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# PRINCIPLES AND PRACTICE OF ORGANIC FARMING

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**O**rganic farming is a philosophical approach to life; live and let live survive together, prosper together - based upon the famous Indian saying: *Vasudhaiva Kutumbakam*. Organic farming means farming in the spirit of Organic relationship. It places farming on integral relationship between soil, water and plant; between soil, microbes and waste product; between vegetable kingdom and animal kingdom including man; between agriculture and forestry, between soil water and atmosphere. Such a holistic concept in the totality of these relationships is the bed-rock of Organic farming. Organic farming system seeks to significantly reduce or avoid entirely the use of chemical fertiliser and pesticides, growth regulators and other agricultreals. It is structured to minimise the need for off-farm agri-inputs. Many of the principles involved in traditional agriculture have now become the basis of Organic farming. The system relies on crop rotation, Organic manure and biofertilisers for nutrient supply, chemical pest control system including bio-pesticide, and bio-control methodologies for insect control, innovative crop husbandry for disease control and maintaining soil productivity.

Organic farming is known by various other names also: Alternative agricultural, Lower input sustainable agriculture (LISA) ecological agriculture, regenerative agriculture etc.

Instead of depending on high-value agri-chemicals, a sustainable farm relies as much as possible on beneficial natural processes and renewable resources drawn from the farm itself for maintaining soil fertility and soil productivity. By raising diverse assortment of crops and live stocks, a farm can buffer itself against economic and biological risks. Diversity results from mixing species and varieties for integrating crops, trees and live-stocks.

In organic farming, nutrient supply is meant for soil, not for plant. An Organic Farmer believes that if the soil is healthy, the plant has to be healthy

and if the plant is healthy, pest and disease attack is a far cry. So, maintaining soil health is the key factor in Organic Farming.

## Soil Health

Adequate quantity of organic matter in the soil is a pre-requisite for maintaining soil health and sustained productivity.

Vegetation is primary source of soil organic matter. Forest soils having large quantity of leaf litter, is rich in soil organic matter. Organic carbon, N and K status in such soil are substantially high. Factors affecting organic matter in soil are: (1) Vegetation (2) altitude (3) soil moisture (4) soil pH (5) atmospheric temperature.



Soil Organic matter plays a key role in maintaining soil structure and soil fertility.

The organic matter content of the cultivated soils of tropics and sub-tropics is comparatively low due to high temperature and intense microbial activity. Therefore periodic addition of organic manure is necessary to maintain soil fertility.

Microbial decomposition of organic matter results in the forming of humus and these release many plant nutrients. Microbes also produce sticky substances called polysaccharides that glue soil particles together. Humus exerts a positive influence on the physical chemical and biological properties of soil and therefore is a major factor determining the soil fertility. Humus improves soil bulk density & water holding capacity (sandy soil) and infiltration capacity in clayey soil by aggregation due to improved soil porosity and aeration, helps root growth and penetration and increases the slow and steady availability of plant nutrients by virtue of its chelation property. Humus substances specially increase phosphorus availability as they have a very high cation exchange capacity.

Organic manure, compost contain a very large population of bacteria, actinomycetes and fungi and also stipulate those which are present in soil. Nitrogen fixation and phosphorus solubilization are increased due to improved microbial activity in the soil. Organic amendments further reduce nematode population in soil. It even mitigates the effect of toxic pesticide in soil mass. Thus Organic manure is not only a N-P-K supplier to soil. It is much more than that. In fact N-P-K content in most organic manures (FYM, crop-residue green manures, compost, biogas slurry, pressmud, oil-cake) are not high. But careful addition of such amendments sustains soil health and crop productivity.

Most of the cultivated soils of India are poor in organic matter due to high temperature and intense microbial activity (O.C. 0.5%) Hence systematic addition of organic manure is highly necessary for maintaining soil health and sustainable crop productivity.

