosystem of the region, rather than a net user.

In stark contrast – ever since the British occupation of India – the commonly prevalent horticultural practices have been largely based on the misconception that plantation trees require copious quantities of water. Coconut and rubber plantations, for example, are supposed to thrive on the availability of considerable and frequent irrigation. Most farmers make elegant circular ditches or sunken basins around their coconut trees and fill these with irrigation water as often as they can afford to. The general conviction is that the more water a tree gets, the more healthy and productive it will be.

Bhaskar Save emphatically refutes this. He, and those who have adopted his methods, insist that large quantities of water are unnecessary for horticulture and harms the trees, particularly their root systems, thereby destabilising the health of the plants and adversely affecting their productivity. Such excessive irrigation, according to them, is a serious error.

Bhaskar Save does not do any tillage whatsoever around his trees and neither does he do any weeding. Only if a wild creeper climbs up a sapling, blocking the sunlight reaching its leaves, it may be cut and mulched around the young plant. The weeds that grow around his trees are not considered as competitors, but rather as helpful friends. Human intervention in the orchard area (with full-grown trees) is thus reduced to a bare minimum. The occasional protective irrigation that may be needed is attended to entirely by Bhaskar Save himself, despite his advanced years! The need for any other workers is mainly during harvesting. And this too is dispensed with in the case of his coconut trees, for he allows the coconuts to ripen and fall to the ground when they are ready. He thus calls this method **of** farming, 'natural farming', since the farmer has to do almost nothing, besides collecting the produce.

In the case of field crops like rice, wheat and pulses, Bhaskar Save acknowledges that the no-tillage system of Fukuoka (a renowned Japanese natural farmer) is difficult in the prevailing agro-climatic conditions where rainfall is concentrated during the four months of the monsoon. He thus calls his method

of growing field crops 'organic farming', as it requires periodic human intervention like ploughing, but is sustainable and water-conserving nonetheless. After harvesting his rainfed rice, he plants a pulse crop that fixes nitrogen in the soil and grows on sub-soil moisture, without any need for irrigation.

Prevailing wisdom may argue that development presupposes ecological destruction of some kind. However, Bhaskar Save has convincingly demonstrated that it is possible to obtain abundant yields without decline, while maintaining the health of the ecosystem.

***1.3 Name of person or institution responsible for the practice or experience***

Bhaskar Save

***1.4 Name and position of key or relevant persons or officials involved***

As in 1.3 above

***1.5 Details of institution***

- (a) Address: Kalpavruksha Farm, At & Post: Dehri, Coastal Highway, Tal: Umbergam 396 170, District Valsad (Gujarat), India
- (b) Telephone:++ (91) (2638) 62126,63866

***1.6 Name of person and/or institution conducting the research***

Claude Alvares, Editor, Other India Press  
Bharat Mansata, Researcher & Writer, Earthcare Books

***1.7 Details of research person/institution***

Claude Alvares

- (a) Address: Above Mapusa Clinic, Mapusa **403 507**, Goa, India
- (b) Telephone:++ **(91) (832) 263 306,256 479**
- (c) Fax: ++ (91) (832) 263 305
- (d) E-Mail: oibs@bom2.vsnl.net.in

Bharat Mansata

- (a) Address: Earthcare Books, 2 Anand, 17 Carmichael Road, Bombay 400 026, India

- (b) Telephone:++ (91) (22) 496 4825
- (c) Fax:++ (91) (22) 374 4193
- (d) E-Mail: earth@bom5.vsnl.net.in

## **2. THE PROBLEM OR SITUATION BEING ADDRESSED BY THE PRACTICE/INNOVATIVE EXPERIENCE**

Irrigation is commonly considered to be one of the most important factors governing crop and farm yields anywhere in the world. Most governments in the South believe fervently in the irrigation mantra and hence are ever ready to allocate large amounts of public resources to providing irrigation facilities for the production of food and other crops, including fruits.

International financial institutions are equally willing to provide loans on easy terms to governments for large irrigation projects, since dams are considered an indispensable modern instrument for supplying regular water for agricultural development. Unfortunately, the experience with many such projects is that it has led to the practice of excessive irrigation, which diminishes productivity, and sets in chain a whole series of problems.

