ORGANIC FARMING

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PREFACE

Welcome to the exploration of **Organic Farming**, a comprehensive guide to understanding and embracing the principles and practices of cultivating crops and raising livestock in harmony with nature. This book delves into the core ethos of organic farming, offering insights into its origins, principles, and the vital role it plays in fostering sustainable and environmentally friendly agricultural systems.

Organic Farming represents a holistic approach to farming that emphasizes soil health, biodiversity, and ecological balance. As concerns about the environmental impact of conventional agricultural practices grow, the demand for sustainable and organic alternatives has never been greater.

In the pages that follow, we will embark on a journey through the fundamentals of organic farming, exploring topics such as soil management, crop rotation, pest control, and the vital role of organic matter. Additionally, we will examine the importance of certifications, standards, and regulations that govern the organic industry, ensuring that consumers can make informed choices about the food they consume.

Throughout this book, emphasis is placed on the interconnectedness of all elements within an organic farming system. From the microscopic organisms in the soil to the complex relationships between plants and their environment, every aspect is considered in fostering a holistic and sustainable approach to agriculture.

Whether you are a farmer seeking to transition to organic practices, a consumer interested in making informed choices, or simply a curious mind eager to explore the world of organic farming, this book aims to serve as a valuable resource. It is our hope that by delving into the principles and practices outlined here, you will gain a profound appreciation for the significance of organic agriculture in building a resilient and ecologically sound future for our planet.

Authors

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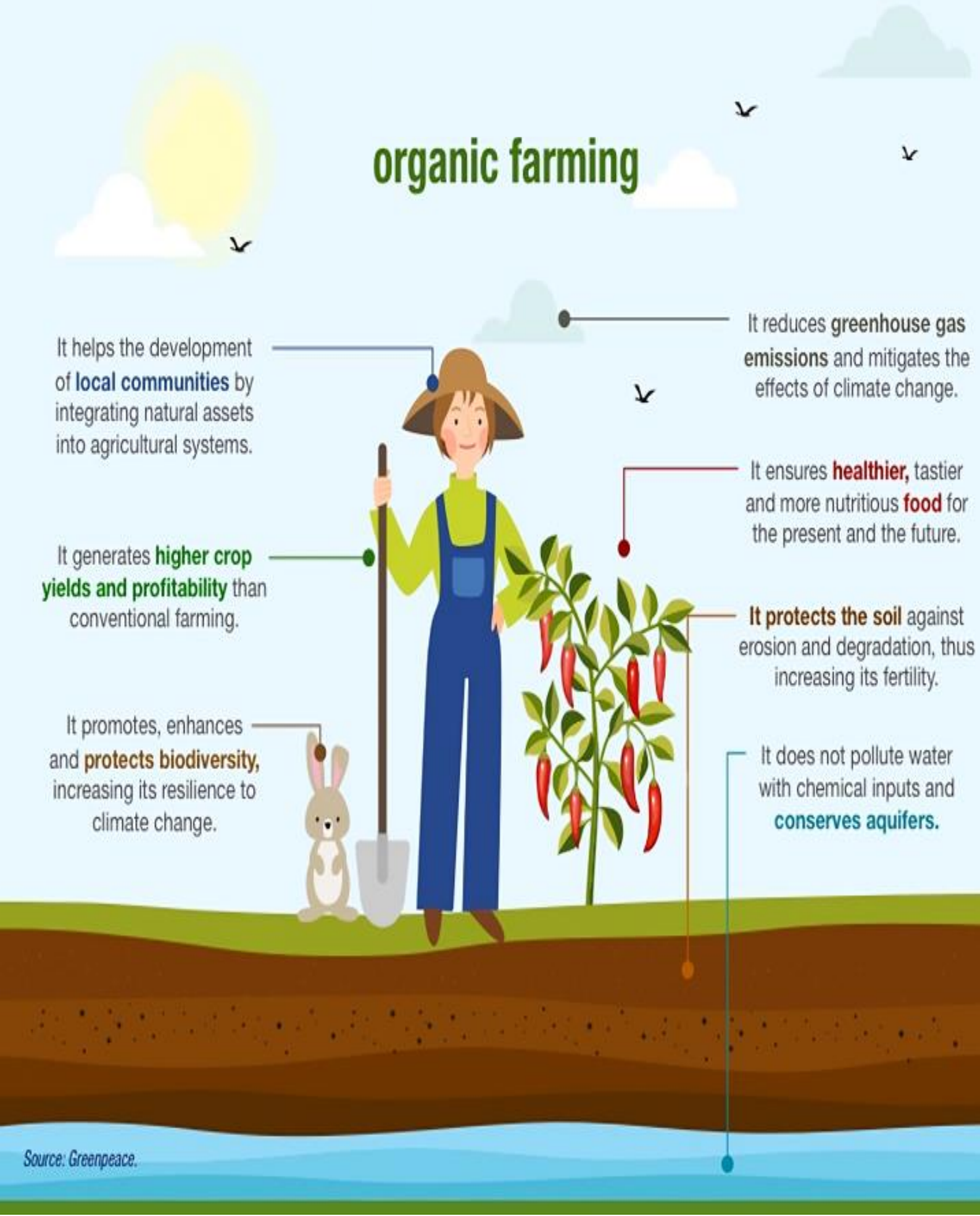
organic farming



Source: Greenpeace.

ORGANIC FARMING – MEANING

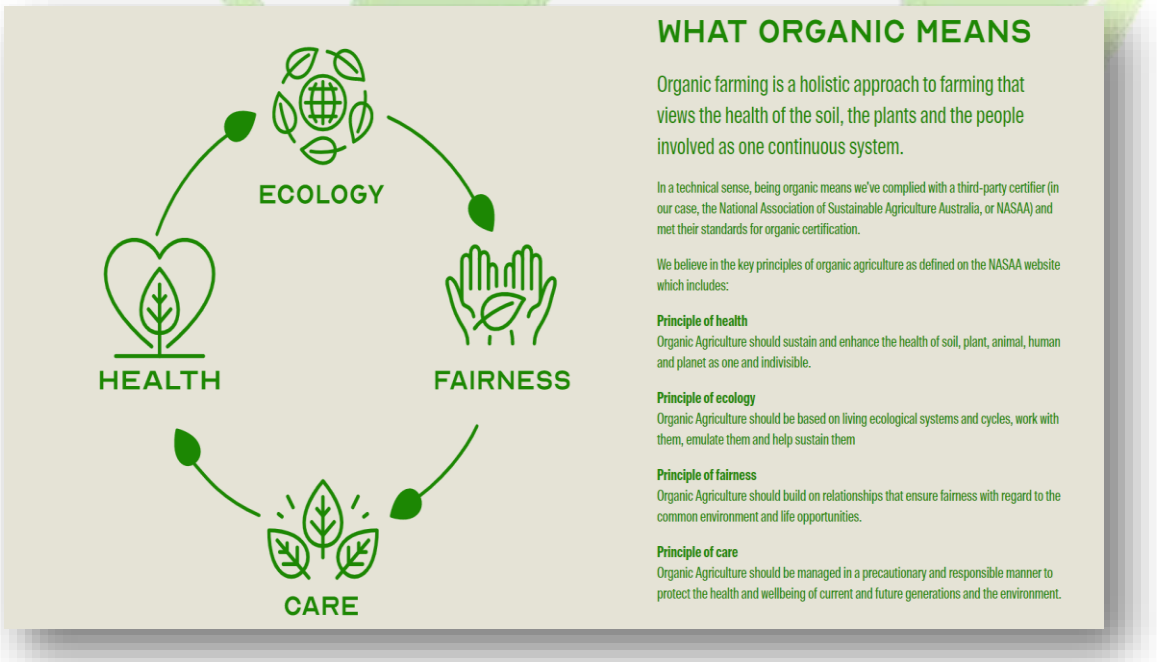
Organic farming based on "Nature can provides for everyone's need but not for greed"……Mahatma Gandhi

The term 'organic' was first coined by Lord Northbourne, in 1940, in his book entitled 'Look to the Land'.

Organic farming is an agricultural system that uses ecologically based pest controls and biological fertilizers derived largely from animal and plant wastes and nitrogen-fixing cover crops. Modern organic farming was developed as a response to the environmental harm caused by the use of chemical pesticides and synthetic fertilizers in conventional agriculture, and it has numerous ecological benefits. Compared with conventional agriculture, organic farming uses fewer pesticides, reduces soil erosion, decreases nitrate leaching into groundwater and surface water, and recycles animal wastes back into the farm.

