Organic farming:

Organic farming can be defined as an agricultural process that uses biological fertilizers and pest control acquired from animal or plant waste. Organic farming was actually initiated as an answer to the environmental sufferings caused by the use of chemical pesticides and synthetic fertilizers. In other words, organic farming is a new system of farming or agriculture that repairs, maintains and improves the ecological balance. The principal methods of organic farming include crop rotation, green manures and compost, biological pest control, and mechanical, antibiotics and growth hormone.

Advantages of Organic Farming

- Economical- In organic farming no expensive fertilizers, pesticides, HYV seeds are required for the plantation of crops. Therefore, no extra expense.
- Good return on Investment- With the usage of cheaper and local inputs, a farmer can make a good return on investment.
- High Demand– There is a huge demand for the organic product in India and across the globe, generating more income through export.
- Nutritional- As compared to chemical and fertilizer utilized products, organic products are more nutritional, tasty, and good for health.
- Environment-Friendly- The farming of organic product is free of chemical and fertilizers, so it doesn't harm the environment.

Disadvantages of Organic Farming

- Incompetent – The major issue of organic farming is the lack of Inadequate infrastructure and marketing of the product.
- Less production- The organic farming products are lesser in the initial years as compared to the chemical product. So, the farmers find it difficult to accommodate large scale production.
- Shorter shelf-life- Organic products have more flaws and shorter shelf life than the chemical product.
- Limited production- Off-season crops are limited and have fewer choices option in organic farming.

Types of Organic Farming

Organic farming is divided into two types, namely:

1. Integrated organic farming
2. Pure organic farming

Pure organic farming means avoiding all unnatural chemicals. In this process of farming, all the fertilizer and pesticide are obtained from natural sources such as bone meal or blood meal.

Integrated organic farming includes the integration of pest management and nutrients management to achieve ecological requirements and economic demands.

Green manuring and organic fertilizer:

Green manure is a cover crop sown on an agricultural plot in order to fertilize the soil for the following crop mainly through the intake of nitrogen.It provides improvement in soil structure with their root system and a relatively little supply of stable organic matter. Green manuring is the practice of ploughing green plants into the soil for improving the fertility. Green manure provides organic matter and nutrients like Nitrogen and Phosphorous to the soil. Commonly used green manure crops eg: sunhemp, guar and sesbania.

Organic fertilizers are fertilizers derived from animal matter, animal excreta (manure), human excreta, and vegetable matter (e.g. compost and crop residues). Naturally occurring organic fertilizers include animal wastes from meat processing, peat, manure, slurry, and guano

Type of Organic Fertilizer

Organic Fertilizers are different types of fertilizers derived from vegetable matter, mineral matter, animal matter, etc. Here are some of the most common kinds of organic fertilizers:

Animal Fertilizers

1. Bone Meal

Bone meal is made from crushed animal bones. It's rich in phosphorus and calcium and supplies some nitrogen. It can promote plant seedling growth, help flowers grow, and increase yield.

2. Blood meal

A blood meal is a dried form of animal blood. It can improve the nitrogen content in the soil and makes the plants denser. Release nitrogen quickly promotes flowering and acts as a natural pest repellent.

But usage and application should be done sparingly, as over-application can contribute to the burning of the plant root.

3. Animal Manure

It can come from a variety of animals. For example, cow manure can control weeds and increases the moisture-holding capacity of the soil and increases air penetration in the soil.

Seabird guano is an organic fertilizer for lawns. It can act as a natural fungicide and control nematodes in the soil.

4. Fish meal

Fish meal is a fast-release fertilizer that is a rich source of organic nitrogen, phosphorus, and calcium. It can improve soil health, increase fertility, and make plants thrive.

5. Fish Emulsion

This blend of finely ground, decomposed fish delivers a big dose of nitrogen. Acts as a soil conditioner. But be careful. Fish Emulsion is highly acidic, and overuse can burn plants.

6. Shellfish

Shellfish are made from the broken shells or bones of shellfish and crabs.

Shellfish organic fertilizers are rich in calcium and also contain significant amounts of phosphorus and other trace minerals.

That means it can help spur flowering and robust root growth. Also, it has chitin, which inhibits the growth of some pests.

Plant-Based Fertilizers

1. Compost

Compost is rich in nutrients and can be used as an excellent soil improver to promote organic matter and soil fertility.

It provides rich growth nutrition for plants, which can retain water in the soil for a long time.