Explaining the reasons for this, Bhaskar Save says: “Just as human beings need to breathe continuously, so also the roots of plants (excluding aquatic/semi-aquatic species like mangroves and rice) require non-stop aeration. Excess water drives out the air contained between soil particles, depriving the roots of their most vital need, and thereby disrupting photosynthesis. But soil that is just damp enables non-stop aeration near the roots, resulting in greater efficiency of photosynthesis.” Such continuous soil aeration, emphasises Bhaskar Save, is of fundamental importance for productive, sustainable agriculture.

Bhaskar Save’s understanding of the critical importance of soil aeration was obtained through his observation of the processes at work in natural forests, which often grow thickly on well-drained mountain slopes, e.g. the Himalayas or the Western Ghats. The rain that falls on such steep terrain is drained away rapidly. In many parts, the mountain slopes are 95% rocks and stones and barely 5% soil, yet trees thrive on such land. The main reason for this is the excellent, continuous aeration in the soil that enables efficient photosynthesis. In contrast, tree growth is seen to be much more inferior in low-lying terrains, where water accumulates, driving out the air from the soil.

Moreover, according to Bhaskar Save, “Prolonged flooding at the roots causes them to rot, resulting in various plant diseases and pest attacks. Even after the excess water in the soil has dried or drained away, much time is lost in regenerating the roots and root fibres, before the photosynthesis of new leaves, flowers, fruits etc. can resume. Thus, any water accumulation around

the trees/plants, even for a few hours, can cause considerable damage, drastically reducing their yield for the year.

“Excess water in the soil also harms the earthworms and aerobic micro-organisms such as various decomposer bacteria, that vitally need oxygen to survive and function. The formation of humus from organic matter by these soil creatures is thus obstructed. The natural tillage function of the soil creatures is similarly affected. With the passage of time, the porosity of the soil is reduced, and its capacity to absorb both air and moisture declines. Consequently, evaporation losses from the surface increase, and insidious salinisation sets in.

“Salinisation of the soil is an extremely serious problem caused by excess irrigation. It is only rainwater that is pure distilled water. The irrigation water drawn from canals (or wells, tubewells etc.) contains salts that have dissolved in it through contact with the earth. When such water is used on the farm, some of it evaporates, leaving the salts behind on the surface of the soil. For example, with 60% evaporation, 60% of the dissolved salts are left behind. This process continues, and a progressively thicker crust of salts is formed on the land. Hot, dry climates with a high rate of evaporation are particularly susceptible to this scourge.

“Salinisation greatly reduces the soil’s capacity to absorb air and moisture, since these cannot penetrate the hard, sealed surface of the earth. The plants suffer as a result of this. Similarly, the earthworms, micro-organisms, etc. also die of suffocation, speeding up the ruination of the soil. In a vicious cycle, the traditional plough drawn by bullocks can no longer break the hardened earth, and the farmer is forced to resort to tractor-ploughing, which only worsens the damage each year. The most serious problems, however, are caused where water-guzzling monoculture cash crops like sugarcane and basmati rice are grown year round, abandoning the traditional mixed-cropping and rotation systems of the past.

“The problems are compounded by toxic chemicals which increase the irrigation requirement of crops, and poison the food-cycle of nature, killing many helpful friends of the farmer like the earthworms, bees, frogs, spiders and birds. The living soil collapses into dead dust.”

Conventional irrigated agriculture is based on several methods. These include channel irrigation, use of sprinklers, drip irrigation, etc. The Israelis have, for example, perfected the art of drip irrigation and are now teaching the technique to the rest of the world. This, however, is not free from problems. Though excessive watering and the consequent salinisation may be largely checked by drip irrigation, the chemicals that are used continue to cause damage to the soil.

Moreover, both drip and sprinkler irrigation systems are extremely ex-

pensive and require enormous amounts of capital to install. Such capital is unavailable to most farmers in the South and hence, these technologies have remained permanently out of the reach of the large masses of farmers and peasants.

In addition to the heavy initial expense, these technologies also manifest other problems: for instance, the drip points in the drip irrigation system can become clogged not only by the salts (as evaporation takes place) but also by dirt, since the discharge points are usually exposed. This reduces the efficiency of the irrigation network and increases the costs of maintenance. In addition, chemicals often have to be used to dissolve the salts clogging the dripper points.

Of all the various irrigation methods available, channel irrigation is still the cheapest of the systems in vogue and is traditionally the most extensively used irrigation practice in countries of the South. It does not demand any expensive equipment and invariably relies on the use of marginal or farm labour, of which there is a surplus in all countries.

The technique basically involves lifting water to a high point in the farm and then letting it flow down channels cut in the earth. These channels lead to either flat enclosed fields (for crops) or to the root zones of plantation trees.