PRINCIPLES…..

Organic farming and food processing practices are wide-ranging and necessitate the development of socially, ecologically, and economically sustainable food production system. The International Federation of Organic Agriculture Movements (IFOAM) has suggested the basic four principles of organic farming, i.e. the principle of health, ecology, fairness, and care. The main principles and practices of organic food production are to inspire and enhance biological cycles in the farming system, keep and enhance deep-rooted soil fertility, reduce all types of pollution, evade the application of pesticides and synthetic fertilizers, conserve genetic diversity in food, consider the vast socio-ecological impact of food production, and produce high-quality food in sufficient quantity (IFOAM, 1998).



SOURCE – randrsmith organic….

DEFINITIONS….

- Organic Agriculture is a production system that sustains the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation, and science to benefit the shared environment and promote fair relationships and good quality of life for all involved.

  (IFOAM General Assembly)

- "organic farming is a system which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives etc) and to the maximum extent feasible rely upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection".

  (USDA)

- "Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs".

  (FAO)

HISTORY

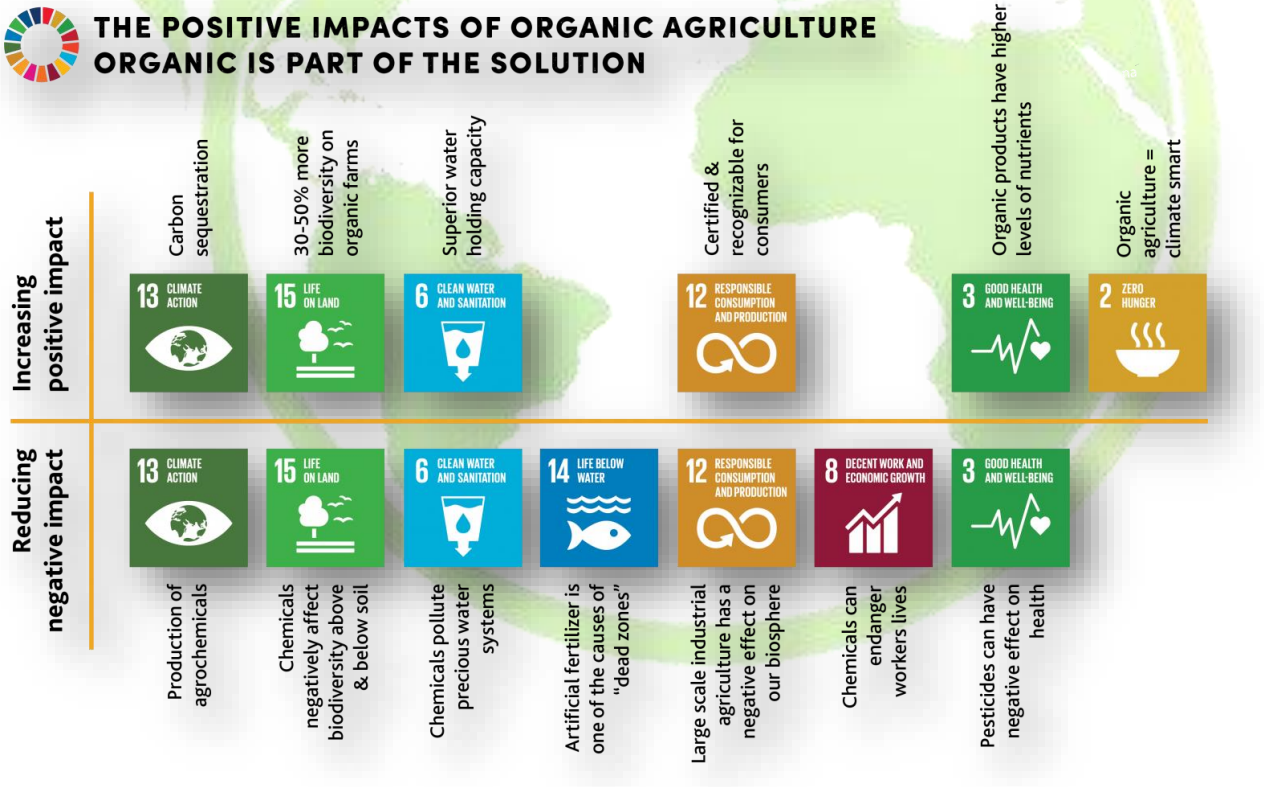
The concept of organic farming was started 1,000 years back when ancient farmer started cultivation near the river belt depending on natural resources only. There is brief mention of several organic inputs in Indian ancient literature like Rig-Veda, Ramayana, Mahabharata and Kautilya Arthasashthra etc

Source- NICHE Agriculture.....

The concepts of organic agriculture were developed in the early 1900s by Sir Albert Howard, F.H. King, Rudolf Steiner, and others who believed that the use of animal manures, cover crops, crop rotation, and biologically based pest controls resulted in a better farming system. Howard, having worked in India as an researcher, gained much inspiration from the traditional and sustainable farming practices he encountered there and advocated for their adoption in the West. Such practices were promoted by J.I. Rodale.

NEED FOR CONVERSION

The goal of organic agriculture is to contribute to the enhancement of sustainability. In the context of agriculture, sustainability refers to the successful management of agricultural resources to satisfy human needs while at the same time maintaining or enhancing the quality of the environment and conserving natural resources for future generations. Sustainability in organic farming must therefore be seen in a holistic sense, which includes ecological, economic and social aspects



Source-Nature and more …….

Organic agriculture provides help on all three aspects, ie.

Social & Economic sustainability and also provides good Market opportunities.

CONSIDERATIONS

Analysis of the Location

The conversion from a conventional to an organic system requires a transitory period, where the organic practices are applied progressively following an organized plan. During this period it is important to analyse carefully the actual situation of the farm and identify the actions to be taken (Florez, 2003). The analysis of the farm must include

1. Farm characteristics: size, plots and crops distribution, which kind of crops, trees, animals are integrated in the farm system.
2. Soil Analysis: an evaluation of the soil structure, nutrient levels, organic matter content, erosion level, and/or the soil have been contaminated.
3. Climate: rainfall distribution and quantity, temperatures, frost risks, humidity.
4. Organic matter sources and management (manures)

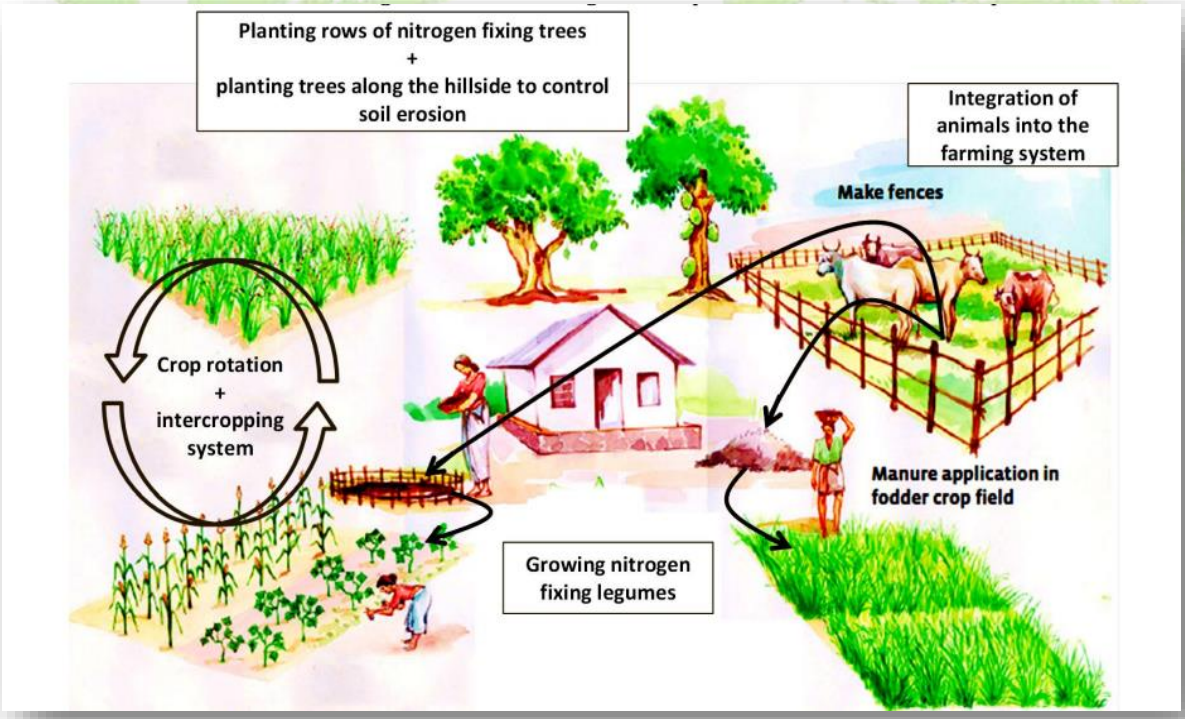
Farm Related Challenges

1. Establishing a diverse and balanced farming system with a natural ability to regulate itself usually takes several years.
2. Major efforts may be necessary to restore natural soil fertility by providing a considerable amount of organic matter to the soil.

