

CONCEPT OF ORGANIC FARMING AND GREEN FOOD PRODUCTION IN HORTICULTURE

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Abstract : Now a days, the term “Organic” is getting popularity in all aspects along with agricultural products. But as far as a farmer is concerned, the organic matter in the soil is important as it provides everything to the soil, good health, and character relation with crop, microclimate for microorganisms etc.

Keywords : Organic farming, Fertilizer, Production, Horticulture

INTRODUCTION

Organic farming is an alternative agricultural production system, which avoids or largely excludes the use of synthetically compound fertilizers, pesticides and growth regulating hormones. In other words, we can say that organic farming is minimal dependent on synthetic fertilizers, pesticides and antibiotics and is considered as a “system of cultivation and with use of organic manures crop rotation, legumes, green manures and aspects of biological pest control to maintain soil fertility and to supply all essential plant nutrients in suitable amount”.

Soil organic matter consists of decomposing plant and animal residues along with living and dead microbial cells. It is a natural component and is one of the most important nutritious resources.

Organic Farming is not new to Indian agriculture, it is an old practice of natural farming, as per documented evidence organic agriculture in India started long back in 1900 by Sir Albert Howard, a British agronomist in local village of north India. Organic refers to agricultural production system used to produce food and fibre, all kinds of agricultural products are produced

organically including grains, meat, dairy, eggs, fibre such as cotton, flowers and processed food products. Organic farming an eco-farming system has its base on the principle ‘Feed the Soil not the Plant’, it maintains the ecological balance without polluting soil, water and air. In this method, the use of chemicals is kept at the minimal level.

MATERIAL AND METHOD

Components of organic matter

Soil organic matter contains different groups of organic compounds, this includes – simple sugars, starch, simple proteins, crude proteins, cellulose, hemi cellulose, fats, waxes, lignins etc. These constituents decompose at different rates. Organic matter decomposition is primarily a microbiological

process. Decomposition is carried out by heterotrophic microorganisms, including bacteria, fungi, actinomycetes and protozoa. Besides these other organisms like earthworms, termites etc. also play an important role to break down the organic residues. (Table-1)

Why Should We go for Organic Farming?

The prolonged use of chemicals on soils has resulted in human health hazards and pollution of air and water systems and further led to damage of soil structure and natural environment.(Fig-1),(Table-2). Besides the development of resistance among pests, pathogens, and weeds and reducing bio-life in soil and land degradation had further made the situation complex.

An estimation of world health organization has indicated that globally at least three million persons are poisoned by pesticides, every year out of whom at least 20,000 die. Now a days the chemical fertilizer are very costly.

In addition indiscriminate use of pesticides, fungicides and herbicides could cause adverse changes in biological balance as well as lead to cancer and other diseases due to the toxic residues present in the consumable parts. Hence there is a vital need for revolution through organic farming to ensure food security and safety environment. These issues can be overcome by shifting to organic culture.

Scope of organic farming

India has good opportunity to take up production of organic food for export and domestic use. Out of the 480 districts in our country data is currently available there are 29 districts which consume less than 10 kg N:P:K per hectare and 71 districts below 25 kg/ha. The major organic food markets for India are European Union, USA, Japan and Middle east etc., the estimated value of export of organic products through APEDA was 30 million US \$ during 2000 –

01. During the last decade organic agriculture has gained international recognition as valid alternative to conventional food products. The commercial organic farming as practiced today is still at a nascent stage [According to Survey of international federation of organic agriculture movements (IFOAM)] and Stiftung Oekologie & Landbau (SOEL), February, 2003. India has about 41,000 ha. area that can be put to organic farming. The world organic market is estimated at over US \$ 26 bn in 2002, cultivated on a total area of about 20 million hectares worldwide with a world production of around 25 million tonne. Almost 92% of the organic industry comprise of farm products (around US \$ 23 bn) and 8% of animal products (around US \$ 2 bn). Organic products are almost over 95% consumed in developed countries. The major produces and importers of organic products are EU, USA and Japan.