These traditional irrigation methods, however, tend to use considerable amounts of water. This is partly because the channels carrying the water are generally unlined, and a fair amount of water may seep into the ground before it reaches the area it is meant to irrigate. However, if such seepage is retained in the earth as soil moisture, or percolated down to recharge underlying aquifers, the water would not be totally 'wasted'. The problem arises mainly because there are considerable evaporation losses from bare, exposed soil.

One modern-day method of 'improving' the channel system is to line the channels with either cement or plastic. Both these options are expensive. In addition, plastic is a known non-biodegradable material and causes major environmental problems. When used in such open channels, its life-span can also be very short as it can be damaged through exposure to the elements, sharp objects and biotic impacts. More significantly, such 'solutions' fail to see where the real problem lies.

### **3. DESCRIPTION OF THE PRACTICE/INNOVATIVE EXPERIENCE AND ITS MAIN FEATURES**

Bhaskar Save's innovative strategy of dense, simultaneous inter-planting of *alpa-jeevi* (short-life), *madhya-jeevi* (medium-life), and *deergha-jeevi* (long-life) crops in the same plot, right from day one, ensures that all the the ground is quickly covered with a thick growth of useful plants. Consequently, evapo-

ration losses are minimised, and optimal benefits are derived from the irrigation that is provided – without resorting to inefficient, expensive and problematic ‘solutions’.

Combining the above strategy with the ‘trench and platform method’ – for both irrigation and drainage, involves intelligent but marginal alterations to the topography of the farm.

The trenches, about 1-2 feet wide, and about 12-18 inches deep are located on either side of a row of trees. Thus, the land between 2 parallel trenches is like a raised platform (in relation to the trenches), and hence the name ‘trench and platform method’. This method is specifically for growing irrigated fruit trees. Bhaskar Save does not use it for growing field crops like rice, wheat or pulses.

In the orchard plot, irrigation is provided only in the trenches (and nowhere else). Thus, the trenches have to be suitably positioned so that the roots of the trees can reach them. Bhaskar Save explains: water (or rather dampness) is not needed near the central trunk, but near the spreading roots of the tree. As the trees grow older and bigger, their lateral roots spread further outward, and the position of the trenches is also shifted further away, in 4 or 5 stages. A good guide for the farmer on how much (and when) to shift the trenches is to observe the canopy of the trees. The lateral spread of the roots of a tree is approximately as much, or as far, as the spreading canopy of the foliage above the ground.

In the final stage, when the long-life trees are fully grown, there is a single trench between every 2 rows of trees, providing irrigation to each of them (when water is released). This is the current position in the fully mature orchard plots on Bhaskar Save’s farm, where the big fruit trees like coconut and chikoo (sapota) are about 30 to 36 years old.

The trenches presently take up barely 4% of the entire area of the orchard. These may be kept well mulched, or are naturally so. The water provided is thus soaked up by the porous soil like a sponge. With shade at ground level (from leaf litter and mulch), and shade from the overhead foliage, evaporation losses are drastically cut. Consequently, the water conservation benefits are immense and obvious. The savings in terms of labour or energy required for irrigation are equally obvious.

When developing a new orchard plot, the choice of species must of course be appropriate to the existing agro-climatic conditions like humidity, temperature, drainage, etc.

The following is an example of the combination of species that Bhaskar Save himself planted in his newer, demonstration orchard plot, which is now about 7 years old:

- (a) *alpa-jeevi* (short-life) plants, e.g. various vegetables. Bhaskar Save mainly planted several varieties of gourds, cucurbits and pumpkin. However, in case no vegetables are planted (e.g. when there is insufficient labour available for periodic harvesting) the weeds should not be removed, unless they begin to overshadow the *madhya-jeevi/deergha-jeevi* saplings, in which case they may be cut and mulched around the saplings.
- (b) *madhya-jeevi* (medium-life) plants/trees (species that may live/yield from 2 to 20 years), e.g. bananas, papayas, dwarf varieties of coconut, etc.
- (c) *deergha-jeevi* (long-life) trees that live/yield for more than 20 years. Bhaskar Save himself mainly planted the 'west coast tall' coconut with a life-span of more than a hundred years, and the chikoo (or *sapota*) that yields for several hundred years!

These categories of plants and trees are assigned definite positions in relation to the trenches, and to each other at the time of planting. If one now follows in stages the Save system, it would proceed as follows:

### Stage I

The species are simultaneously planted as shown in Diagram 1. The trenches are dug about 9 inches away on each side of every row of tree species.