3. Abandoning high input external fertilizers results in yield depression in the first years of conversion, before soil fertility is re-established and yields rise again.

4. New approaches and practices usually involve a lot of learning and intensive observation of crop development, and dynamics of pests, diseases and natural enemies.

5. Avoid burning of crop residues after harvest as this is, in most cases, not a viable solution, since it destroys valuable organic material and damages soil organisms.



6. Establish a well organised diversification systems including a 'planned' crop rotation and intercropping systems.

7. Accumulate knowledge and practice regarding efficient use of farm own resources, especially for compost production to manage and improve soil fertility.

Climate Related Challenges

Converting a farm to organic farming in an area with very little rainfall and high temperatures or strong winds will be more challenging than converting a farm located in an area with well distributed rainfall and favourable temperatures.

In very warm and dry climate, losses of water through transpiration from plants and evaporation from soils are high. These losses may be further encouraged by strong winds, enhancing soil erosion. The soils' organic matter content is

generally low, as biomass production is low, implying that the availability of nutrients to the plants is highly reduced. Under such conditions, the key to increasing crop productivity lies in protecting the soil from strong sun and wind and increasing the supply of organic matter and water to the soil.

Soil organic matter can either be increased through compost or through cultivation of green manure crops. In the case of compost production the

challenge is to increase production of plant biomass, which is needed for compost production.

In warm and humid climate, high aboveground biomass production and rapid decomposition of soil organic matter imply that the nutrients are easily made available to the plants. Under such conditions a balance between production and decomposition of organic matter is important to avoid depletion of soil. Creating a diverse and multi-layer cropping system ideally including trees, growing nitrogen-fixing cover crops in orchards and applying compost to enrich the soil with organic matter and in this way increase its capacity to retain water and nutrients.

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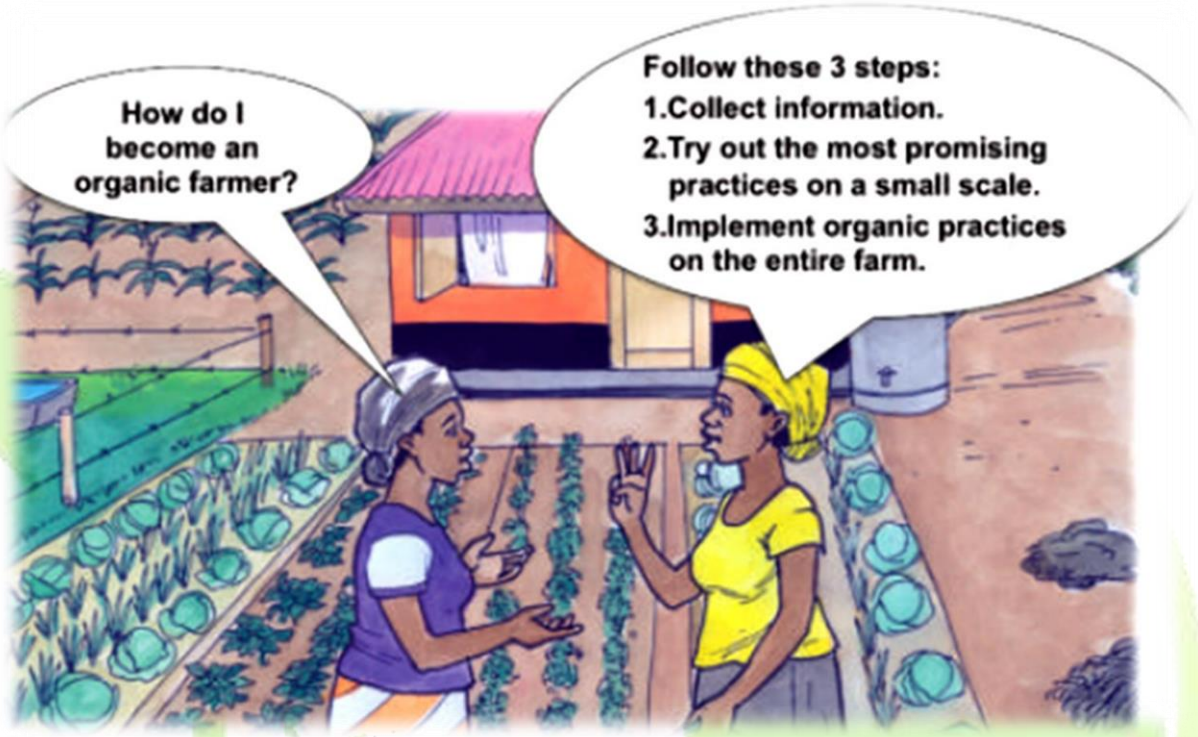
STEP-BY-STEP CONVERSION



STEP 1 : Good Information First

Basically, farmers who are interested in converting their farm to organic agriculture need to know:

- How to improve soil fertility.
- How to keep crops healthy.
- How to best increase diversity in the farm.
- How to keep livestock healthy.
- How to give value to organic products and how to successfully sell them.

STEP 2 : Familiarise with Organic Practices

- **Mulching** - Covering the soil with dead plant material is an easy way to control weeds and protect the soil in annual crops. This practice can be implemented into most existing cropping systems.

- **Intercropping** - Growing two annual crops together, commonly a leguminous crop like beans or a green manure crop in alternating rows with maize or another cereal crop or vegetable is a common practice in organic farming to diversify production and maximize benefits from the land. In intercropping, special attention must be paid to avoid competition between the crops for light, nutrients and water.

- **Composting** - Application of compost to the fields can have a major impact on crop growth and yields. To get familiar with the process of making compost, farmers should be instructed by an experienced person. Proper compost production requires some knowledge and experience and additional labor, but is low in investments.

- **Green manuring** - The practice of growing a leguminous plant species for biomass production and incorporation into the soil may be new to most farmers. Proper green manuring first requires information on appropriate species.

- **Organic pest management** – Careful associations and management of plants and animals in order to prevent pest and disease outbreaks. Initially, bio-control agents may be applied but organic pest management is best achieved through ecological approaches that establish a pest/predator balance

- **Appropriate seeds and planting material** - Use of healthy seeds and planting materials, and robust and/or improved cultivars can make a big change in crop production.

- **Planting of leguminous trees** - In perennial crop plantations such as banana, coffee or cocoa, planting of leguminous trees such as gliricidia, calliandra, and sesbania may improve the growing

conditions of the fruit crop by providing shade, mulching material and nitrogen through nitrogen fixation