2. Cottonseed Meal

Cottonseed Meal is a rich source of nitrogen and a small amount of phosphorus and potassium. It can be an excellent organic fertilizer grass.

It is mainly used to cover the garden soil to regulate the soil environment.

3. Alfalfa and Soybean meal

It contains nitrogen, phosphorus, and neutral pH.

Soybean meal is a functional additive for longer-lasting results during soil maintenance.

4. Seaweed

Seaweed is an immediate-release fertilizer and an excellent source for zinc and iron. It goes well with the high-potash crop.

Mineral Fertilizers

1. Greensand

Greensand is an olive-green sandstone containing glauconite. It is a rich source of iron, potassium, and magnesium.

It aids in the stimulation of flowering and fruition in fruit trees. And loosen the soil, increase the water content in the soil to improve the rhizosphere.

2. Rock Phosphate

Phosphate is extracted from mineral rocks and clay.

It has over 30% phosphate, together with high concentrations of trace micronutrients. It can be used to increase soil acidity and promote plant seedling growth.

Recycling of biodegradable municipal,agricultural and industrial waste:

Biodegradable" refers to the ability of things to get disintegrated (decomposed) by the action of micro-organisms such as bacteria or fungi biological (with or without oxygen) while getting assimilated into the natural environment. There's no ecological harm during the process.

Municipal waste：

Biodegradable municipal waste (BMW) comprises those elements of the municipal waste streams that will rot or degrade biologically. The main constituents of the biodegradable proportion of municipal waste are typically parks and garden waste, food waste, timber, paper, card and textiles.

Agricultural waste：

Agricultural waste is waste produced as a result of various agricultural operations. It includes manure and other wastes from farms, poultry houses and slaughterhouses, harvest waste, fertilizer run- off from fields, pesticides that enter into water, air or soils, and salt and silt drained from fields. This production can be achieved using agricultural waste/s as raw material including banana/fruit peels, cassava starch, corn, wheat straw, rice straw etc. Starch and cellulose are the major raw material for the production of biodegradable plastic. Cassava is one the richest source of Starch.

Industrial waste：

Industrial waste is defined as waste generated by manufacturing or industrial processes. The types of industrial waste generated include cafeteria garbage, dirt and gravel, masonry and concrete, scrap metals, trash, oil, solvents, chemicals, weed grass and trees, wood and scrap lumber, and similar wastes. Industrial waste, generally, can be categorized into two types, i.e., nonhazardous and hazardous.
Nonhazardous industrial waste is the waste from industrial activity, which does not pose a threat to public health or environment, e.g., carton, plastic, metals, glass, rock, and organic waste.

Types of Industrial Waste

Industrial waste can be categorized into biodegradable and non-biodegradable.

1. Biodegradable

Those industrial wastes which can be decomposed into the non-poisonous matter by the action of certain microorganisms are the biodegradable wastes. They are even comparable to house wastes. These kinds of waste are generated from food processing industries, dairy, textile mills, slaughterhouses, etc. Some examples are paper, leather, wool, animal bones, wheat, etc. They are not toxic in nature, and they do not require special treatment either. Their treatment processes include combustion, composting, gasification, bio-methanation, etc.

2. Non-biodegradable

Those industrial wastes which cannot be decomposed into non-poisonous substances are the non-biodegradable wastes. Examples are plastics, fly ash, synthetic fibres, gypsum, silver foil, glass objects, radioactive wastes, etc. They are generated by iron and steel plants, fertilizer industries, chemical, drugs, and dyes industries. It is estimated that about 10 to 15 percentage of the total industrial wastes are non-biodegradable and hazardous, and the rate of increase in this category of waste is only increasing every year. These wastes cannot be broken down easily and made less harmful.

Hence, they pollute the environment and cause threat to living organisms. They accumulate in the environment and enter the bodies of animals and plants causing diseases. However, with the advancement in technology, several disposals, and reuse methods have been developed. Wastes from one industry are being treated and utilized in another industry. For example, the cement industry uses the slag and fly ash generated as waste by steel industries. Landfill and incineration are other methods which are being resorted to, for the hazardous wastes.

Methods of biocompost:

The term bio-compost means plant matter that has been decomposed and recycled as a fertilizer or manure. Bio-compost is considered as a key ingredient in organic farming. Addition of worms and fungi helps in the process of decomposition.