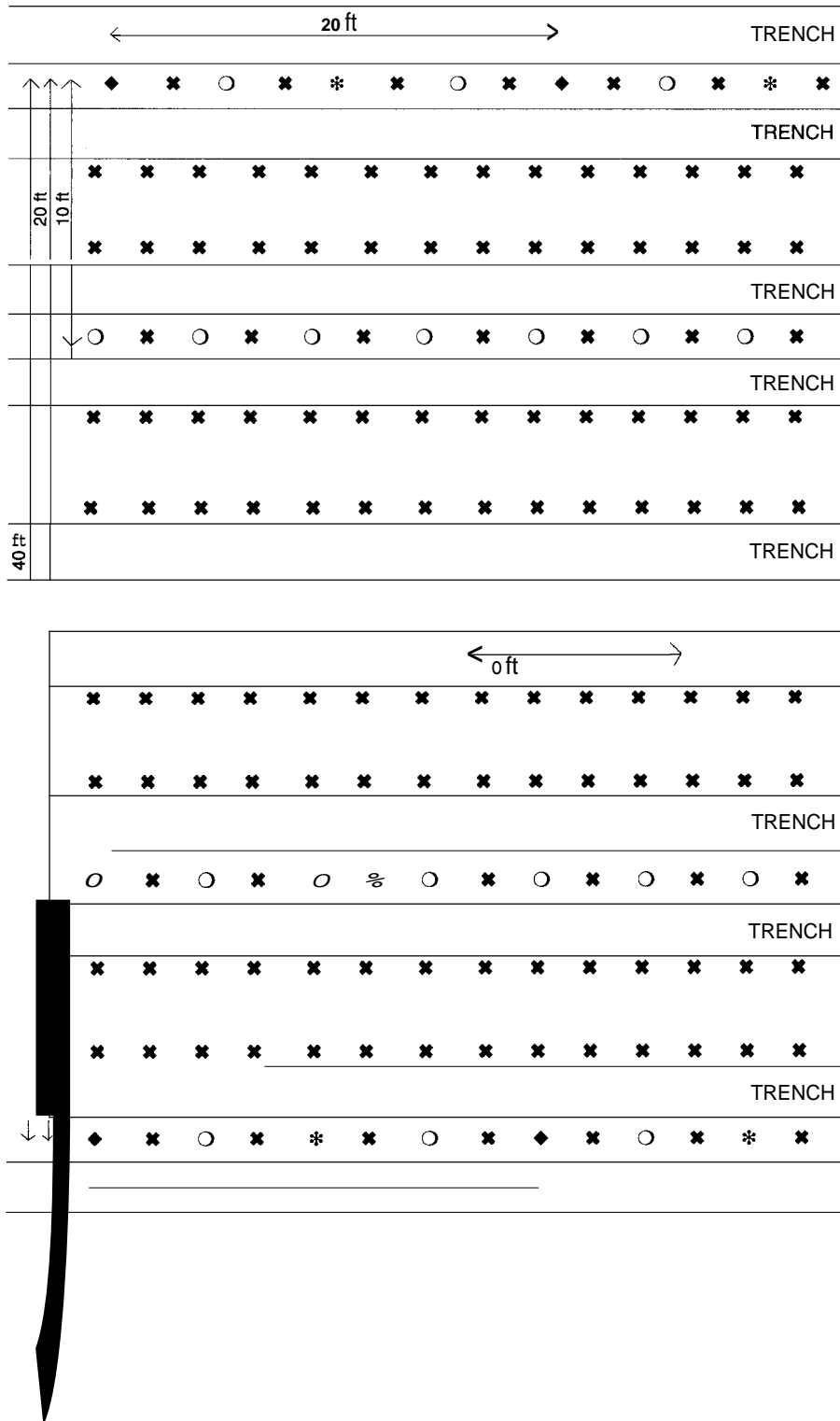
### Stage II (After 2 years)