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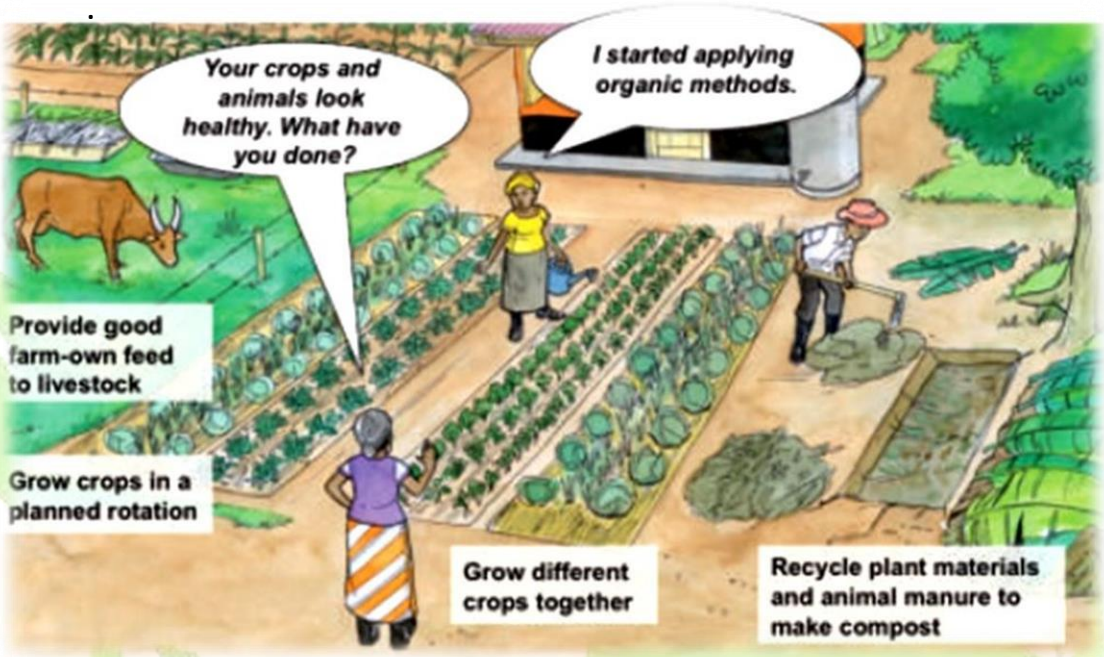
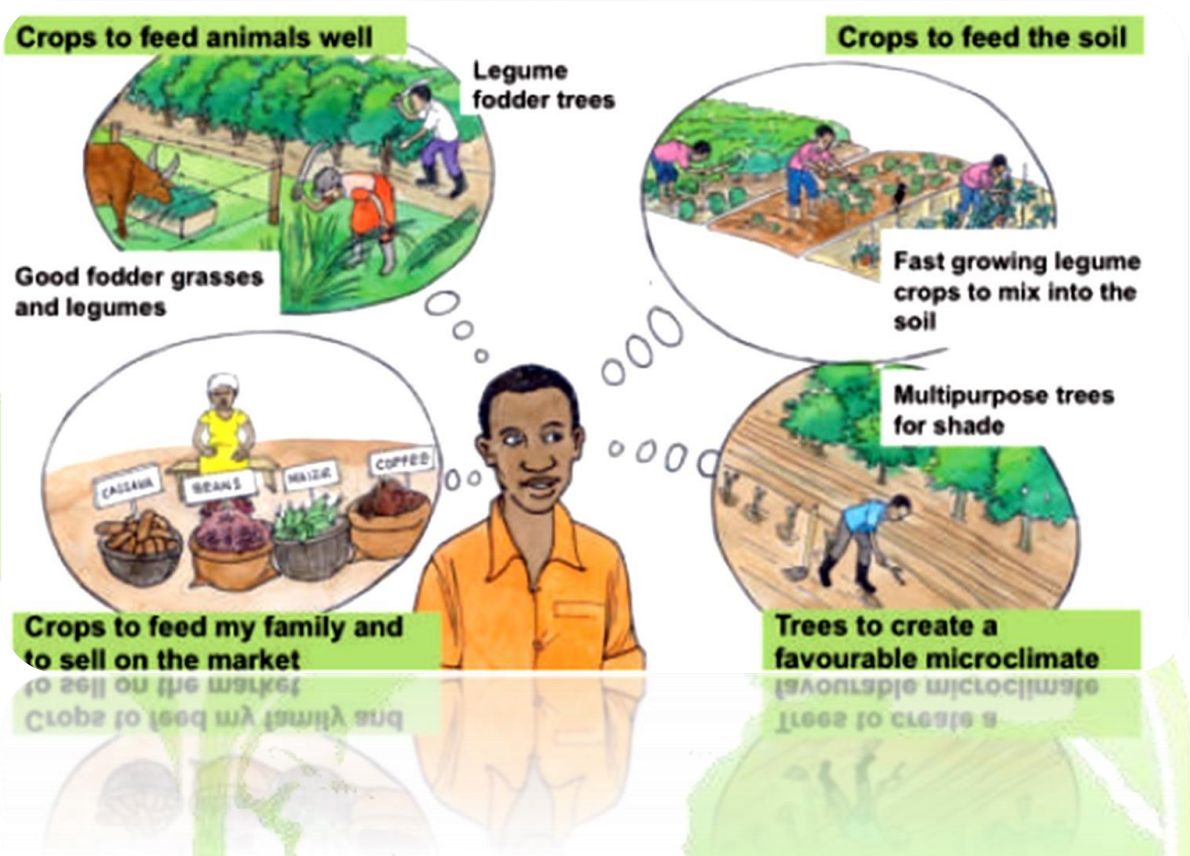


- **Terraces and soil bunds** - Construction of terraces and soil bunds along the curves of hills is a key measure for soil conservation. This practice builds the foundation of further improvement to soil fertility on slopes. It is of high relevance, but requires much labor and some specific knowledge for appropriate implementation

Crops to Grow During Conversion

Besides growing crops for food, farmers may need to grow leguminous cover crops to provide high-protein feed for livestock and to be used as green manures to feed the soil. Planting trees for shade, as windbreak, for firewood, feed, mulching material or for other uses, can be recommended in most situations.



STEP 3 : Full Conversion to Organic Farming

In a third step, implementation of organic practices throughout the entire farm should be considered, once sufficient experience with different practices has been gained. As soon as organic practices are implemented throughout the entire farm, a farmer can claim to be an organic farmer.

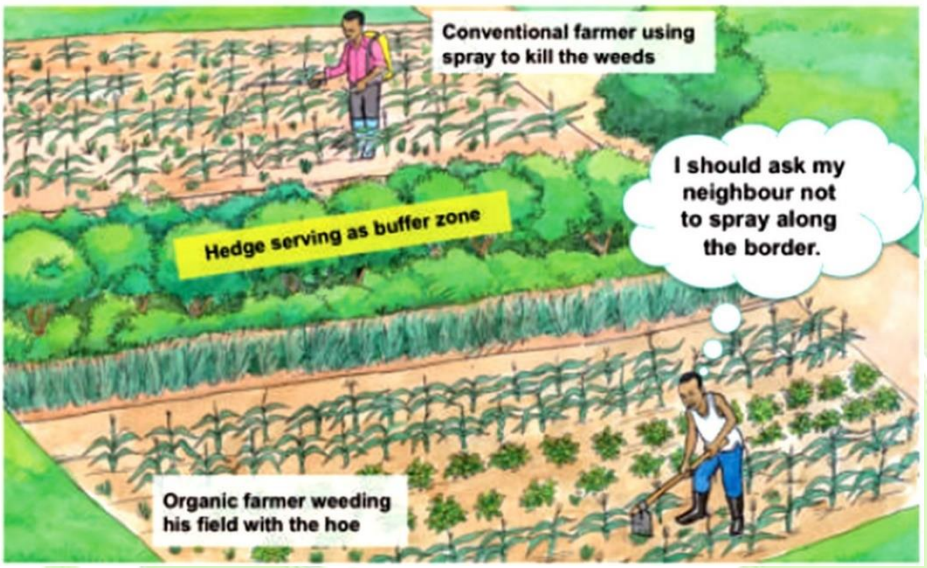
Commonly, consistent application of organic practices marks the beginning of a long process of improving the production system:

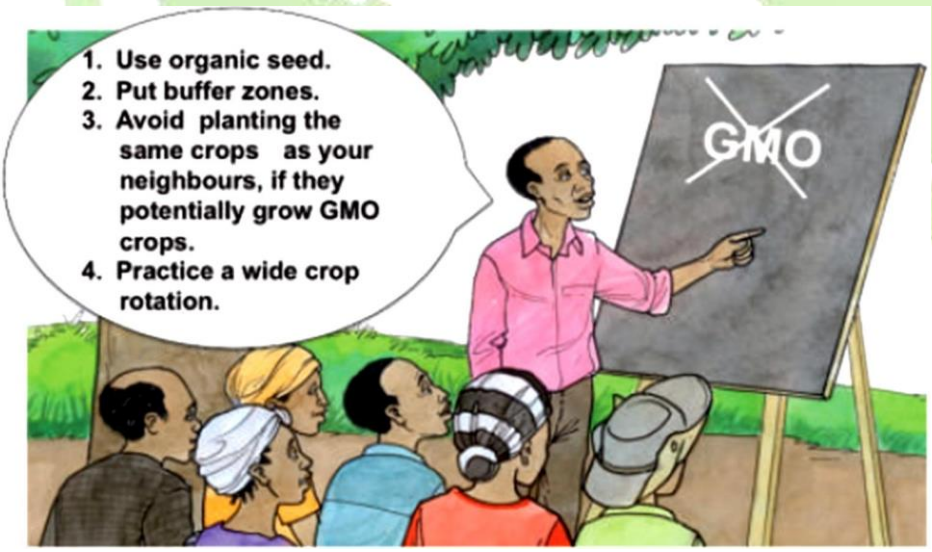
1. Improving soil fertility based on the recycling of farm own organic materials and enhancement of farm own biomass production.