The Indian organic farming industry is growing rapidly and has already made in roads into the world organic market in certain sectors, such as tea, coffee, spices, fruits and vegetables. Under various product segments of organic agriculture, organic tea and coffee production has done significantly well. India accounts for about 1% (around 0.370 metric tonne) of the total world's market in the organic spice market.

India is at very nascent stage in terms of organic fruits and vegetables exports, which is estimated to be in tune of Rs. 15 – 20 cores. Major potential organic fruits and vegetables for exports are banana, mango, pineapple, grape, passion fruit and selected vegetables like mushroom, gherkin, baby corn, sprouting broccoli, asparagus etc., aromatic plants like vanilla, plantation crops, e.g. coconut, tea, coffee, cocoa and palm oil.

Organic farming is one of the fast growing segments of US agriculture during the 1990's USDA estimate that the value of retail sales of organic food in 1999 was approximately \$ 6 billion. The no. of organic farmers is also increasing by about 12% per year.

Sources of soil organic farming

- i) Natural sources : Plant animal and microbial materials are primary sources of organic matter,
- ii) Organic manures : Crop residues, grasses, animal excreta (e.g. Fym) compost material, green manures, oil cakes etc. can be used as organic manures.
- iii) Municipal and Industrial wastes : Municipal solid waste and organic waste etc.

(i) Farm yard manure

It is the most commonly used organic manure in most countries of the world. It is also called stable manure, dung and cattle manure. This manure consists of 0.5% N, 0.2% P₂O₅ and 0.5% K₂O.

Application of partially or fully decomposed materials speed up the nutrient release already present in the soil to the growing crops.

Trenches of 6 m long, 2 m wide, 1 m deep are dug, daily collected materials dung and urine soaked daily are placed in these trenches, when each section is filled upto a height of about 0.5 mt above the ground level, the top of the heap is rounded off and plastered with slurry of cow dung. Before plastering apply 4 – 5 buckets of water in the pit – it conserves moisture and nitrogen. This manure becomes ready in 4 – 5 months after plastering.

It is possible to obtain 5 – 6 T of manure / year / head of cattle. Normally 10 – 25 cart loads of manure is applied per hectare.

(ii) Farm Compost

Decomposed plant residues / farm wastes are known as farm compost. It consists of 1.01% N, 0.5% P₂O₅ and 0.8 – 0.9% K₂O. Composting is a biological decomposition process that convert organic matter to a stable humus like product under controlled conditions. Compost

is the dark brown. Crumbly material that is produced when a collection of plant and animal material is decomposed into organic matter and further to humus. Once compost has been mixed into the soil it will undergo the process of mineralisation in which the humus releases minerals in the soil, making them available to the plants.

(iii) Urban Compost

In recent years, large scale composting in towns and cities had been taken up successfully by the municipal bodies and the corporations.

Trenches 1 – 1.2 mt wide, 75 cm deep are filled with successive layers of night soil, town refuse and earth in order and finally the compost gets ready in about 3 months.

Benefits of composting

When compost is added to the soil the level of organic matter increases, improves soil texture, permeability and water holding capacity of that soil. Compost can also be used as a mulch by nursery men and vegetable farmers. It is an excellent material for litter and bedding. Microbes play important role in decomposing these materials to convert them into compost.

Vermi compost

It is a stable fine granular organic matter. In vermi composting you speed up the process and end up with a rich end result called castings. It is a method of making compost with the use of earth worms, which generally lives in the soil. They eat biomass

and excrete it in digested form. This compost is generally called vermin compost. It is estimated that 1800 worms, which is an ideal population for 1 sq.mt can feed on 80 tones of humus per year. Earthworms can generally be called as biological indicators of soil fertility. Availability of earthworms in soil have always promoted plant growth.

There is abundant evidence that concentration of exchangeable Calcium, Sodium, Magnesium, Potassium, and available Phosphorus are higher in earthworms casts than the surrounding soils. Several valuable compounds are also produced through the earthworms micro

flora interaction, these include Vitamins (such as B₁₂) and plant growth hormones (such as gibberellins). In whole world only 3 – 4 species of earthworms are widely used, but in India only 2 species i.e., *Eisenia fetida* and *Eudrilus eugeniae* are mostly used.(Table-3).