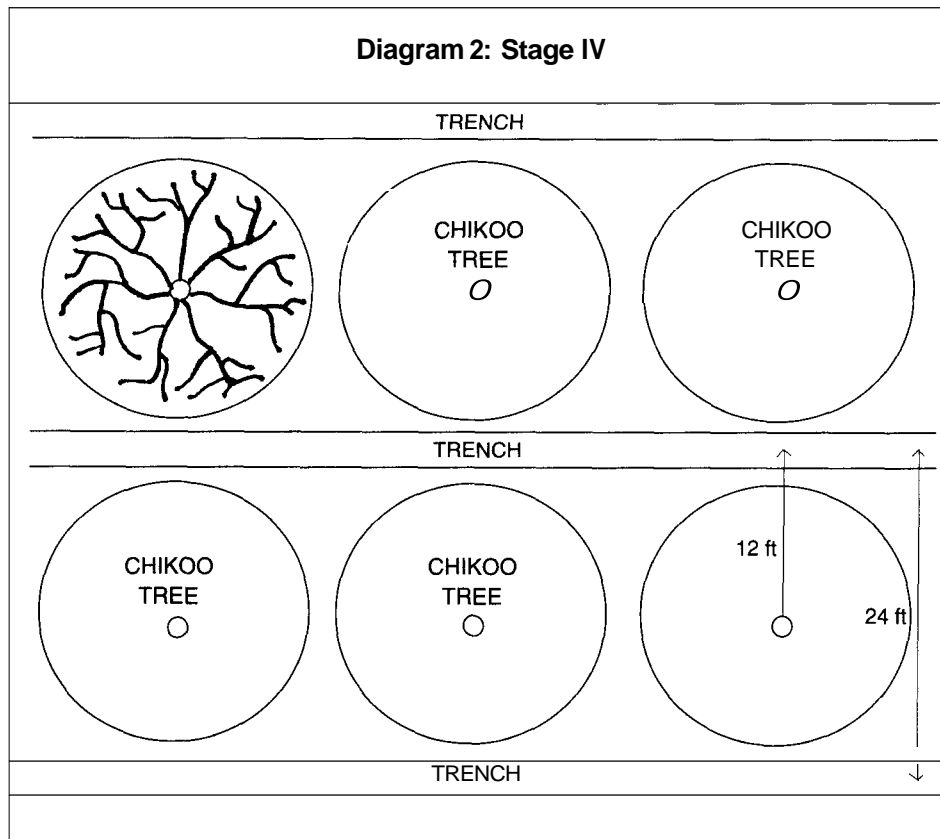
As the trees grow, and their lateral roots spread outward (roughly corresponding with their overhead foliage), the distance between the trenches and the trees is now increased to about 2 feet on each side. The soil excavated in the digging up of the new trenches is used to fill up the old trenches. As there is much more shade cast on the ground by the densely planted trees, the vegetables are largely phased out. The banana and papaya trees would be yielding profusely at this stage.

### Stage III (After 4-5 years)

The trenches are moved further away to about 5 feet from the tree line (on either side). The banana and papaya trees are phased out as the other trees are now casting considerable shade on the ground. The *madhya-jeevi* coconut trees would be yielding well at this stage, while the *deergha-jeevi* 'west coast tall' coconut trees would have just begun to yield.

Diagram 1: Stage I



**Stage IV (After 8-10 years)**

Judging once again from the spread of the overhead canopy or foliage of the trees, the trenches are repositioned about 12 feet from the tree line. By now, the tall and dwarf coconuts trees would have spread their shade over almost every square foot of the platform. This is an appropriate time to introduce shade-tolerant or shade-preferring species like arecanut, pepper vines, betel leaf (*paan*) vines, curry leaf shrubs, etc. at the edge of the new trenches. At this stage, only a single trench is retained between every 2 parallel rows of big trees. The 'west coast tall' coconut trees would now be yielding well, while the dwarf palms would be approaching a phase of declining yields.

Finally, after about 15-20 years, when their yields have sharply declined, the dwarf palms may be culled to make way for the planting of some additional under-storey, shade-tolerant plant species, since the shade from the canopy of the *deergha-jeevi* coconut palms would be covering most of the platform area.

[Note: It must be kept in mind that the inter-trench distances will vary depending on the nature and age of the plants/plant combinations grown, and more particularly on the spread of the growing root systems. Factors such as land slope and the moisture-retention capacity of the soil may also necessitate some modifications of design.]

Apart from the already stated major benefits of water conservation and minimal labour requirement for irrigation, there are 2 additional important advantages of the trench and platform system as pointed out by Bhaskar Save.

By gradually locating the trenches further and further away from the trunks of the trees, the roots of the trees are encouraged to spread laterally to their maximum natural limits in search of the necessary moisture. Such a wide-spreading root system is important for the tree in the following significant ways: first, it provides greater stability and weight-bearing capacity, enabling the tree to withstand rough storms; and second, but just as significantly, the wider reach of the roots enlarges the territory a tree can draw upon for its moisture and nutrient requirements – an important ability in times of drought and moisture scarcity.