2. Encouraging positive interactions between all parts of the production system (the farm ecosystem) to enhance self-regulation of pests and diseases.

3. Optimizing the balance between feed production and livestock.

Farming organically also means continuously learning from personal observation, from outside experiences, sharing experiences with other organic farmers and implementing new information on the your farm, making it increasingly more sustainable.





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Agriculture in the Tropics. Edited by Frank Eyhorn, Marlene Heeb, Gilles Weidmann, p 210-224, http://www.ifoam.bio

MULCHING IN ORGANIC SYSTEM

Mulching is the process of covering the topsoil with plant material such as leaves, grass, twigs, crop residues, straw etc. A mulch cover enhances the activity of soil organisms such as earthworms. They help to create a soil structure with plenty of smaller and larger pores through which rainwater can easily infiltrate into the soil, thus reducing surface runoff. As the mulch material decomposes, it increases the content of organic matter in the soil.

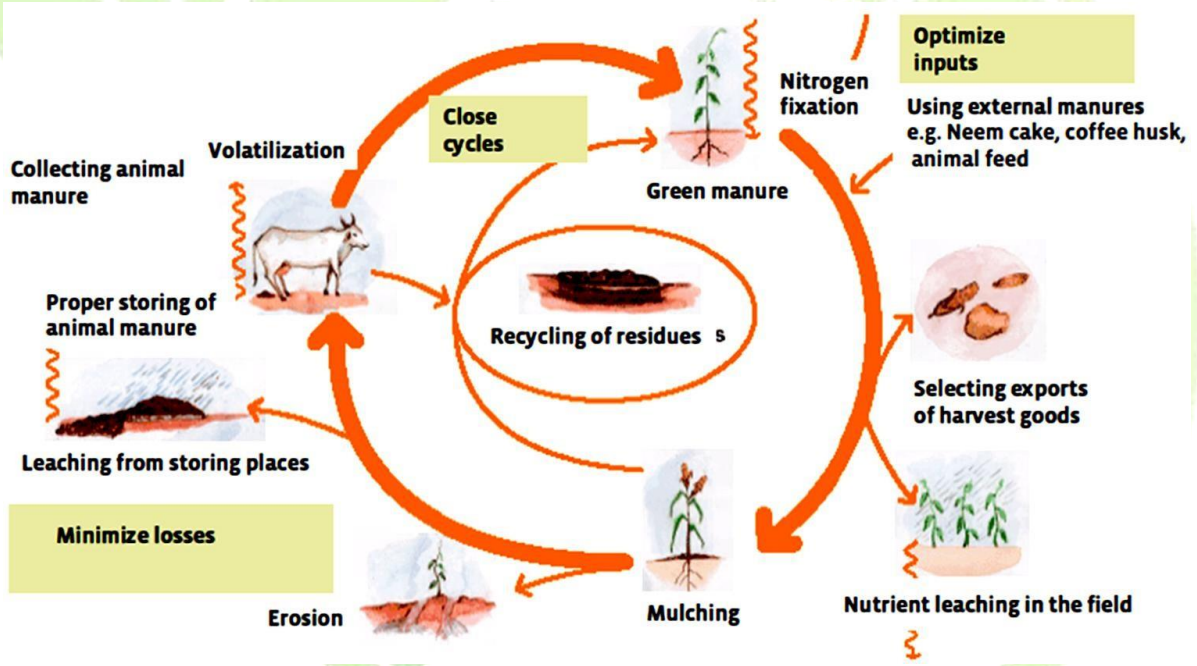
USES

- Protecting the soil from wind and water erosion: soil particles cannot be washed or blown away.
- Improving the infiltration of rain and irrigation water by maintaining a good soil structure: no crust is formed, the pores are kept open

- Keeping the soil moist by reducing evaporation: plants need less irrigation or can use the available rain more efficiently in dry areas or seasons

- Feeding and protecting soil organisms: organic mulch material is an excellent food for soil organisms and provides suitable conditions for their growth
- Suppressing weed growth: with a sufficient mulch layer, weeds will find it difficult to grow through it

Selection of Mulch Material

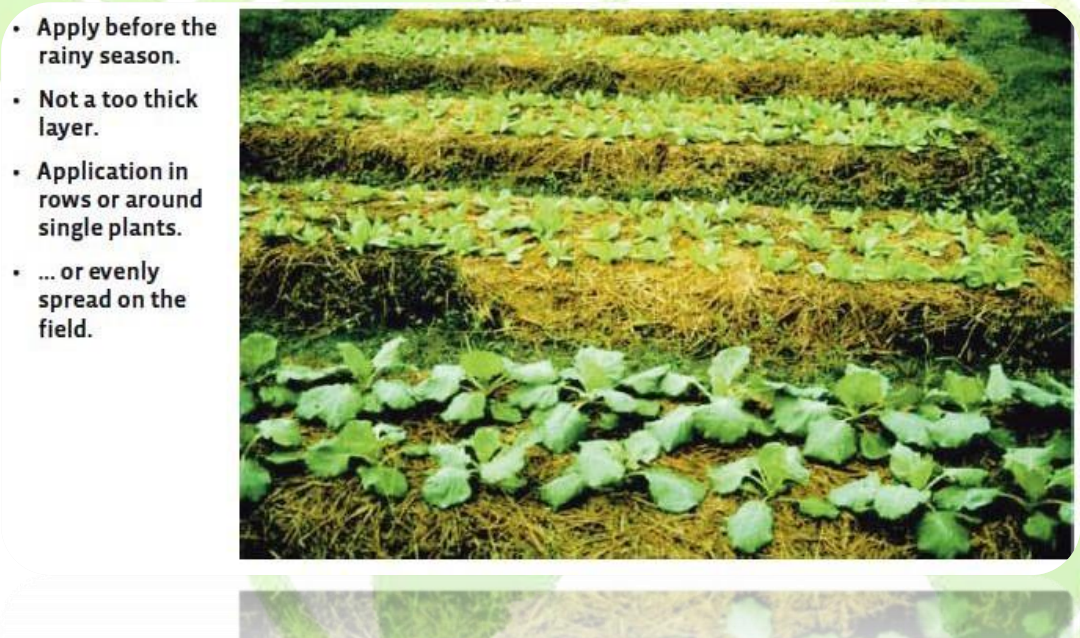


The kind of material used for mulching will greatly influence its effect. Material which easily decomposes will protect the soil only for a rather short time but will provide nutrients to the crops while decomposing

Application of Mulch

If possible, the mulch should be applied before or at the onset of the rainy season, as then the soil is most vulnerable.

If the layer of mulch is not too thick, seeds or seedlings can be directly sown or planted in between the mulching material. On vegetable plots it is best to apply mulch only after the young plants have become somewhat hardier, as they may be harmed by the products of decomposition from fresh mulch material.



If mulch is applied prior to sowing or planting, the mulch layer should not be too thick in order to allow seedlings to penetrate it. Mulch can also be applied in established crops, best directly after digging the soil. It can be applied between the rows, directly around single plants (especially for tree crops) or evenly spread on the field.

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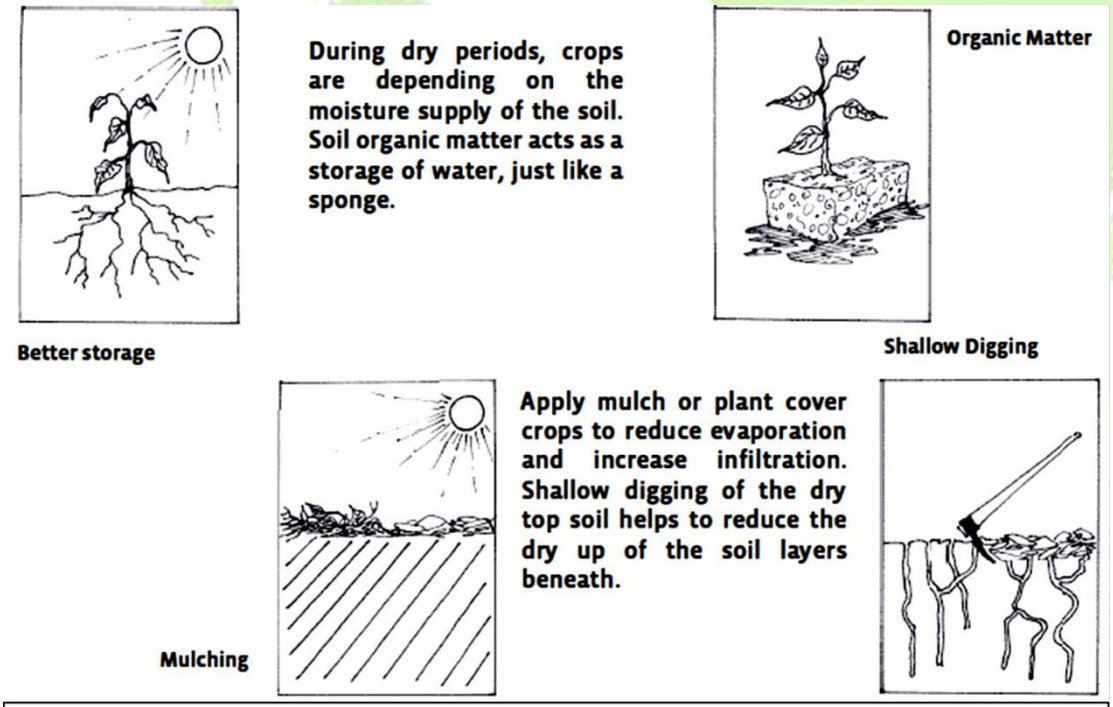
WATER MANAGEMENT