Preparation of vermi compost

Selection of earthworm species is very important factor for preparation of vermi compost.

A tank of Brick line of 3 m x 1.5 m dimension having drainage facilities is built in shady condition. In the tank about 10 – 15 cm layers of loam soil is spread out and about 5 – 6 kg of diluted dung is also spread and available earth worms may be placed. Dry leaves are put on the vermibed and kept moist for 3 – 4 weeks, every 4th day a 10 cm layer of straw leaves of plant, Kitchen wastes are spread on the bed. Finally the beds are covered with gunny cloth and it needs watering every day to keep sufficiently moist, after 30 days the garbage is turned up and down and again and covered with same and watering is maintained for another month or so. The earth worms feed on decaying organic matter and digested food comes out in the form of vermi compost within 2 months. About 10 kg of castings will be produced by 1 kg of worms. The mature compost is gray to brown coloured granular mass. Finally it is dried and packed.

Benefits of Vermi Compost

- 1) Vermi compost influences the Physio – chemical as well as the biological properties of soil.
- 2) It contains many micro – nutrients like Mg, Fe, Mo, Br, Cu, Zn etc. in addition to some of the growth regulators.
- 3) It also enhances the water holding capacity.
- 4) Buffering action of vermi compost neutralizes soil pH and helps in the availability of minerals and trace elements more easily to crops.
- 5) Enhances soil fertility status and reduce toxicity.
- 6) Enhances Quality, shelf life and nutritive value of horticultural crops.

Benefits of Organic Farming

1. Organic farming is more energy efficient than conventional farming.
2. Reduced soil health hazards by pollution.
3. Low incidence of plant pathogens, especially *Phythium* and *Rhizoctonia* infections in beans & peas.
4. Improved soil properties owing to higher levels of organic matter lower soil erosion better soil structure, permeability and drainage.
5. Availability of variable amounts of a whole range of plant nutrients and less loss of nutrients by leaching and run off because of higher cation exchange capacity.
6. Increased up take of nutrients and improves crop quality thus fetching higher market price.
7. Maintenance of proper soil temperature and soil aeration.
8. Binds soil particles, forming stable aggregates thus reducing soil erosion.

Risks

- 1) Occasional or more regular over supply of certain products may lead to dropping of prices of products, leading to insufficient profitability for producers and traders.
- 2) Other forms of environmental friendly and sustainable agriculture in the form of integrated farming systems may provide increased competition in future.
- 3) Media reporting of fraud, in the form of unscrupulous traders selling non-organic products for a higher price as organic food stuff could make the market more skeptical of products labeled as organic.

Should India go in for Organic Farming?

Keeping in view, the human population of India the 2nd most populous country in the world and is expected to cross 1.3 billion by 2020 AD, hence, the food grain requirement is much high. There are fears that India will not be able to meet the demands of food, oil, sugar, fibre, etc. of its growing human population. As productivity of organic farms is generally lower compared to those managed conventionally, it is but natural to expect lower production levels from organic farms. But by considering the merits of organic farming and organic produce no one can deny the acceptance of the system. So, it is felt that India should go in for organic farming.

Several success stories with respect to organic farming in different parts of the country amply justifies the above statement.

Strategies for green food production in horticulture

‘Green Fod Production’ refers to organically grown crops without using any synthetic pesticides, herbicides, insecticides, fungicides, fertilizers and synthetic hormones. No artificial flavours and colour is to be added right from the stage of seed treatment to final post harvest handling and processing. Green foods are not only free from harmful chemicals but are also safer, healthier and tastier. It is a holistic production management system. Most of the vegetables are eaten fresh, hence any contamination (chemical residue) may lead to various kind of health hazards. Hence Green food / organic food production offers a better possibility in horticultural crops rather than in field crops. In organic production system in general micronutrients are not taken care, there is every doubt that over long duration, their deficiencies may create production constraints and these technology might be a failure rather than a sustainable alternative to Bio-dynamic agriculture. Under the present scenario it appears to be a sound alternative. In present day, bio-dynamic farming is becoming popular in several countries, such as Germany, Australia, New Zealand, USA etc. Rodolf Steiver (1924) from Central Europe was founder of Bio-dynamic agriculture, the biodynamic farming is more than just another organic method. This system is based on the principle of harnessing the synergy between cosmos, mother earth, cow and plants. Basically there are two types of bio-dynamic preparations :

