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Organic Farming – An Approach to Sustainable Development

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Abstract: Organic farming through sustainable agriculture meets not only the food requirements of present generation in an environment friendly way but also the requirements of future generations and maintains our environment. Modern agriculture involving use of fertilizers, pesticides pose serious health concerns and degradation of environment. This is the reason interest is now stimulated to organic farming. Organic farming provides macronutrients and micronutrients to the plants and also improves soil physical, chemical and biological characteristics of soil.

Keywords: Organic Farming, Sustainable Agriculture, Modern Agriculture,

I. INTRODUCTION

India has been traditionally practicing organic agriculture but modern agriculture practices have pushed it to walls. Organic farming has developed as an alternative sustainable system of farming as it is equally productive, maintains safety and quality of foods. Vermicomposting have positive impacts on plant growth and health and treats organic waste in an environment friendly way (Cristina Lazcano[a] and Jorge Domínguez[b]).

With the exceptional growth in area under organic management and increase demand for wild harvest products, India has achieved the status of single largest nation in terms of total area under certified organic wild.

Figure 1:- Organic Farming through Vermicomposting

Table 1:- Area under Organic Certification Process (***Source:-National Centre of Organic Farming, Department of Agriculture, Cooperation & Farmer's Welfare, Ministry of Agriculture and farmer's Welfare government of India***.)

S. No.	Years	Area under organic Management in Ha.
1	2003-04	42,000
2	2004-05	76,000
3	2005-06	1,73,000
4	2006-07	5,38,000
5	2007-08	8,65,000
6	2008-09	12,07,000
7	2009-10	10,85,648

Global trade during the year 2013-14 of organic produces was USD 60 billion and may increase upto USD 100 billion in the next five years. In India trade may cross Rs. 5000 to 6000 crore, which is nearly 1% of the global trade. (Base-Paper-Organic-Farming, ICAR, 2015). Organic farming improves soil physical, chemical biological properties and enhances its health through availability of macro and micronutrients (P.Ramesh, N.R.Panwar, A.B.Singh, S.Ramana,Sushil Kumar Yadav, Rahul Srivastava and A Subba Rao)

Table 2:- World Organic Agricultural Land, Regional Share of Global Organic Agricultural Land, 2013 ***(Source: FiBL-IFOAM Survey 2015)***

S. No.	Region	Organic Agricultural Land (hectares)	Regions Share of Global Agricultural Land
1	Africa	1227008	2.8%
2	Asia	3425939	8%
3	Europe	11460773	26.6%
4	Latin America	6611636	15.3%
5	North America	3047710	7.1%
6	Oceania	17321773	40.2%
	Total	43091113	100%

II. COMPONENTS OF ORGANIC FARMING

Important components of organic farming are biological nitrogen fixation, crop rotation, use of organic manure and soil microorganisms, residues of crops, biopesticide, biogas slurry etc.Vermiculture or Vermicomposting has emerged as a major component in organic farming which is very effective in enhancing soil fertility and growth of crops in a sustainable way.

The various components of organic farming are:-

1. Crop rotation:

For practising sustainable agriculture there should be rotation of crops on the same land over a period of two

years or more for maintaining soil fertility and control of insects, weed and diseases. For example use of legumes in rotation improves soil fertility.

2. Crop Residue:
India has great potential of using residues of crops and straw of cereals and pulses in recycling of nutrients during organic farming. Crop residues when inoculated with fungal species improve physico-chemical properties of soil and crop yields.

3. Organic manure:
The organic manure is obtained from biological sources (plant, animal and human residues). Organic manure helps in increasing crop growth directly by improving the uptake of humic substances and indirectly promoting soil productivity by increasing availability of major and minor plant nutrients through soil microorganisms.

a) Bulky organic manure:
Bulky organic manure includes compost, FYM and green manure having less nutrients in comparison to concentrated organic manure.

- **FYM:-**Farm Yard Manure (FYM) refers to the well-decomposed combination of dung, urine, farm litter and left over materials (roughages or fodder).

- **Compost:** - Large quantities of waste material (vegetable refuse, weeds, stubble, bhusa, sugarcane trash, Sewage sludge , animal waste, human and industrial refuse) can be converted into compost manure by anaerobic decomposition. Compost is used in the same way as FYM and is good for application to different type of soils and crops.

- **Green Manuring:-** Green manuring is practice of adding organic matter to the soil by ploughing and adding into the soil undecomposed green plant tissues for improving physical structure and fertility of the soil.The green manure crop (legume crop) supplies organic matter and additional nitrogen. Commonly used green manure crops are: Sunhemp (Crotalaria juncea), Dhaincha (Sesbania aculeata), Cowpea , Cluster Bean ,Senji (Melilotus parviflora),Vigna sinensis), Berseem (Trifolium alexandrium)

b) Concentrated Organic Manure:
Oilcakes, blood meal, fishmeal, meat meal and horn and hoof meal (Concentrated organic manures) that are organic in nature made from raw materials of animal or plant origin and contain higher percentage of vital plant nutrients such as nitrogen, phosphorous and potash, as compared to bulky organic manures.