Scarcity of water for agriculture is a common phenomenon in many countries. In some regions it is almost impossible to grow crops without irrigation. Even in areas with large amounts of rainfall in the rainy season, crops may get short of water during dry periods.

Organic farming aims at optimising the use of on-farm resources and at a sustainable use of natural resources. Active water retention, water harvesting and storing of water are important practices, especially for organic farmers. Organic farmers know that it is more important to first improve the water retention and the infiltration of water into the soil.

Approaches



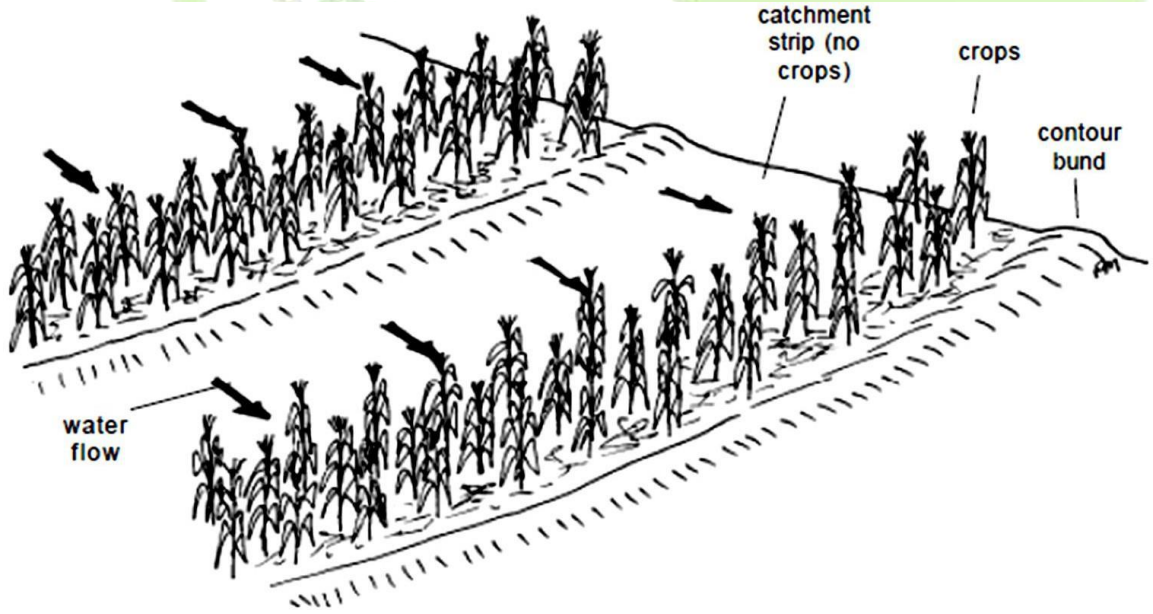
Approaches for water conservation: Better water retention through high contents of soil organic matter; reduced evaporation through mulching or shallow digging

Planting Pits

Planting 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.

Contour Bunding & Catchment Strips

In areas with low rainfall, there may not be enough water to grow a crop over the whole 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 downslope 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 slow evaporation.



CONTOUR BUNDS AND CATCHMENT STRIPS

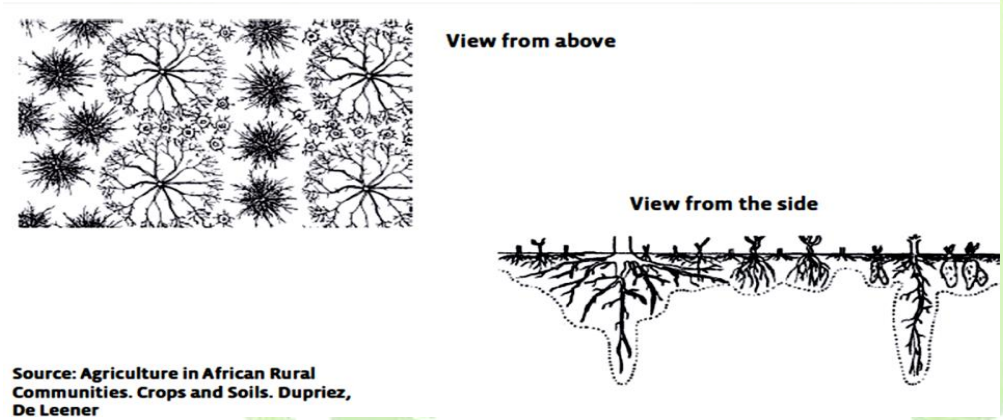
SOURCE: IIRR AND ACT. 2005. CONSERVATION AGRICULTURE: A MANUAL FOR FARMERS AND EXTENSION WORKERS IN AFRICA.

CROP PLANNING & MANAGEMENT

Crop Rotation

Crop rotation means changing the type of crops grown in the field each season or each year .It is a critical feature of all organic cropping system, because it provides the principal mechanisms for building healthy soils, a major way to control pests, weeds, and to maintain soil organic matter). In more details, crop rotation brings the following benefits.

View of roots of intercropped coffee, maize, and cocoyam from above and the side



Source: Agriculture in African Rural Communities. Crops and Soils. Dupriez, De Leener

•**<u>It improves soil structure</u>**: some crops have strong, deep roots. They can break up hardpans, and tap moisture and nutrients from deep in the soil. Others have many fine, shallow roots. They tap nutrients near the surface and bind the soil. They form many tiny holes so that air and water can get into the soil.

•**<u>It increases soil fertility:</u>** legumes (such as groundnuts and beans) fix nitrogen in the soil. When their green parts and roots rot, this nitrogen can be used by other crops such as maize. The result is higher, more stable yields, without the need to apply expensive inorganic fertilizer.

- **It helps control weeds, pests and diseases:** planting the same crop season after season encourages certain weeds, insects and diseases. Planting different crops breaks their life cycle and prevents them from multiplying.
- **It produces different types of output**: growing a mix of grain, beans, vegetables and fodder means a more varied diet and more types of produce to sell.

General Recommendations

- Grow winter cover crops BEFORE late-planted crops to accumulate organic matter and nitrogen.
- Grow winter-killed cover crops (oat-pea) BEFORE early season crops, so the seedbed will be easy to prepare.
- NEVER grow any crop after itself.
- Certain insect pests and diseases may spread easily from one crop to the next through the crop residues. Avoid crop combinations where this is a problem.
- Markets do not always exist for new crops; however you may want to plant some of them as part of your rotation. However. If your objective is marketing, ensure that there is a market for your main output and rotation crops.

Intercropping

Intercropping refers to the practice of growing two or more crops in close proximity: growing two or more cash crops together, growing a cash crop with a cover crop, or other non-cash crop that provide benefits to the primary crop .

When two or more crops are growing together, each must have adequate space to maximize cooperation and minimize competition between them. To accomplish this, four things need to be considered:

Spatial arrangement, Plant density, Maturity dates of the crops being grown, Plant architecture.

ROW INTERCROPPING WITH ALTERNATE ROWS OF MAIZE AND BEANS (LEFT) ROW INTERCROPPING WITH ALTERNATE ROWS OF A CEREAL AND A GRASS COVER CROP (RIGHT).

