

I started my farm 'Kalpavruksha' in South Gujarat about 40 years back. At that time the use of agrochemicals was just starting to spread in India. Like most other farmers, I abandoned my father's traditional farming methods and adopted the conventional or chemical farming methods. First, I believed chemical farming to be a superior scientific method. My farm was even used as demonstration farm and scientists of Bombay and Poona followed my results. But as I was very fond of experimentation I carefully analysed what happened. At the end of the third year, I realised that I was spending more and more to get less and less. For that reason I decided to experiment with organic farming and started on a small plot on which the use of chemicals was totally stopped. Initially, there was further fall in production but farm profits were higher than before due to savings on costs of inputs. Each year I converted more acreage to organic farming. Steadily, both the soil and production improved. External inputs of organic matter were gradually reduced. Now, my farm is already 32 years completely free of chemicals. By carefully observing nature I developed a system of Natural Farming which is very productive while conserving the natural resource base. Although there are similarities in spirit and philosophy with Natural Farming as developed by Mr. Fukuoka (see box on Fukuoka), who in 1990 visited my farm, I developed my way of farming directly from nature. My farm is my university!

'Sanghavi' farm

Five years ago, Ashok Sanghavi, inspired by the results of my way of farming, asked me to help him start a farm on land which he bought nearby my place. On 'Sanghavi' farm we now try new techniques of Natural Farming (see box on new way of coconut farming). On this farm a training centre is being built to help other farmers to adopt their farms to Natural Farming. Trainings will be conducted in local languages, Gujarati, Marathi and Hindi. Both farms are

Planting coconut trees my way

Normally, coconut trees are planted on 7.5m x 7.5m basis. I discovered that by planting the trees two by two on the north-south axis, leaving 0.5m resp. 7.0m between the trees in the row and leaving 15m between the rows, trees get the same amount of sunlight as when planted in the conventional configuration. Benefits of such plantation are:

- Per acre 84 trees can be planted against 70 in the normal method.
- Because of the two trees being together, expenses can be saved for maintenance, planting, watering, etc.
- On the vacant land of 15m between the rows of trees, vegetables and pulses and also bananas can be planted which considerably increase productivity of the land.



Photo: Cavin Rajiv/ies

Mr. Save's way of Natural Farming

Based on carefully observing nature and some forty years of experience, Mr. Save developed his way of Natural Farming. This balanced way of farming leaves important aspects of farming such as tillage, fertilisation, weeding and pest control as much as possible to natural processes. According to the authors a lot of hard work has become unnecessary and relatively high production and income are obtained. But even more important, this way of farming conserves the natural resource base and guarantees food security also for future generations. In this article Mr. Save explains the principles on which he built his orchard farm.

Bhasker Save and Ashok Sanghavi

managed on the basis of 6 principles which I found to be important for Natural Farming.

Earthworms for tillage

In an orchard the soil needs no tilling. Only in the first year initial tilling is necessary to remove medium and large size rocks and to facilitate spread of roots. Subsequent tilling is harmful as it cuts off the roots. Instead effective tilling can be carried out by earthworms who work free of charge. Therefore, it is most important to create the right environment for the earthworms, ie. dark, moist, well aerated surroundings with an abundance of organic matter. This may be achieved by means of organic fertiliser, mulching, providing ground cover of vegetables, legumes, or at least letting the weeds grow and by shading. In such conditions, the earthworms will usually come and multiply on their own. Sometimes, earthworms can be bought from a vermi-

composting farm. However, often these are manure worms (*Eisenia foetida*) which only survive in compost heaps. In orchards, species are needed which dwell in the soil and are adapted to the local conditions (see box on vermiculture biotechnology). Buying earthworms or even vermicompost with earthworm cocoons has often led to considerable financial loss which may make farmers unnecessarily disheartened about Natural Farming. If irrigation is used (also drip irrigation) earthworms will stay active the whole year round, even during a long dry season.

Organic replaces chemical

To enhance soil life, especially earthworms, all kind of organic manure can be used. Organic manure spread on the soil will be eaten by earthworms and disappears within a few months during the rain season.

Mr Save (with scarf), Mr. Sanghavi (far right) and friends in front of coconut trees grown two by two at 'Sanghavi' farm.

In 'Kalpavruksha' farm most organic matter applied comes from internal sources: crop residues, leaves, weeds and especially biogas slurry. As external inputs, I use about 1.5 tons of organic manure mainly cow and poultry waste, about 3 tons of municipal garbage and about 14 tons of silt obtained from the bottom of a nearby pond.

Feeding soil life, not plants

Both organic manure and irrigation water are kept at a certain distance from the plants. Manure is not the food of the plants but it is the food of soil life. These organisms make the soil rich in humus, NPK, micronutrients and other vital substances. Humus enables the soil to absorb and retain moisture and prevents leaching of plant nutrients. Both moisture and plant nutrients are sucked by the roots and transported to the leaves. Trees are irrigated at a certain distance from their trunks. Organic manure is applied on the

sides of the trenches or in the trenches in the case of biogas-slurry.