- 1) Bio-dynamic Compost Preparations (BD-502-507)
- 2) Bio-dynamic field sprays (BD-500-501), all these preparations are made in descending period of moon except BD-507. The BD set are used in cowpat pit (cpp), BD-compost, Bio-dynamic liquid manure and bio-dynamic liquid pesticides.
- i) **Cowpat pit (CPP) :** It is also known as soil shampoo, it is a bio-dynamic field preparation. It is strong soil conditioner, it enhances seed germination, promotes rooting in cuttings and graftings improves soil texture, provides resistance to plants against pests and diseases etc. It may be prepared through out the years, depending upon the weather and temperature.
- ii) **Bio-dynamic Compost :-** It is an immediate source of nutrient for a crop. It can be prepared by using green and dry leaves piled up in alternative layers of 15 – 25 cm thick. Bio-dynamic liquid manures and pesticides are prepared using liquid fish manure, liquid plant manure etc. An average preparation of liquid manure takes 8 – 12 weeks times. 1 litre of liquid manure is dissolved in 4 – 5 litres of water and used as foliar spray. Bio-dynamic pesticides are prepared from neem, pongamia and calotropis leaves.
- iii) **Bio-dynamic Field Sprays :-** (BD 500 – 501) : Cow horns filled with fresh cow dung from

lactating cows are buried in fertile soil, when the moon is descending during autumn (October – November) for incubation during whole winter. It is taken out in March – April, stored in earthen pots at dark and cool place.

- iv) **BD 501 (or Horn Silica Manure) :-** It is prepared in ascending period of moon by filling cow horn with “Mealy” Silica powder and buried in spring (March and April), within 6 months the preparation is ready for use. 1 g. of it is dissolved in 13.5 litre of water solution is sprayed on leaves at sunrise. It encourages the development of fruits and seeds, quality and also improves shelf – life of pre-produce. Bio-dynamic farming is gradually being accepted by the farmers because of its low cost as well as for its multifarious role. It has been successfully utilised in nutrient management, pest and disease management in horticultural crops. However bio-dynamic preparations are always to be supplement with organic manures, Vermicompost or inter cropping of legumes etc. for better nutrient management. Another important point is the time of operations in relation to the exact constellation is to be practiced for getting the best results. Some other related farming systems based on organic culture are Rishi Krishi (It advocates the use of rhizosphere soil of banyan tree to improve soil fertility and amrithpani – a mixture of cow dung honey and ghee in proportion for treatment of the seeds and the seedlings). Homafarming (It is based on “homa” i.e. purification through fire tuned to the rhythm of nature, time to sunrise and sunset biorhythm). Panchgavya Krishi (mixture of slurry, cow dung, urine, milk, curd, ghee along with sugar cane juice, coconut water, ripe banana encourages vegetative and reproductive growth of plants). All these different forms of farming comes under organic farming system and can safely be used in an ecofriendly manner. (Fig-2).
- 1) Various aspects of green food production particularly for horticultural commodities need to be standardized.
- 2) Promotion of establishment of demonstration for preparation of biodynamic compost, cow horn manure (BD – 500), horn silica (BD – 501), cowpat pit (cpp), liquid manures and liquid bio-dynamic pesticides.
- 3) Promotion for field demonstrations for biodynamic preparations.
- 4) Organizing intensive training to farmers, NGO representatives, entrepreneurs, and extension personal of Department of Horticulture for biodynamic preparations and their applications.
- 5) Helping State Agriculture Universities (SAUS) to initiate few courses on organic / biodynamic agriculture.