There are at least four basic spatial arrangements used in intercropping. Most practical systems are variations of these:

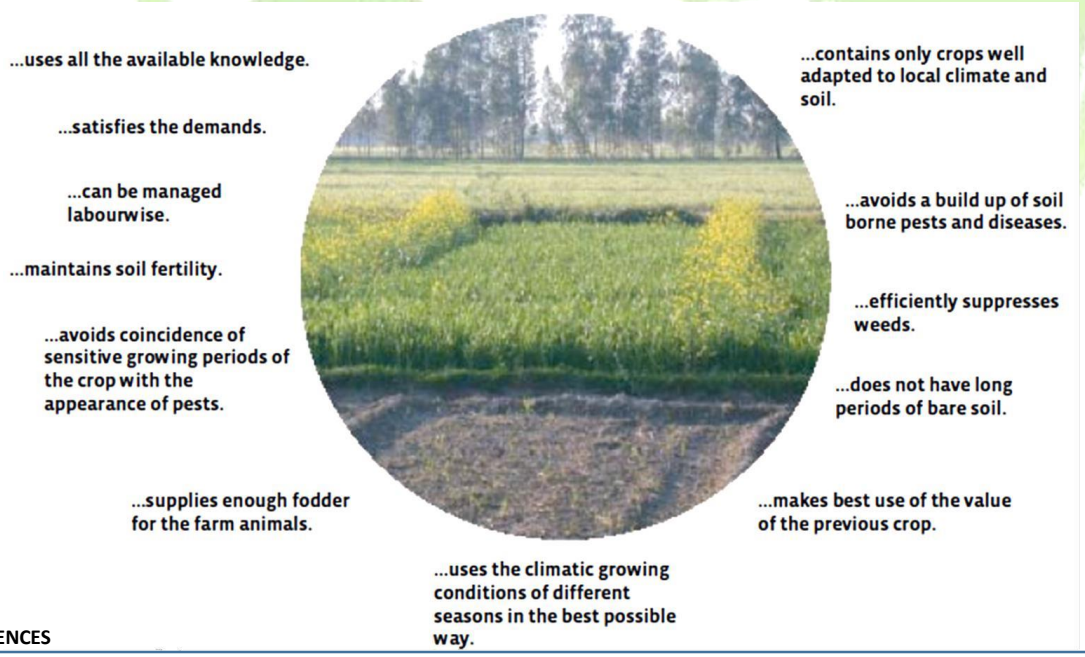
- **Row intercropping**
- **Strip intercropping**
- **Relay intercropping**
- **Mixed intercropping**

Cover crops

Every plant which covers the soil and improves soil fertility can be a cover crop. It could be a leguminous plant with other beneficial effects, or it could be a weed characterised by its rapid growth and enormous production of biomass. The most important property of cover crops is their fast growth and the capacity of maintaining the soil permanently covered.

The following characteristics make an ideal cover crop -

- The seeds are cheap, easy to get, to harvest, to store and to propagate
- Be of rapid rate of growth and be able to cover the soil in short time
- Be resistant against pests and diseases
- Produce large amounts of organic matter and dry material
- Fix nitrogen from the air and provide it to the soil
- Have a de-compacting root system and regenerate degraded soils
- Easy to sow and to manage as single crop or associated with other crops
- Can be used as fodder, grains as food grains



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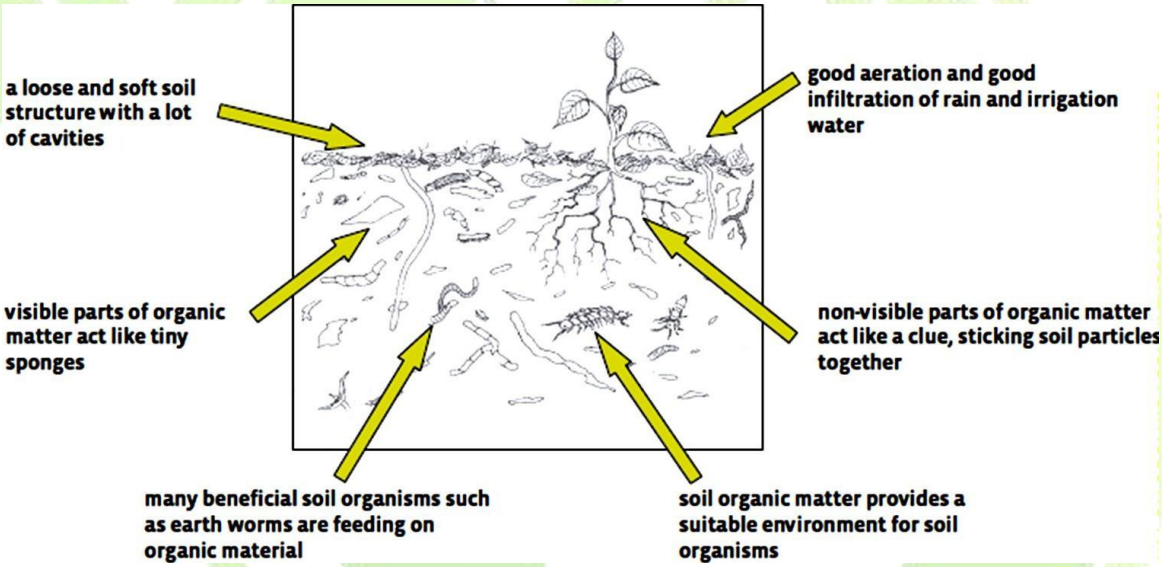
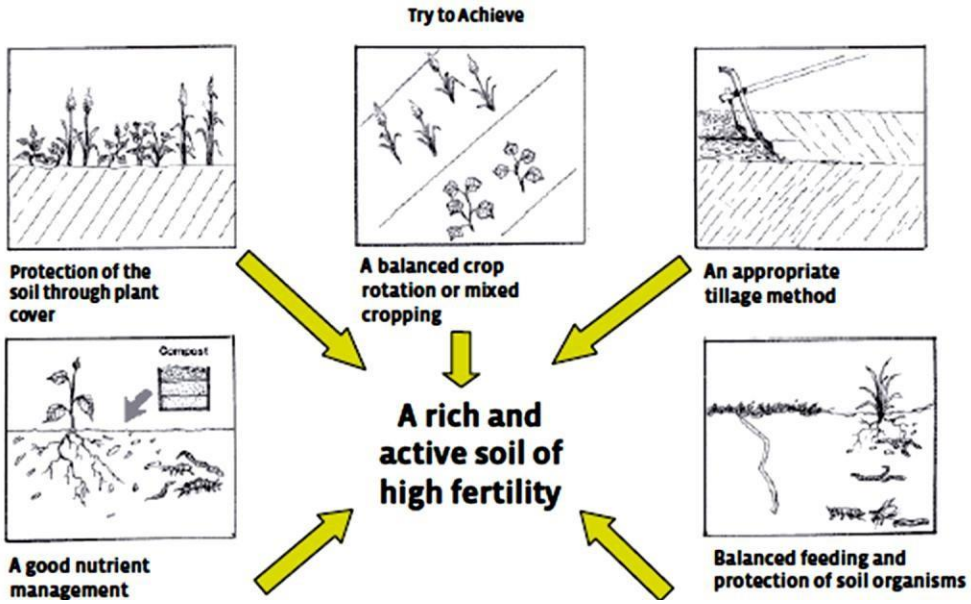
NUTRIENT MANAGEMENT

Soil is a living system and soil fertility is the key to agricultural productivity. The maintenance of the fertility of the soil is the primary step in any agricultural system. The plethora of microorganism inherent in any soil system ensures that nutrient cycle is in place and the large substrate is broken down to minute particles that can be easy assimilated by the plant's root system.





Composting

Composting is the process of transforming organic materials of plant or animal origin into humus in heaps or pits. Compared with uncontrolled decomposition of organic material, decomposition in the composting process occurs at a faster rate, reaches higher temperatures and results in a product of higher quality.

Within the process of composting, three main phases can be distinguished: the heating phase, the cooling phase and the maturing phase. However, these phases cannot be clearly separated from one another.

Heating phase

•Within 3 days of setting up the compost heap, the temperature in the heap rises to 60 to 70 °C and usually stays at this level for 2–3 weeks. Most of the decomposition occurs during the heating phase.