4. Waste:

1. **Industrial waste:** Industrial by products such as spent wash & coir waste can be used as manure.
2. **Municipal and Sewage waste:**
   It is an important component of organic waste.

5. Biofertilizers:
Biofertilizers are microorganisms that have the capability of increasing the fertility of soil For example by fixing atmospheric nitrogen and through mycorrhizal fungi and phosphate solubilisers. These are ecofriendly and sustainable way of achieving soil fertility.

Biofertilizers have biological nitrogen fixing organism which help them in establishment and growth of crop plants and trees, enhance biomass production and grain yields.

Types of Biofertilizers:

There are two types of bio-fertilizers.

1. Symbiotic Nitrogen-fixation:
Rhizobium: Rhizobium Bacteria fixes atmospheric nitrogen in roots of leguminous plants, form tumours like growth known as root nodules. It is widely used biofertilizer which can fix around 100-300 kg N/ha in one crop season.

2. Asymbiotic N-fixation: Blue Green Algae, Azolla, Azotobacter, Mycorrhizae and Azospirillium grow on decomposing soil organic matter and fixes atmospheric nitrogen in suitable soil medium.

Azotobacter: Azotobactor has beneficial effect on vegetables, millets, cereals, sugarcane and cotton. Organism is capable of producing nitrogen as well as antifungal, antibacterial compounds, siderophores and harmones.

Azospirillium: Azospirillium has beneficial effect on oats, barley, maize, sorghum, forage crop and pearl millet. It fixes nitrogen by colonising root zones.

Blue Green Algae: Blue-green algae reduce soil alkalinity and it is good for rice cultivation and bio-reclamation of land.

Azolla: Small floating fern, Azolla harbours blue-green algae, anabaena, commonly seen in shallow fresh water bodies and in low land fields. They fix nitrogen in association.

Mycorrhizae: Mycorrhizae is symbiotic association of fungi with roots of Vascular plants. This helps in increasing phosphorous uptake and improve the growth of plants.

6. Bio-pesticide:
Biopesticides are of plant origin and include plant products like alkaloids, phenolics, terpenoids and some secondary chemicals. They are biologically active against insects, fungi, nematodes affecting their behaviour and physiology. Commonly known insecticides are pyrethrum, Nicotine, Neem, Margosa, Rotenone etc.

7. Vermicompost:
Vermicompost is organic manure or compost produced by the use of earthworms that generally live in soil, eat organic matter and excrete it in digested form. These are rich in macro and micronutrients, vitamins, growth hormones and immobilized microflora essential for plant growth.

III. EFFECT OF INORGANIC FERTILIZERS AND OTHER AGRO-CHEMICALS ON SOIL AND PLANTS

Modern agriculture involving use of agrochemicals like fertilizers causes:

- Depletion in soil fertility and pollution problems in ground as well as surface water bodies.
- A portion of the nutrients added through fertilizers does not become available to plants and remain in soil which may result in Eutrophication in water bodies like lakes or increase in nitrate concentration in ground water more than the permissible limit of 10 ppm causing Blue baby Syndrome.
- Increases the soil acidity with nitrification.
- Denitrification results in formation of methane, ammonia, elemental nitrogen and nitrous oxide.
- Depletion of micronutrients like sulphur & zinc.
- Increased risk of humus depletion and decline in crop production through large doses of N-fertilizers. (Dhar,1962)
- Trace metal contamination (Fluoride, Arsenic & cadmium) in soils and plants due to large and regular use of phosphatic fertilizers.
- Trace toxic metal contaminants can cause problem when they reach human body through food chain.

IV. BENEFITS OF ORGANIC FARMING

The benefits provided by organic farming are:-

- It maintains health of environment by reducing pollution.
- It helps in increasing agricultural production in a sustainable way.
- It helps in improving the soil health.
- Agriculture products obtained from organic farming are better in quality. (Bigger in size, flavor, size & aroma)
- Water holding capacity of the soil is increased through organic farming.
- It improves the availability of nutrients required and essential for plants. (Macro nutrients & Micro-nutrients)
- Organic farm products are usually of better size, flavor, aroma (Quality)
- Underground water of the area under organic farming is free of toxic chemicals.
- Vermicomposting brings down waste bulk density.
- Vermicomposting has hormone like substance auxins which increases plant growth.
- Maintains C:N ratio in the soil and increases the fertility and productivity of the soil.
- Increase in biological activity makes lower depth nutrients availability possible.
- Increases water holding capacity of the soil.
- Improves texture & structure of soil.

V.CONCLUSION

Organic farming thus provides the best possible alternative for meeting food requirements of the growing population in a sustainable manner by improving yield, quality of food grains and improving overall environment. Chemical fertilizers help in increasing yield but poses risk to environment especially soil. Organic farming enhances nutrient availability while chemical fertilizers disturbs the soil characterestics as it causes micronutrient imbalance. So organic farming should be practiced in order to meet the needs of present and future generations without causing harm to the environment.

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