- 6) Facilitation for certification for green food production.
- 7) Establish National Standards for covering marketing of certain agricultural products as Green produces products.
- 8) Assure Consumers that there meet a consistent standard.
- 9) Market Promotion for 'Green Food' and their processed products.

Table 1. Nutrients Present in Some Common Materials

	Approximate Analysis %.		
	N	P	K
Bone meal	4	21	-
Blood dried	12	1	-
Meat meal	8	1	0.
Fish meal	8	8	-
Oil seed cake (avg)	6	1	1
Egg shells	1	0.4	0.1
Mushroom compost	0.6	0.5	0.9
Cattle dung, fresh	0.4	0.2	0.3
Sheep dung, fresh	0.7	0.5	0.3 – 1.0
Cattle urine	0.7 – 1.2	-	0.5 – 1.0
Human urine	0.6 – 1.0	0.1 – 0.2	0.2 – 0.3
Ash house hold	0.5 – 1.9	1.6 – 4.2	2.3 – 12.0
Ash wood	0.1 – 0.2	0.8 – 5.9	1.5 – 36.0
Rural compost (dry)	0.5 – 1.0	0.4 – 0.8	0.8 – 1.2
Urban compost (dry)	0.7 – 2.0	0.9 – 3.0	1.0 – 2.0
G/Nut husks	1.6 – 1.8	0.3 – 0.5	1.1 – 1.7

Green Manures (fresh)

	N	P	K
Cow pea	0.71	0.15	0.58
Green gram	0.72	0.18	0.53
Sun hemp	0.75	0.12	0.51
Black gram	0.85	0.18	0.53

Table 2. Anthropogenic Pollution of the Soil-plant-animal System.

Kinds of Soil Pollution :	
Pesticides :	(i) Insecticides, (ii) Fungicides, (iii) Herbicides, (iv) Antibiotics, (v) Rodenticides, (vi) Nematicides
Fertilizers Organic Wastes :	Municipal & Industrial Wastes, Some of which may be dumped in soil.
Other Pollutants :	(i) Garbage, (ii) Sewage effluent & sludge. (i) Soluble salts, (ii) Radio nuclides, (iii) Acid rains.

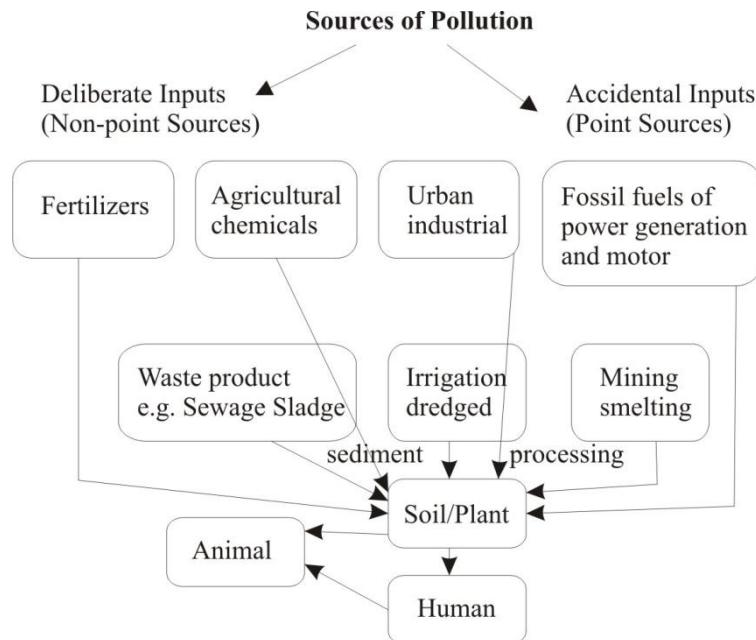
Table 3. Comparative Percentage of Nutrient Content in F.Y.M. and Vermi-compost.