Technology of Organic farming practice thus gives primary importance to recycling of organic matter. Other important steps are crop rotation, use of bio-fertilisers, biological control of pest soil matter. Other important steps are crop rotation, use of bio-fertilisers, biological control of pest, soil water management for *in situ* moisture conservation and integrated farming system approach. An innovative crop rotation system keeps the weak population down by allelopathic effect of root exudates, and prevents growth and expansion of insect pests and pathogen in soil media. Growing legume crop helps in saving 40-50 Kg N/ha. when next cereal crop is taken.

Bio-fertilizer's are inexpensive and environment friendly. Their use helps in harnessing atmospheric nitrogen and soil-bound phosphorus. The use of enriched organic manure and biofertilisers can reduce costly input and sustain the productivity without damaging soil and water resources.

Biological control of pest is of prime importance to Organic Farming for maintaining ecological balance. Bio-control techniques of using Bt, NPV predators/parasites, natural pesticides like Neem and other plant extracts are some of the best ways to combat pests without the use of toxic chemicals. Suitable cultural practices, devised and adopted by organic farmers, also keep the pest population down.

In-site water conservation techniques are adopted by organic Farmer by suitable soil-water management system. Prominent among them are: mulching, reduced tillage, ridge and furrow system of irrigation, conservation of rain-water by contour trench, bench terracing etc.

Integrated farming system approach involves a blend of crops, animals, poultry, fisheries bee keeping, sericulture, agro-forestry, agro-horticulture and silvi-pasture system. This helps in Organic recycling and energy economy.

The Organic Farmer is the fortunate possessor of energy-efficient sustainable farm land containing more organic matter, nitrogen and biologically available potassium. It has better capacity to store

nutrient, a higher water content, a large microbial population and a deep top soil. All these result in sustainable crop productivity yet remaining benign to environment and ecology. Organically produced foods also have better nutritional make-up and taste properties, improved shelf-life and free from pesticide residue.

There is a tendency among us to romanticise the organic farm (OF) methodologies based upon our traditional practices in the distant past and to feel nostalgic about it and to find fault with the modern technology. There is also an equally opposite tendency of glamourising chemical farming (CF) and condemn the past. But considering the stark reality facing us to feed evergrowing population from even shrinking per capital agriculture land, we cannot wish away chemical farming. Organic farming simply does not have adequate resources for supplying necessary nutrients for high yielding/hybrid seeds grown with a cropping intensity of 200-300%. Nor can it keep such farm lands free from pest-inoculum by bio-control agents only. However modern agriculture also has thrown out new problems: ground-water pollution, food contamination by pesticide residues causing human health hazard, pesticide resistance, reducing soil microbial activity. Natural regenerative activity of soil is getting impaired as a result of high chemical fertiliser. Increasing costly input of petro-based agro-chemicals make the commercial agriculture cost-prohibitive.

Meanwhile research has shown that complementary use of chemical fertiliser and organic manures increase the efficiency of both the sources of nutrients and improve soil productivity.

#### Effect of complementary application of Organic manure (FYM) and chemical fertiliser on the grain yield of cereals.

Country	Crop	FYM(t/ha)	FertiliserN kg/ha	Yield kg/ha	%increase over control
India	Rice	0	0	950	0
		5.6	0	1400	47
		0	67	1550	63
		5.6	67	2070	118
China	Wheat	0	0	1330	0

15	0	1570	18
0	70	1530	15
15	70	1790	35
0	140	1630	23
15	140	1990	50

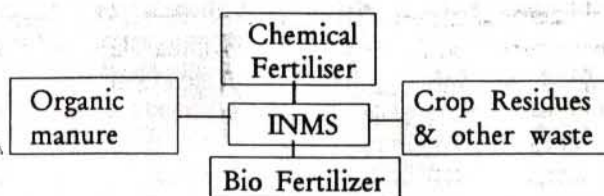
Similarly complementary use of Bio-control agents with chemical pesticides along with other means have been able to keep pest population below ETL (Economic Threshold Level), predators and parasites alive, food less contaminated and pesticide resistance to insert pests less common.