Composting Method

- Open air composting (hot composting)
- Direct Composting (in-ground composting)
- Tumbler Composting (A form of hot composting)
- Worm Farm Composting (Vermicomposting)
- EMO Composting (Bacteria composting)

- Combination Composting (Compot Composting)

- Commercial Composting

- Mechanical Composting

Types and method of vermicomposting:

Vermicomposting is the scientific method of making compost, by using earthworms. They are commonly found living in soil, feeding on biomass and excreting it in a digested form.

Vermiculture means “worm-farming”. Earthworms feed on the organic waste materials and give out excreta in the form of “vermicasts” that are rich in nitrates and minerals such as phosphorus, magnesium, calcium and potassium. These are used as fertilizers and enhance soil quality.

Vermicomposting comprises two methods:

Bed Method: This is an easy method in which beds of organic matter are prepared.

Pit Method: In this method, the organic matter is collected in cemented pits. However, this method is not prominent as it involves problems of poor aeration and waterlogging.

Process of Vermicomposting

The entire process of vermicomposting is mentioned below:

Aim

To prepare vermicompost using earthworms and other biodegradable wastes.

Principle

This process is mainly required to add nutrients to the soil. Compost is a natural fertilizer that allows an easy flow of water to the growing plants. The earthworms are mainly used in this process as they eat the organic matter and produce castings through their digestive systems.

The nutrients profile of vermicomposts are:

1.6 per cent of Nitrogen.

0.7 per cent of Phosphorus.

0.8 per cent of Potassium.

0.5 per cent of Calcium.

0.2 per cent of Magnesium.

175 ppm of Iron.

96.5 ppm of Manganese.

24.5 ppm of Zinc.

Materials Required

Water.

Cow dung.

Thatch Roof.

Soil or Sand.

Gunny bags.

Earthworms.

Weed biomass

A large bin (plastic or cemented tank).

Dry straw and leaves collected from paddy fields.

Biodegradable wastes collected from fields and kitchen.

Procedure

To prepare compost, either a plastic or a concrete tank can be used. The size of the tank depends upon the availability of raw materials.

Collect the biomass and place it under the sun for about 8-12 days. Now chop it to the required size using the cutter.

Prepare a cow dung slurry and sprinkle it on the heap for quick decomposition.

Add a layer (2 – 3 inch) of soil or sand at the bottom of the tank.

Now prepare fine bedding by adding partially decomposed cow dung, dried leaves and other biodegradable wastes collected from fields and kitchen. Distribute them evenly on the sand layer.

Continue adding both the chopped bio-waste and partially decomposed cow dung layer-wise into the tank up to a depth of 0.5-1.0 ft.

After adding all the bio-wastes, release the earthworm species over the mixture and cover the compost mixture with dry straw or gunny bags.

Sprinkle water on a regular basis to maintain the moisture content of the compost.

Cover the tank with a thatch roof to prevent the entry of ants, lizards, mouse, snakes, etc. and protect the compost from rainwater and direct sunshine.

Have a frequent check to avoid the compost from overheating. Maintain proper moisture and temperature.

Result

After the 24th day, around 4000 to 5000 new worms are introduced and the entire raw material is turned into the vermicompost.

Advantages Of Vermicomposting

The major benefits of vermicomposting are:

Develops roots of the plants.

Improves the physical structure of the soil.

Vermicomposting increases the fertility and water-resistance of the soil.

Helps in germination, plant growth, and crop yield.

Nurtures soil with plant growth hormones such as auxins, gibberellic acid, etc

Disadvantages of Vermicomposting

Following are the important disadvantages of vermicomposting:

It is a time-consuming process and takes as long as six months to convert the organic matter into usable forms.

It releases a very foul odour.

Vermicomposting is high maintenance. The feed has to be added periodically and care should be taken that the worms are not flooded with too much to eat.

The bin should not be too dry or too wet. The moisture levels need to be monitored periodically.

They nurture the growth of pests and pathogens such as fruit flies, centipede and flies.

Vermicomposting turns the kitchen waste and other green waste into dark, nutrient-rich soil. Due to the presence of microorganisms, it maintains healthy soil.

Vermicomposting is an eco-friendly process that recycles organic waste into compost and produces valuable nutrients.

Field application of vermicompost:

Vermicompost contains water-soluble nutrients and is an excellent, nutrient-rich organic fertilizer and soil conditioner. It is used in farming and small scale sustainable, organic farming. Vermicomposting can also be applied for treatment of sewage.