On the other hand, a farmer who regularly serves water and manure close to a tree is removing the need for it to spread its roots to help itself. Such trees remain more dependent on the farmer to provide their requirements.

In the monsoon, when the soil becomes saturated, the excess rainwater percolates into the aquifer or underground water table. During prolonged heavy showers, the excess water flows away through the trenches and into the rice field. The trenches now function as drainage channels preventing water from accumulating near the surface of the soil around the trees, where the active roots prefer continuous aeration.

The trench and platform system is thus especially appropriate for use in heavy monsoon areas for it enables excess rainfall to drain away rapidly in such areas. In the dry months, when irrigation water is routed directly into the trenches, the plants are able to access their moisture requirements through their outer root tips. Thus, the trenches serve the double purpose of functioning as irrigation channels in the dry months and drainage channels in the monsoon period.

There are several additional insights on the irrigation needs of his trees that Bhaskar Save has gleaned from his considerable experience. For example, he has found that he needs to irrigate considerably less (and less frequently) in summer than in winter. This, he explains, is because humidity is much higher in summer than in winter. This insight he gained from observing his ingenious ‘water metres’, the humble croton plants growing near the irrigation trenches. They are sensitive to the moisture regime of the soil, and he found that they tend to wilt much more quickly in winter if they are not irri-

gated more frequently than in summer.

At the Bhaskar Save farm – which is spread over approximately 14 acres – the irrigation water in the trenches is released through a 2-inch pipe fed from the well by a 3 horsepower pump. The pump is operated 4 days a week for about 6-7 hours each time. The average daily water consumption works out to approximately 12-15 litres per tree or barely 1,000 litres per acre (for a mature orchard plot). This is less than one-tenth the amount of water used in conventional modern farms and less than half the amount used in drip irrigation systems.

In addition, the trench and platform system is also a no-tillage system. Tillage is avoided because it damages the organic life in the soil and the root systems of plants. Many miles of delicate root fibres can be lost in a single hour of working the soil by tractor/tiller or plough. Even light, manual tillage with hand tools should be totally avoided. Any such tillage significantly reduces the fruit yield of the trees, as considerable time is lost in regenerating the root system before optimal yield is restored.

The high productivity of Bhaskar Save's orchard is readily visible. At any time of the year, a visitor can see thick clusters of coconuts on his palms. The average yield of each coconut tree is about 400 fruits per year. No wonder, the farm attracts regular visitors, even from the distant state of Kerala, which is known as coconut country! There is also a high demand, and often a waiting list, for the coconut saplings that he grows by the thousands.

The simultaneous inter-planting of the 3 different categories of species, when developing a new orchard plot, also has obvious benefits:

- (a) It assures continuity and diversity of yield to sustain small farmers during the gestation of the long-life trees.
- (b) There are also important soil benefits: the dense planting increase biomass yield and cast more shade on the earth, thereby encouraging the growth of organic life in the soil. Consequently, soil porosity and aeration are vastly improved, while the thick shade from the foliage also reduces evaporation losses.

Facilitating soil aeration is a vital consideration in Bhasker Save's scheme of horticultural development. The trench and platform method enables non-stop aeration and respiration near the concentrated root crown zone immediately surrounding the trunk and close to the soil surface. The system is in fact modelled on the natural, undulating terrain found in areas rich in tree growth.

The system is simple, low-cost, does not require intensive labour and is easy to maintain and operate. All that is required to be done is to plug or unplug the water outlet leading into a particular trench to control the flow of water to a particular area of the orchard.

#### 4. DESCRIPTION OF THE INSTITUTION RESPONSIBLE AND ITS ORGANISATIONAL ASPECTS

Bhaskar Save is an institution in himself. He was born in 1920 into a family and community of *Wadwals*, a name which essentially means farm-tender or farmer. In 1951, Bhaskar Save resigned from his job as a school teacher to take up farming full-time, beginning with a holding of 2 acres. At that time, he used to grow only rice and vegetables. When the use of chemical fertilisers started in India, he was among the first to apply them. He became a model, demonstration farm, and Bhaskar Save even set up an agency for marketing chemical fertilisers.