Thus avoiding pitfalls involved in both these extreme views of organic farming (OF) and chemical farming (CF) combining both the broad schools of thinking, integrated nutrient management (INM), integrated pest management (IPM) and integrated disease management (IDM) systems are being developed. This has given way to practical farming (PF) substituting both OF & CF.

#### Integrated Nutrient Management System (INMS)

Aims at maintaining soil fertility and plant nutrient supply for sustainable crop productivity by adjusting, chemical fertiliser, organic manures and crop residues. Different proportion of these components are to be used based upon crop and availability of local supply.

The cropping system rather than the individual crop and the farming systems rather than the individual field are the focus of attention of this approach for developing INM system for major agro-ecological zones and for various categories of farms.



#### Integrated Pest Management System (IPMS)

IPM is a mixed bag. Different components are:

1. Use of tolerant variety
2. Cultural/Agronomic Practices
  - Timely sowing

- Wide spacing
- Removal and destruction of altered host
- Crop rotation
- Field sanitation
- judicious use of chemical fertiliser

3. Pest surveillance and monitoring by use of

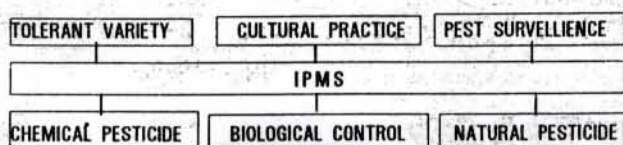
- Pheromone Trap
- Light Trap

4. Biological control: By Bt., NPV, Entomofungus and predators/parasite.

5. Natural pesticide

6. Chemical Control.

IPMS is in developing stage. IPMS has already been developed for cotton and sorghum. They have dramatically reduced the use of pesticides on such crops. IPMS of major crops are yet to be developed. Farmers acceptance of this technology is, however, very poor.



**Integrated Diseases Management System (IDMS)**

This thinking is the latest in the series and stems from the same concern of environmental pollution caused by the array of chemicals (Fungicides, nematocides, anti-virals) used to control various plant diseases including post-harvest diseases of many fruit crops.

Alternative strategies are continuously sought for and blended with chemical control strategies to build IDMS. Essentially the coverage is disease-oriented.

**Some examples are:**

- \* Summer ploughing and tarping (Soil solarization) can control pearl millet smut disease.
- \* Seed cleaning by commercial model of specific gravity can remove ergot sclerotia in pearl millet.

- \* Mixed cropping of brinjal with marigold and sesamum in alternate rows significantly reduce root-knot index of soil and increase brinjal yield.
- \* Early sowing and summer ploughing reduce purpleblotch disease and increases yield in onion.
- \* Cumim wilt can be effectively controlled by soil amendment of mustard cake and poultry manure.
- \* Stem rot of mango can be prevented by harvesting fruit on clean dry day and promptly packing the produce.
- \* Tulsi leaf extract is effective against certain fruit roots in guava.
- \* Papaya rots can be prevented by holding the harvested fruits in a case on a standing position rather than heaped in a basket.
- \* Aerated steam treatment also can prevent papaya rot, deactivating enzymes of the pathogen by heat coagulation process.

Thus practical farming involving integrated management system needs many inputs one of which is brain. This implies that methodologies should be technically sound, practically feasible, economically attractive and socially acceptable. They should also be continuously refined based on new findings and feed-back from the field.

It is difficult to spell out what direction Indian farming will take in future. In Holland, Israel and so on, the concept of green house farming has been implemented with the aid of computers and low man-power. The situation in our country is different.

Abundant natural bounties and different types of soils and seasons prevail in India. There is certainly no dearth of human population. We should, therefore, exploit these factors to our advantage adopting practical farming, fine-tuning whenever necessary but not blindly base our farming methods on the western pattern. □

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