

## Soil Health and Water Management in Organic Farming

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### Introduction

Organic Farming techniques Significantly used by other sustainable agricultural approaches like Soil health, water Management, intercropping, crop rotation, mulching, integration of crops and livestock. Organic matter play essential role in soil health and fertility and retention of soil moisture. The soil organisms serve as the primary source of plant nutrition by the daily consumption and assimilation of organic residues of plants.

### Soil Health & Water Management:

The basic step in monitoring soil organic matter and health is to get to know your soil, including natural properties and current management history. To identify soil type, texture and other inherent properties helps to generate information collectively with direct observation and soil test reports, provides a preliminary step towards the future applications and responses to management practices. Soil with enriched organic matter capable of producing organic food which is the healthy option results in Sales of organic produce which is highly appreciated by public from the past few years with the promising organics industry provides safer, healthier food created by farming practices which are better for the environment. Organic farming community believes in that organic farming minimizes the need for chemical inputs results in preventive damage to health and the environment. This is one of the sustainable methods of farming than traditional techniques and helps in restoration of biodiversity. Conventional farming results in the low fertility of the land, but with organic farming techniques and sustainable crop rotations, soil health and water table is improved. The lack of sufficient amount of Organic compost and manures and non-availability of bio-fertilizers in local market further confine organic farmers. Soil health cards and test kits suggest the more quantitative in field measurements, pH including water infiltration, bulk density, soil consolidation and permeability. The objectives of the sustainable agriculture to obtain higher yield and higher

economic returns achieved only by maintenance of soil health and water management. Conventionally India has been an agriculture-based economy. The objectives of irrigation sector was assigned a very high priority in the 5-year plans, massive schemes like the Bhakra Nangal, Damodar Valley, Hirakund, Nagarjunasagar, Rajasthan Canal project etc. were taken up to increase irrigation prospective and in that way agricultural production. Groundwater has played a major role to agricultural growth in India, predominantly during the last four decades. It has helped to achieve food security all the way through green revolution. But its a matter of concern, the exploitation of groundwater, which has grown exponentially from the past many years. In 1950, there were 3.86 million dug-wells and 3000 deep tube-wells and that nearly 19.8 million wells were operational in 2002 creating a cumulative irrigation potential of 50M ha.

Estimated annual water requirement for various sectors for the years 2025 and 2050 for two scenarios: low growth and high growth. The available water will be just enough to meet the projected supplies and if the population grows at higher rates, there might be shortages.

Organic Farming plays a essential role in:

- Sustainability of long-term soil fertility.
- Enhancement of biological diversity.
- Soil biological activity increases.
- Recycle plant wastes and animal origin results in retention of nutrients of the soil, thus minimizing the use of non-renewable resources;
- Maintain the healthy use of soil, water and air as well as reduce all forms of pollution that may result from agricultural operations.

According with IFOAM (2002), the organic agriculture practices are based on the following principles:

- ✚ Principle of health.
- ✚ Principle of ecology.
- ✚ Principle of fairness.
- ✚ Principle of care.

### Soil Improvement Practices

- ✚ **Green Manuring:** The residues of the previous crop are incorporated into the soil

before preparing the seedbed for the next crop. Crop residues, green manure crops and farmyard manure should be worked only into the topsoil layer (15 to 20 cm), as decomposition in deeper soil layers is incomplete, results in producing growth inhibiting substances which can harm the next crop.

- ✚ **Primary Tillage:** Primary tillage is usually done with a plough or a similar instrument in annual crops or new plantations. As a belief, soil cultivation involves a flat turning of the top soil and a loosening of the medium deep soil. Deep turning of soil cultivation mixes the soil layers, harms soil organisms and disturbs the natural structure of the soil.
- ✚ **Seedbed Preparation:** Secondary soil cultivation is done to crush and smoothen the ploughed surface before sowing or planting. Seedbed preparation has the purpose to provide enough loose soil of appropriate clod size. If weed pressure is high, seedbeds can be prepared early thus allowing weed seeds to germinate before the crop is sown. Shallow soil cultivation after some days is sufficient to eliminate the young weed seedlings. Where water logging is a problem, seedbeds can be established as mounds or ridges.
- ✚ **Hoeing:** Once the crop is established, shallow soil cultivation helps to suppress weeds. It also enhances the aeration of the soil and at the same time reduces the evaporation of soil moisture from the deeper soil layers. When crops are temporarily lacking nutrients, shallow soil cultivation can stimulate the decomposition of organic matter, thus making nutrients available.