When plants are nourished this way, they develop strong roots which protect them against strong winds. Secondly, because no chemical fertilisers are used, they do not become thirsty. In my farm the trees need only 30% of the irrigation water as compared to the amount normally used in gravity irrigation. Since the trenches are well mulched and earthworm activity is high, absorption of water is rapid, and evaporation losses are greatly reduced. During monsoon, excess water in the porous soil drains away into the trenches.

No monocultures

Nutrient rich excreta of earthworms near the trenches provide a buffet for the plants, each of which draws according to its needs. Since all nutrients are abundant in supply, it is not necessary to adjust to the individual specific requirements of each species. However, the position of each species in relation to the trench is important, as its roots should be able to reach it. Thus, depending on the nature of the plant, the appropriate distance to the trench is chosen.

Short life, medium life and long life



Coconut (long life), banana and papaya (medium life) intercropped in 'Sanghavi' farm.

	Natural Farming way	Conventional way
1st bunch of bananas on tree	18 kg	25 kg
Second bunch	30 kg	30 kg
Third bunch	25 kg	20 kg
Fourth bunch	15 kg	tree dies
Total	88 kg	75 kg
We sold this at	2.50 per kg	1.75 per kg
Total Income	Rs 220.00	Rs 131.25
LESS expenses		
Water, Labour, Transport	Rs 66.00	Rs 105.00*
Net profit per tree	Rs 154.00	Rs 26.25
Net profit per tree with ordinary price	Rs 88.00	Rs 26.25

* Including additional expenses of fertiliser, pesticides and weeding

'Kalpavruksha' farm

The farm of Mr. Save is situated in Umbergaon region, the coastal zone of South Gujarat, traditionally known for its orchards of chikoo (also called sapodilla or sapota, *Manilkara achras*) and coconut trees. The land is nearly flat and receives about 2000 mm rain from the South-West monsoon from June to September. The soil has become very rich in soil life, humus and plant feeding nutrients. Due to the many earthworms and other micro-organisms soil structure has become very porous providing excellent drainage, moisture holding capacity and aeration. The maximum depth of the watertable is about 10 m.

'Kalpavruksha' farm is about 14 acres, of which 10 acres are under tree crops, 2 acres for coconut nursery, and 2 acres for field crops like rice, pulses, vegetables, etc. which are mainly used for home consumption. Main market crops are chikoo (about 350 trees) and coconut (about 350 trees). Yearly, about 20,000 coconut saplings are raised and sold. Smaller numbers of banana, papaya, mango, jack-fruit, guava, areca-nut, custard apple, kala jamun, white jambu, drum-stick, curry-leaves, pepper, passion fruit, etc. are planted in between. Further 2 cows, 1 bull and 2 calves are kept.

Labour requirement is relatively low and well distributed over the year. The main part of the work is done by Mr. Save and his son. Harvesting, washing and sorting of chikoo is done by 3 employed girls. The lady members of the family help in supervising and keeping an account of quantities sold.

Approximately 90% of the revenue of the farm comes from chikoo and coconut. The other 10% a.o. from banana, curry leaves and honey.

plants with respectively short, medium and long root systems are planted together in such a way that following the development of the long life plants, the short life and medium life plants can be harvested. When starting a new orchard plot vegetables (short life plants), banana and papaya (medium life plants) and chikoo or coconut (medium life plants) can be harvested. After 3 months, vegetables are harvested, after two to three years banana is taken away and used as mulch, leaving full space to chikoo or coconut. Many other species of trees are interplanted in lesser numbers.

Natural pest control

Plants nourished this way are very healthy and develop strong resistance to diseases so that pesticides are not needed. It is not that pests do not attack plants being grown the Natural Farming way. They do, but they are kept under control biologically in the sense that every pest would be prey to another and not all such pests would be harmful to the plants. Pests like spiders, red ants, some birds (eg owls), etc do not harm the plants but they eat away harmful pests and rodents. Some types of plants like sweet neem (curry-leaves, *Murraya koenigii*) help in controlling the pests. Also other natural methods can be used, such as a mixture of one part of cow urine and eight parts of water to be sprayed on the plants. Plants need care not cure!

Plants grown this way cannot easily be beaten in their race with weeds. Once weeds are deprived of sunlight they are

defeated and die. These dead weeds should not be removed as they protect the soil from strong radiation, prevents loss of moisture and provide additional manure.

No hard labour

Natural farming relieves a large work force from seasonal, irregular, laborious and badly paid work. Also, we experienced that quality and shelf life of crops grown the Natural Farming way is much better as compared to conventionally grown crops. For that reason we get higher prices for our products. For example, for bananas we get Rs 2.50 instead of Rs 1.75 per Kg. We are convinced that farming done the Natural Farming way makes sound economic sense. On an annual expense of about Rs 50,000/-, my annual revenue is more than Rs 500,000/-, a profit margin on costs of more than 900%. Apart from being ecologically sound, Natural Farming can increase food production considerable in an economically feasible and profitable way. Unless we move to methods which renew soil fertility even while getting maximum production from it, we cannot hope to solve the problem of food for all the people in the years to come. As I always say: oil may last till 2050, soil will not!