Within a few years, however, he found yields declining, forcing him to increase fertilisation inputs. This made him wary, and despite opposition from his family, he gradually began reverting to organic farming – 1 plot each year – completely eliminating the use of any chemicals on such organic plots. In every such plot, the first year of discontinuing chemical inputs saw a drastic 50% decline in yields. However, every subsequent year, the yields gradually improved. Though output was initially less, he calculated that he was still not making a loss, simply because he had no outgoings on chemical purchases. By about 1963, Bhaskar Save had ceased using chemicals altogether. Yields continued to improve. Around this time, he also began developing his orchard, trying to learn from the natural processes at work in a forest, and gradually refining his understanding of minimum intervention natural farming.

Today, Bhaskar Save's farm is considered one of the best natural/organic farms not only within the country, but beyond its borders as well. When the renowned Japanese natural farmer, Masanobu Fukuoka visited his farm in 1998, he proclaimed: "I have seen farms all over the world. This is the best. It is even better than my own farm!"

Each year, many hundreds of farmers from all across the country journey to southern coastal Gujarat to see his farm for themselves. It constitutes a resounding refutation of the modern idea that plants and trees need the assistance of synthetic fertilisers and toxic pesticides to survive, flourish and yield generously.

The farm is generally open to visits from the public only on Saturdays from 2-4 pm, when Bhaskar Save himself accompanies visitors around the farm and explains with ever-fresh enthusiasm his way of natural farming. He is most fluent in Gujarati and Marathi, but can make himself understood in Hindi as well. Visitors who understand none of these 3 languages should preferably take along an interpreter with them. For serious visitors who are involved in farming, it may be possible to arrange a visit on a day other than Saturday, by obtaining Bhaskar Save's prior consent over the telephone.

Bhaskar Save's immediate family consists of himself, his wife, his 2 sons, 2 daughters-in-law, and 4 grandchildren, who all live with him, and help out on the farm when required. Both his sons, Naresh Save and Suresh (Balam) Save, whole-heartedly follow his approach of natural farming, and independently work on or supervise other farms as well. They are also sometimes overwhelmed with requests for on-site consultations and guidance for visitors' or neighbours' farms.

There are usually just 2 or 3 full-time (monthly wage) employees helping out on Bhaskar Save's farm. Additionally, daily-wage workers may be hired, as and when required, for harvesting, washing (and packing large baskets) of chikoos, and also for gathering the fallen coconuts. During summer, when the community pond outside his farm has dried up, Bhaskar Save sometimes gets 2 workers to bring in on his bullock-cart, the upper layers of the pond silt, freshly collected the previous monsoon. Such silt/soil has excellent fertility, and helps restore the 'drain' or 'loss' of soil micro-nutrients contained in the substantial produce that is sold. Moreover, the desilting benefits the local community as well – by restoring the water-storage potential of the pond.

## **5. PROBLEMS OR OBSTACLES ENCOUNTERED AND HOW THEY WERE OVERCOME**

During the initial transition years, most of the opposition/discouragement to Bhaskar Save's efforts to revert to organic farming came from his own family members and friends. Seeing the sharp decline in yield during the first year, they were naturally concerned, for they lacked his confidence that productivity would gradually improve. This is a common enough experience among farmers who wish to desert chemical-based farming and return to organic agriculture. Such opposition, however, is fairly temporary and often, after the organic farm has turned the corner, and visitors come in droves to inspect the successful farm, family members relent and soon begin to share in the confidence and pride of having achieved something that the outside world has noticed.

There has been no support provided to Bhaskar Save from any government institution or agricultural university. He has never expected any, as they are on diametrically opposite paths, promoting chemicals, big irrigation schemes, hybrids, mechanisation, etc. Bhaskar Save is quite blunt (though never arrogant) in criticising this approach. Numerous high-ranking officials, agricultural scientists and policy makers from Gujarat, Maharashtra and other states have visited his farm over the years. Many of them have (perhaps reluctantly) noted glowing remarks in his visitors' Opinion Book, which now runs into several volumes. But there has been no sincere effort by them to popular-

ise his way of natural farming. On the contrary, a new mega port that the Gujarat Government plans to build nearby, now threatens to swallow his farm, which has become like a hallowed university for all those who desire to learn the philosophy and practical aspects of successful natural farming.

## 6. EFFECTS OF THE PRACTICE/INNOVATIVE EXPERIENCE

Bhaskar Save's approach of natural farming, his system of inter-planting the three categories of species in orchard development, and his trench and platform method for irrigation and drainage has numerous benefits as already indicated.