#### Comparison of Zero Tillage to Conventional Tillage

Zero Tillage	Conventional Tillage
It reduces the cost of fuel, irrigation, machinery cost and Labour.	It requires a significant amount of fuel, irrigation, machinery cost and Labour and increases cost.
It reduces carbon emissions and is a Eco-friendly operation.	The carbon emissions more.
It Controls Soil erosion.	It Contributes to Soil erosion.
It maintains organic matter of soil.	It eliminates organic matter of soil.
The Soil structure do not disrupts.	The Soil structure disrupts.
Sowing of seeds is faster.	It requires more time and labour.



There are many advantages for cultivating the soil as following:

- Loosen the soil to facilitate the penetration of plant roots
- Improve the aeration (nitrogen and oxygen from the air)
- Encourage the activity of the soil organisms
- Increase infiltration of water
- Reduce evaporation
- Destroy or control weeds and soil pests
- Incorporate crop residues and manures into the soil
- Prepare the site for seeds and seedlings
- Repair soil compaction caused by previous activities

#### Water Management using Organic Techniques

- ✚ **Retention of soil moisture:** Soils are more and some are less in a position to supply crops with water during dry periods. The capability of a soil to absorb and store water

largely depends on the soil composition and on the content of organic matter. Soils rich in clay can store up to three times more water than sandy soils. Soil organic matter acts as storage of water, just like a sponge. crop residue (mulch) or a cover crop protects the soil, prevents crusting on the surface, and reduces soil erosion. Roots, earthworms and other soil life maintain cracks and pores in the soil. Due to the low runoff losses, and more sinks into the soil.

✚ **Organic Mulch:** Organic mulches maintain the soil temperature, provides nutrients to the plants as it slowly composts, reduces the soil erosion. Reducing the pathogens and pests attack, boost beneficial microorganisms and neutralizes pollutants. It helps the farmers in terms of ease of agricultural operations. Use of mulch significantly play important role in the maintenance of orchard, especially during a drought period especially in semi-arid and arid regions. Organic Mulch works as an insulator which cools and moderates the soil temperature during hot days and cold nights. It increases the beneficial microbial activity and helps in reduction in disease occurrence. It reduces the evaporation of moisture from the field, as it prevents soil moisture from the direct solar radiation and air flow across the soil surface, which results in lower losses of soil moisture. Evaporation losses of moisture from the surface of the soil is to a great extent distressed crop water use efficiency. The evaporation from the surface of the soil was accounted 25-50 percentage of total evapotranspiration of crop land.

✚ **Water Infiltration:** During Heavy rains, only a part of the water the soil. A substantial part flows away as surface runoff, thus being lost for the crop. In order to restoration of the available rainwater into the soil, the infiltration of rainwater needs to be increased. The most important for achieving a high infiltration is to maintain a topsoil with a good soil structure containing many cavities and pores with the activities of earthworms. Cover crops and mulch application are suitable to create such a desirable top soil structure. Further, they help to slow down the flow of water, thus allowing more time for the infiltration.

✚ **Planting pits:** Pits are hand-dug circular holes which collect water and store it for use by the crop. Each pit is about 20 cm across and 20 cm deep. After planting, the holes are left partly open so they collect water. Planting pits take a lot of work to dig when the soil is dry. But they produce good yields in areas where otherwise crops might die because of a lack of water. Once made, the pits can be used again, season after season.

Leave the soil covered, and add compost or fertilizer to the pits to increase their fertility.

- ✚ **Contour Bunds and Catchment Areas:** The areas with low rainfall, there may not be enough water to grow a crop over the entire area. On gentle slopes (less than 3%), one possibility is to use contour bunds and catchment strips. Catchment strips are areas where no crops are planted. When rain falls on this ground, it runs down slope and is trapped by the contour bund. Plant rows of crops behind the bund to use this water. This can produce a good yield even with very little rain. Mulch the cultivated areas with crop residues to prevent erosion, help water sink in, and slowdown the rate of evaporation.
- ✚ **Road Catchments:** Runoff water loss from roads and from other barren areas such as paths and homestead compounds can be channeled on to fields. It may be possible to divert water from structures that already exist, such as the ditches below terraces or special bunds can be built around fields close to the road. An additional possibility is to direct the water into a pond or well, which can be used to irrigate crops.
- ✚ **Half-moon microcatchments:** Half-moon microcatchments are small, semicircular earth bunds. They are quite common on the desert margins of the Sahel, where they are called “demilunes”. The half-moons catch water flowing down a slope. Crops such as sorghum, millet and cowpeas can be planted in the lower portion of the halfmoons. Half-moons are helpful to rehabilitate degraded land.

### Half Moon Catchments