I n rural areas, agriculture, animal husbandry and related activities generate large quantities of organic wastes. Considerable quantities of tender twigs, dry leaves, grass, weeds, etc., are also available. These organic wastes contain organic carbon and plant nutrients in appreciable amounts. Organic wastes are safer and more useful when composted and applied, rather than when they are directly applied. The process of composting organic wastes using earthworms is called 'vermicomposting'. Earthworms ingest organic matter and excrete valuable 'vermicompost'. Vermicompost has many good qualities and its application to soil has many benefits. Vermicompost is rich in organic carbon, which plays a key role in soil fertility, and contains all essential plant nutrients in appropriate proportions. Thus it is a complete and balanced plant food. It also contains biochemical substances that promote plant growth and fight plant diseases. Nutrient value of vermicompost Nutrient Content Organic carbon 20-25% Nitrogen 1.5-2.0% Phosphorus 0.5-1.5% Potassium 0.5-1.0% Calcium 0.4-0.8% Magnesium 0.3-0.6% Sulphur 100-500 ppm* Iron 6.7-9.3 ppm Copper 2.0-9.5 ppm Zinc 5.7-11.5 ppm *ppm - parts per million The use of vermicompost not only increases the rate of water intake into soil but also improves the soil's ability to hold water. Its use enhances colour, smell, taste, flavour and keeping quality of flowers, fruits, vegetables and foodgrains and helps the growers to sell their products at a higher price in the market. The making of vermicompost provides livelihood support to the unemployed in rural areas. Enterprising villagers can take up commercial production of vermicompost and earn good profits by selling the compost in the market, which is constantly growing. Earthworms convert waste materials, that would otherwise pose disposal problems, into valuable compost. Thus vermicomposting prevents environmental pollution and helps in keeping the surroundings clean and free of garbage. Earthworms, organic wastes and water are the three major requirements for vermicomposting. 1. Earthworms: Non burrowing, organic debris consuming species of earthworms, such as

Eisenia foetida, Eudrilus eugeniae, Feretima elongata, Perionyx excavatus are ideal for vermicomposting. These are available with many krishi vigyan kendra's, agricultural research centres, non-government organizations and private companies. They can also be obtained from villages where vermicomosting is already being done. 2. Organic wastes: The following organic wastes can be utilized for vermicomposting. ★ Crop based waste materials such as straw, stubble, chaff, husk, etc., tree leaves and twigs, weeds ★ Animal based wastes such as cattle dung, sheep and goat dung, poultry wastes ★ Household wastes such as vegetable and fruit wastes, leftover and spoilt foods 3. Water: Adequate water is essential for maintaining moisture in the compost heap. Vermicompost can be prepared in pits dug below the ground, in raised heaps above ground, in cement rings or any such containers, and in walled enclosures called vermicompost 'beds'. The bed method is more suitable for large-scale production of vermicompost and for preventing soil from mixing with the compost. The procedure for vermicomposting in beds is described below. Since earthworms have to be protected from heat and excess water, a place that is shielded from sun and rain has to be chosen. Alternatively, a shed can be erected. The size of the shed will be determined by the scale of vermicomposting. In the shed, walled enclosures of 2 feet height, 3 to 4 feet width and required length are to be constructed using brick and mortar. The floor of the bed also has to be paved with bricks and mortar. For producing vermicompost round the year, two or more enclosures should be prepared, or one large enclosure should be partitioned into compartments. On the floor of the bed one layer of broken bricks are to be spread and on top of these a 2-3 inch layer of soil and sand has to be applied uniformly. To discourage ants and termites from entering the bed, a layer of neem or pongamia leaves has to be applied A 3-4 inch layer of bedding material such as dry banana leaves, straw or weeds has to be applied. A 3-4 inch layer of dry cow dung has to be applied on top of the bedding material. On the layer of cow dung, earthworms have to be released at the rate of 1 kg worms for square metre Finally, decomposable organic wastes mixed with cow dung have to be stacked to a height of one foot and the beds have to be covered with gunny bags. Water has to be sprinkled on the beds regularly to keep the heap moist. Once every 15-20 days, the heap of organic wastes has to be turned upside down and has to be covered with gunny bags again. In 2-3 months time all the organic waste material will be converted into vermicompost. When worms are found sticking to the under surface of the gunny bags, it is an indication that the composting process is complete.