Castings indicate the activity of earthworms along the irrigation trenches. Earthworms are one of the keys to Natural Farming.

Further information can be obtained from Mr. Ashok V. Sanghavi, 23A, Central Chowpaty, Chowpaty, Bombay - 400 007, India.

Masanobu Fukuoka's way of Natural Farming

Fukuoka is the guru of Natural Farming in Japan, well known from his books 'The one straw revolution' and 'The natural way of farming' (Fukuoka 1978, resp. Fukuoka 1985). Fukuoka's method of farming emerged out of his conviction that nature knows best. The best way to grow plants and trees is to imitate nature as closely as possible, that is, to grow plants and trees in an environment which closely resembles their growing conditions in the wild. Once the proper natural environment is provided, nature will take care of the rest. In his vision Natural Farming goes much further than organic farming in pursuing the way of nature. 'Natural Farming arises of itself when a unity exists between man and nature. It conforms to nature as it is. It proceeds from the conviction that if the individual temporarily abandons human will and so allows himself to be guided by nature, nature responds by providing everything'. Fukuoka considers Natural farming a way of living.

His farm consists of about 12.50 acres orange orchard mixed with many other tree species and vegetables and about 1.25 acres rice and winter grain. Productivity and stability seem to be higher than on comparable conventional farms in his neighbourhood and the ecological capital is well kept. Four important differences with conventional farming are:

- **No cultivation:** no ploughing or turning of the soil. The earth cultivates itself naturally by means of penetration of plant roots and the activity of micro-organisms, small animals and earthworms.
- **No chemical fertiliser or prepared compost:** if left to itself, the soil maintains its fertility naturally, in accordance with the orderly cycle of plant and animal life. Fukuoka grows a leguminous ground cover of white clover, returns the crop residues to the fields and adds a little poultry manure.
- **No weeding by tillage or herbicides:** weeds play their part in building soil fertility and in balancing the biological community. As a fundamental principle, weeds should be controlled, not eliminated. Straw mulch, ground cover of white clover interplanted with the crops and temporary flooding provide effective weed control on Fukuoka's farm.
- **No dependence on chemicals:** nature, left alone, is in perfect balance. Harmful insects and plant disease are always present but do not occur in nature to an extent which requires the use of poisonous chemicals. The sensible approach to disease and insect control is to grow sturdy crops in a healthy environment. Fukuoka grows his grain crops without chemicals of any kind. On some orchard trees he occasionally uses a machine-oil emulsion for the control of insect scales.

References

- Fukuoka M, 1978. The one straw revolution. An Introduction to natural farming. Emmaus: Rodale Press.
- Fukuoka M, 1985. The natural way of farming: the theory and practice of green philosophy. Tokyo: Japan Publication Trading Co Ltd.

Vermiculture biotechnology

Earthworms are one of the farmer's greatest allies: by decomposing organic matter, generating nutrient rich casts and opening channels in the soil, earthworms improve soil fertility and structure. There are many different earthworm species with different habits.

Some species inhabit organic matter lying on the soil surface, where they eat fallen leaves and other non-decomposed litter. An example of this is the California redworm or manure worm (*Eisenia foetida*), which is used in vermicomposting. Vermicomposting is the process of using earthworms and microorganisms to convert organic waste such as manure or household refuse to valuable compost. This is being done in temperate as well as in tropical countries on household as well as industrial scale. Other species live beneath the soil surface, where they mix and aerate the soil as they make extensive horizontal burrows. These species eat soil and dead roots. Again other species burrow vertically into the soil creating channels for drainage, aeration and root growth. These species feed on surface leaf litter, manure, and other organic matter, dragging the material into their burrows before they eat it.

All three types of earthworms prefer cool moist soil rich in organic matter, such as found in moist grasslands and forests. Materials with a low carbon to nitrogen (C:N) ratio make a better food source than grasses, which have a higher C:N ratio. A soil pH close to neutral favours worm populations.

Many farming practices, including frequent tillage and the use of chemical fertilisers and pesticides, have detrimental effects on earthworms and their habitats. Werner and other researchers (Werner and Dindal, 1989) are studying how practices can be tailored to enhance worm populations. Tillage seems to be the overriding factor which lowers the earthworm population. It is difficult to find ways to enhance earthworm populations in either conventional or organically managed systems as long as tillage is practised. Much remains to be learned about earthworms in agroecosystems.

As farmers become more and more interested in substituting low-external-input practices for conventional management, they may find that earthworms play an important role in their efforts. From: Cathy Baldwin, 1991. The role of earthworms in agroecosystems. The Cultivar, 9(1):5-6, Agroecology Program, University of California, Santa Cruz, California 95064, USA.

References

- Werner MR and Dindal DL, 1989. Earthworm community dynamics in conventional and low-input agroecosystems. In: *Revue D'Ecologie et de Biologie du Sol*, 26(4):427-437.
- Bhawalkar V and Bhawalkar U, 1991. Vermiculture Biotechnology. Bhawalkar Earthworm Research Institute, A/3, Kalyani, Pune-Salara Road, Pune - 411 037, India.