

Role of Organic Farming for Sustainable Agricultural Development

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Introduction:

In the pre-independence period Indian agriculture was usually described as a gamble with monsoons. There used to be a great deal of uncertainty about crop prospects, as monsoons played a decisive role in determining agricultural output and their failures resulted in wide spread famine and misery. In the last few years, Indian agriculture has made impressive progress and so is more resilient to the vagaries of the monsoon. The world population was increased day by day and the per capita availability of land was decreased day by day and food production also decreased rate. Hunger must be banished from the surface of earth, as a first responsibility of any civilized society to provide sufficient food for the people who are below the poverty line.

Indian agriculture before the green revolution:

Our traditional farming systems were characterized mainly by small and marginal farmers producing food and basic animal products for their families and local village communities. Farming was highly decentralized with individual farmers deciding on the types of crops to grow depending on climate and soil conditions. These traditions consisted of methods of controlling pests and diseases, and for building soil fertility and structure in their own ingenious ways, since farming did not include the use of chemical pesticides or fertilizers. Rather, soil health and pest control were achieved using practices such as shifting cultivation, conservation, the use of animal manures and farm wastes and the introduction of legumes into crop rotations.

The green revolution:

After the green revolution was launched in India, substantial increase in the production of food grains was achieved through the use of improved crop varieties and higher levels of inputs of fertilizers and plant protection chemicals. But it has now been realized that

the increase in production was achieved at the cost of soil health and that sustainable production at higher levels is possible only by the proper use of factors which will help to maintain the fertility of the soil.

Impact of green revolution on the environment:

To increase the agricultural production in the country and to meet the requirements of the expanding population. It becomes imperative to change the methodologies. These involved the use of high-yielding varieties and higher fertilizer dosages; increasing the irrigated area and intensive cropping; bringing large areas under one crop; growing crops in non-conventional areas; and changing the crop sequences. The green revolution followed the development of commercial agriculture in the developed countries after second World war II. Chemical companies that developed highly toxic and life damaging chemicals for the purpose of welfare, decided to turn their attention on the chemical control of insects, pests and unwanted plants in the farmers fields. The following effects of green revolution are stated to be:

- Reduction in natural fertility of the soil,
- Destruction of soil structure, aeration and water holding capacity,
- Susceptibility to soil erosion by water and wind,
- Diminishing returns on inputs,
- Indiscriminate killing of useful insects, microorganisms and predators that naturally check excess crop damage by insect pests,
- Breeding more virulent and resistant species of insects,
- Reducing genetic diversity of plant species,
- Pollution with toxic chemicals from the agrochemicals and their production,
- Endangering the health of the farmers using chemicals and the workers who produce them,
- Poisoning the food with highly toxic pesticide residues,
- Cash crops displacing nutritious food crops,
- Chemicals changing the natural taste of food,
- High inputs increasing the agricultural expenses,
- Increasing the farmers work burden and tension,
- Depleting the fossil fuel resources.

- Increasing the irrigation needs of the land,
- Big irrigation projects often resulting in soil salinity and poor drainage.

Organic farming:

Organic farming techniques will help to increase the organic matter content of soil, thus reducing the bulk density and decreasing compaction. Organic farming is an system of farming which avoids or largely excludes the use of synthetic compounded fertilizers, pesticides, growth regulators and livestock feed additives. Soil organic matter is one of the important components of the soil. The dead plant and animal remains and dead microbial tissues form the main source of soil organic matter.

Components of organic farming:

Green manuring: Crops grown for the purpose of restoring or increasing the organic matter content in the soil are called green manure crops. Their use in cropping system is called “Green Manuring” where the crop is grown *in situ* or brought from outside and incorporated.



Classification of green manures:

It can be mainly classified into two groups viz., legumes and non-legumes and further sub-divided under two groups in each viz., green manure and green leaf manure.

Legumes:

- Fix free nitrogen from the atmosphere.
- Physical condition of the soil is improved by cultivation and incorporation.
- They are more succulent than the non-legumes and less soil moisture is utilized for their decomposition.
- They serve as cover crops by their vigorous growth and weeds are smothered e.g., clover, dhaincha and cowpea.

Non-legumes:

- Free nitrogen is not fixed by non-legumes except in specific plants which have root nodules produced by bacteria or fungi, e.g., casurina, Elasagnus and Cycas.
- They are not as succulent as legumes and hence require more soil moisture and time for decomposition.

Advantages of green manuring:

- Green manuring has a positive influence on the physical and chemical properties of the soil.
- It helps to maintain the organic matter status of arable soils.
- Green manure serves as a source of food and energy for the soil microbial population which multiplies rapidly in the presence of easily decomposable organic matter.
- The enhanced activities of soil organisms not only cause rapid decomposition of the green manure but also result in the release of plant nutrients in available forms for use by the crops.
- Green manuring improves aeration in the rice soils by stimulating the activities of surface film of algae and bacteria.
- Many green manure crops have additional use as source of food, feed and fuel.

Soil structure and tilth improvement:

- Green manuring builds up soil structure and improves tilth.
- It promotes formation of crumbs in heavy soils leading to better aeration and drainage.
- Depending on the amount humus formed, green manuring increases the water holding capacity of light soils.
- Green manure crops form a canopy over the soil and reduce the soil temperature and protect the soil from the erosion action of rain and water currents.

Fertility improvement of soils:

- Green manure crops absorb nutrients from the lower layer of soils and leave them in the soil surface layer when ploughed in, for use by the succeeding crops.
- Green manure crops prevent leaching of nutrients to lower layer.
- Leguminous green manure plants harbour nitrogen fixing bacteria, rhizobia, in the root nodules and fix atmospheric nitrogen.

- Green manure crops increase the solubility of lime phosphates, trace elements etc., through the activity of the soil microorganisms and by producing organic acids during decomposition.
- A crop of green manure on an average is reported to fix 60 to 100 kg nitrogen /ha in single season under favourable conditions.

Amelioration of soil problems:

- Green manuring helps to amelioration soil problems. Dhaincha, when applied to sodic soils continuously for four or five seasons, improves the permeability and helps to leach out the harmful sodic salts. The soil becomes fit for growing crops.

Improvement in crop yield and quality:

- Green manuring increases the yield of crops to an extent of 15 to 20 per cent compared to no green manuring.
- Vitamin and protein content of rice have been found to be increased by green manuring of rice crop.

Pest control:

- Certain green manure like Pongamia and Neem leaves are reported to have insect control effects.

Stages of incorporation:

When the green manure crops are grown and incorporated in the same field, the best stage of incorporation is the flowering stage of the crop. However, when green leaf manuring is practiced by bringing in the green plants grown elsewhere, no definite stage can be fixed as the green leaf manuring is controlled by many other factors.

Time of incorporation:

The success of green manuring depends on the correct time of trampling green matter into the soil and giving sufficient interval before or planting the crop. The manure, being a bulky one, is usually applied as basal dressing before the main crop is raised in the field.