- (a) excellent yields;
- (b) continuity of yield during the gestation of 'long-life' fruit trees; (c) regeneration of soil fertility;
- (d) water conservation;
- (e) water harvesting (high recharge of aquifers);
- (f)** wholesome, poison-free produce;
- (g) low costs and excellent profits;
- (h) progressively reduced labour requirement;
- (i) minimal external inputs;
- (j)** demonstration effect that reaches out to many others;
- (k) friendly to nature's creatures; and
- (l) nips cynicism, restores hope, and is therefore spiritually satisfying and uplifting.

## 7. SUITABILITY AND POSSIBILITY FOR UPSCALING

There are enormous potentials for upscaling. However, suitable modifications may be needed in design and choice of appropriate species, depending on local topography and agro-climatic conditions. The basic principles are universal, but a formula method cannot be prescribed. The trench and platform method is particularly suitable for growing various irrigated trees, but not for field crops like cereals and pulses.

## 8. SIGNIFICANCE FOR (AND IMPACT ON) POLICY-MAKING

The practice of trench and platform farming can have significant impacts on policy-making. Existing irrigation development policies are based on the idea that supplies of large quantities of water are essential for improving and maintaining the productivity of modern horticultural farms, whether large or small. To supply such large quantities, governments and international finan-

cial institutions are still spending colossal sums of money on the erection of large dams, despite the fact that such dams are now known to have very serious direct and indirect negative impacts on the ecosystems in which they are situated.

Bhaskar Save's method of water conservation and brilliant use of scarce water supplies should convince policy makers that the association between ample water supplies with productive farms is not as close as is made out to be, and that much agricultural output can be raised with far less water than is presently used. And on the contrary, the inevitable trend of excessive irrigation that results from most big irrigation schemes is proving disastrous to the soil, to the sustainability of farming systems, and consequently to the food security of Southern nations.

Policy makers should start to realise that there are far better ways of meeting our water needs than by building big irrigation schemes. Next to South America, India receives the highest rainfall in the world. The annual average is 1150 mm, or almost 4 feet. Consequently, out of the annual renewable fresh water resources of about 350 million hectare metres, almost half is held within the land mass as soil moisture, and as ground water – without any expenditure by the State for either storage or movement.

The soil and its underlying aquifers absorb the rainfall, thus functioning as gigantic reservoirs; a free gift from Nature. The water they hold is better protected from surface evaporation or pollution. The availability is decentralised. Usage remains in local control, according to need, and is therefore more efficient. And the total storage potential is many times the combined capacity of all of India's 'major and medium' irrigation projects: complete, incomplete, and those still on paper.

Lands under forests and trees are the most efficient in soaking rainwater. Like massive sponges, they absorb until the soil is saturated. The excess water then percolates into underground aquifers, or flow as perennial streams. This is how most Indians once had water all year round, long after the rains had stopped.

The annual rainfall in Gujarat is 12 times the amount of water that the gigantic Sardar Sarovar Dam may provide, even by the most unrealistic estimates. Thus, if absorption into the earth is increased by restoring ground cover vegetation, particularly trees, more water can be available in a decentralised, benign form than what the mega-dam aims to provide at enormous ecological and economic cost.

As Bhaskar Save points out, India is also blessed with a fabulous wealth of species that provide food, fodder, firewood, timber, green manure, and a host of other needs. Among fruit or food trees that grow with little or no irrigation are mango, custard apple, ber, aonla, jambul, mahua, fig, pome-

granate, date palm, toddy palm, cashew and tamarind. Numerous other multi-purpose species also grow well in low-rainfall areas.

## **9. POSSIBILITY AND SCOPE OF TRANSFERRING TO OTHER COMMUNITIES OR COUNTRIES**

There is wide scope for applying the trench and platform technique in other farming communities, farm families and countries. The technology is not complicated and once the basic concept is understood, it can be easily replicated, with any necessary modifications. The farmer does not have to invest huge amounts of capital. Experimenting in small plots is thus risk free, until the farmer feels confident enough to replicate such efforts in wider areas.

## **10. OTHER COMMENTS**

More information, contributed by Bharat Mansata on Bhaskar Save's trench and platform method of farming is contained in the *Organic Farming Source Book*, edited by Claude Alvares, and published by the Other India Press, Above Mapusa Clinic, Mapusa 403 507, Goa. There is also a book-length manuscript, *The Vision of Natural Farming*, currently being prepared on Bhaskar Save and his way of farming by Bharat Mansata. This will be published shortly by Earthcare Books, 2 Anand, 17 Carmichael Road, Mumbai 400 026.