S.No.	Nutrient	F.Y.M.	Vermi-compost
1.	N (%)	0.4 – 0.9	1.0 – 1.6
2.	P ₂ O ₅ (%)	0.2 – 0.3	0.22 – 0.5
3.	K ₂ O (%)	0.2 – 0.5	0.67 – 1.5
4.	Ca (%)	0.91	0.44
5.	MG (%)	0.19	0.15
6.	Fe (ppm)	146.5	175.2
7.	Mn (ppm)	69.0	96.51
8.	Zn (ppm)	14.5	24.43
9.	Cu (ppm)	2.8	4.89
10.	C : N ratio	31.28	15.5

Nutrients Present In :

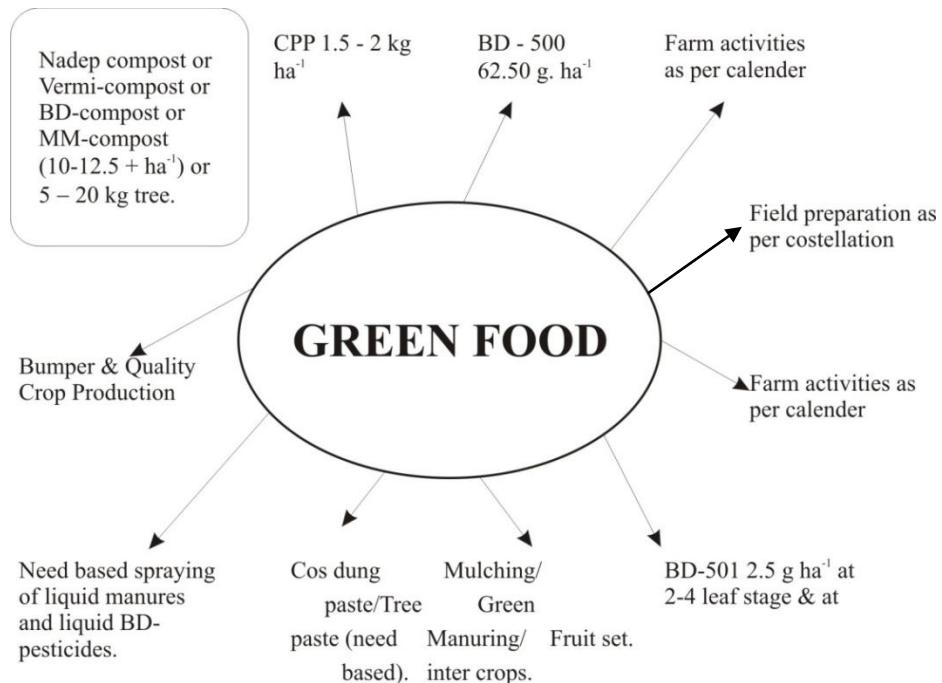
Farm compost :	N (%)	P ₂ O ₅ (%)	K ₂ O (%)
	1.01 %	0.5	0.8 – 0.9
Sheep and Goat manure	3	1	2
Poultry manure	1.5	1.2	0.5
Crop residues	0.5	0.6	1.5
Rice husk	0.3 – 0.4	0.2 – 0.3	0.3 – 0.5
Press mud	1.25	2.0	--
Tea wastes	0.3 – 0.35	0.4	1.5

Fig. 1.Soil Pollution through Agro-Chemicals.



Strategies

Fig. 2. Schematic Presentation of Green Food Production



CONCLUSION

The population pressure, water loss, soil erosion, floods, saline and alkaline soils, weed and pest damage are considered to be the main indicators of unsustainability. Hence, supply and judicious use of production factors play a decisive role in the sustainable growth of agricultural production. We have discussed on almost all aspects of organic farming and can conclude that it is an economic, ecofriendly system, which attempts to provide a balanced environment,

maintains soil fertility, control insect pest and diseases and produce safer and qualitative food stuff. However technologies like organic farming or integrated management systems need to be assessed to their location, specific applicability and adaptability to bring about better sustainability. Over all organically grown food may not put more nutrients into once body but will surely optimize the health and production of inter-dependent communities of soil life, plants, animals and people. When one buys certified organic food and products, the money you spent cast a vote for a healthier planet.

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