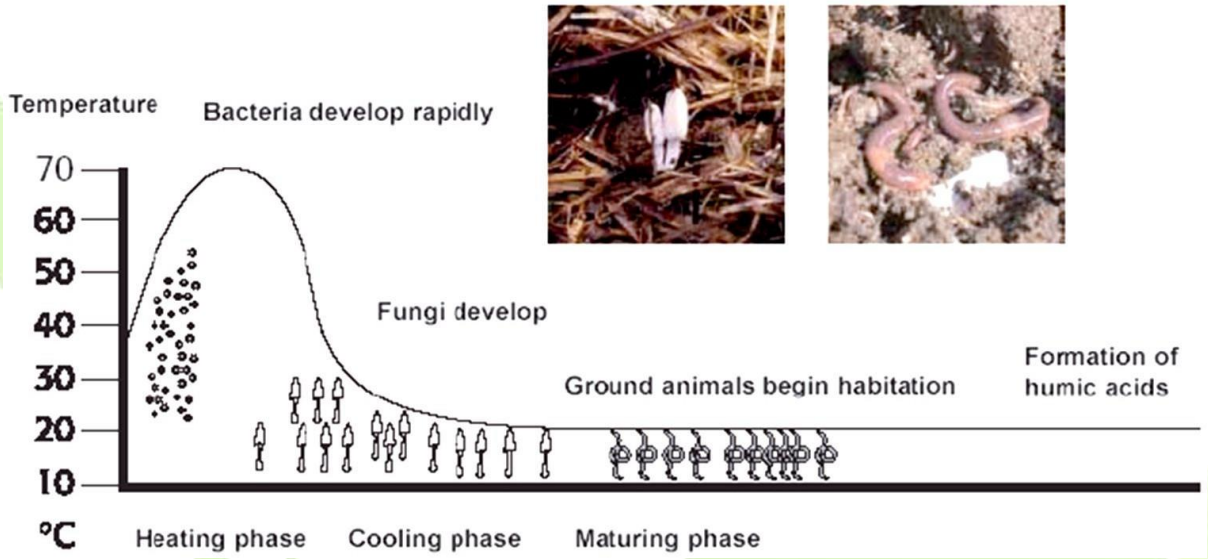
•During this first phase of the composting process, the bacteria have a very high oxygen demand due to the rapid development of their population. High temperatures in the heap signal that there is an adequate supply of oxygen for the bacteria. If there is not enough air in the heap, bacterial development will be hindered and the compost will develop an unpleasant odour.

Cooling phase

•Once the material which is easily digested by the bacteria has been converted, the temperature in the compost heap declines slowly and will remain at 25–45 °C.

•With the decline in temperature, fungi settle and start the decomposition of straw, fibres and wooden material. As this decomposition process is slower, the temperature of the heap does not rise.

•As the temperature drops, the pH of the composting material declines (i.e. acidity increases).



Maturing phase

•During the maturing phase nutrients are mineralised and humic acids and antibiotics are built-up.

•Red compost worms and other soil organisms start to inhabit the heap during this phase.

•At the end of this phase the compost has lost about half of its original volume, has the colour of dark, fertile soil and is ready to use.

•The longer it is stored from now on, the more it loses its quality as a fertilizer, while its capacity to improve soil structure increasesGree

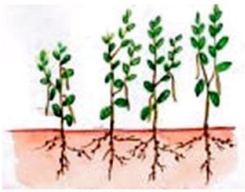
Green manuring

Green manures are plants grown to accumulate nutrients for the main crop. When they have built up maximum biomass, they are worked into the surface soil. As they are usually cut before flowering, growing a green manure is thus different from growing a legume crop in the rotation. Once worked into the soil the fresh plant material releases nutrients quickly and will be fully decomposed within a short period of time. Old or coarse material (e.g. straw, twigs, etc.) will decompose at a slower rate than fine material and will therefore contribute more to the build-up of soil organic matter than to fertilizing the crop.

- Timing? Which species to grow?
- Avoid competition to the main crops.
- Ensure good growing conditions.

1. Sow the green manure

2. Wait until maximum biomass is developed



- Cut before flowering.

3. Cut and incorporate the plant material in the soil

- Crush the material into pieces.
- Incorporate it superficially.

4. Sow or plant a crop with a high nutrient demand

- Sow or plant the next crop within two weeks to avoid nutrient losses.

An alternative to sowing a green manure crop in the field is to collect fresh plant material from elsewhere and work it into the soil. For example, trees and/or shrubs growing alongside crops in an agroforestry system may provide a large quantity of green material which can be used as green manure or for mulching.

Animal Manure

Depending on whether animals are kept in stables or not (part or full time), farmyard manure consists of animal excreta and bedding material (usually straw or grass). Farmyard manure is extremely valuable organic manure.

Some characteristics and effects of farmyard manure:

•It contains large amounts of nutrients.

•Only part of the nitrogen content of manure is directly available to plants, while the remaining part is released as the manure decomposes. The nitrogen in animal urine is available in the short-term.

•When dung and urine are mixed, they form a well-balanced source of nutrients for plants. The availability of phosphorus and potassium from farmyard manure is similar to that from chemical fertilizers. Chicken manure is rich in phosphorus. However, it is important to be aware of the origin of the manure, as chicken manure from conventional farms is contaminated by heavy metals.

•Organic manures contribute to the build-up of soil organic matter and thus improve soil fertility.

Microbial and Mineral Fertilizer

The microbial fertilizers mostly consist of organic material and some source of sugar or starch, which are fermented together with specific species of microorganisms. The products are living organisms and need to be applied cautiously. They should not be used when expired, since the organisms may be dead.

Although some research has been done on the use of microorganisms and positive effects may be proven, there is still little experience with such products. To find out the effect of a certain product, it is recommended to test them in small scale and compare with an untreated plot. Remember though: microbial fertilizers cannot substitute an appropriate humus management in the farm.

A Bolivian recipe for 1500 kg of Bocashi

(to be adapted to the local conditions)

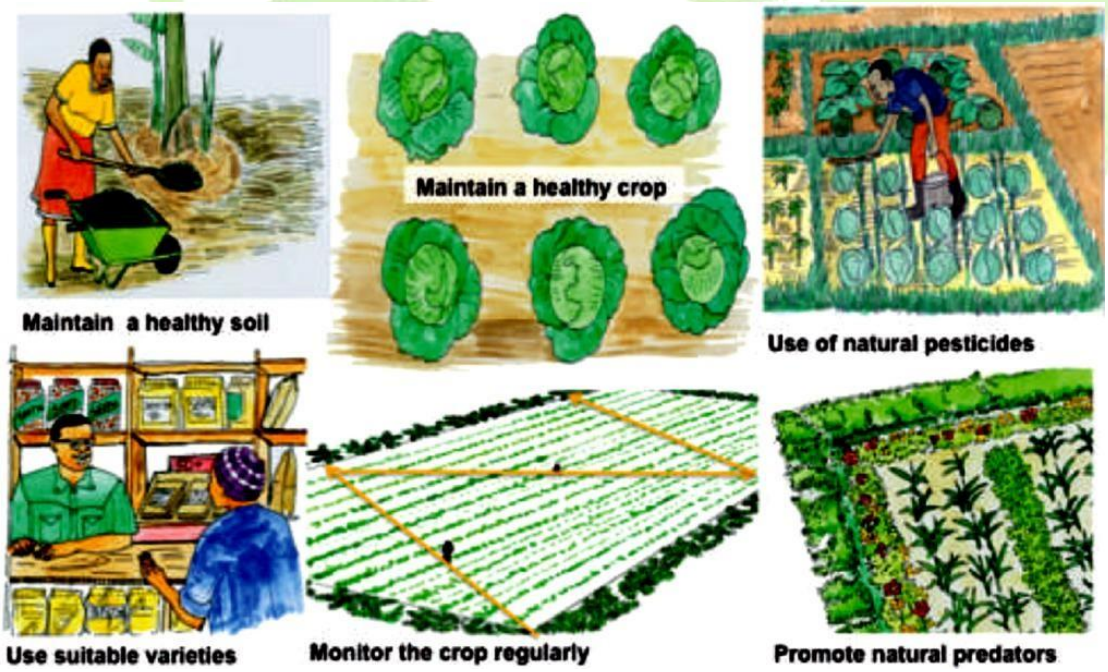
- 400 kg of animal dung (cattle, chicken, rabbit, sheep, goat)
- 400 kg straw from oats, wheat, rice or rye
- 400 kg of soil from the place, without stones and clumps
- 120 kg of charcoal in small pieces
- 20 kg of bran, concentrate for cattle or flour
- 1 kg of lime (in zones with acid soils)
- Some kg of yeast, fermented maize or already prepared Bocashi
- 1 litre of sugar cane molasses
- 225 litres of water

Most of the bacteria and fungi present in the purchased products are generally present in soil. Microbial inocula, therefore, enhance the presence of the specific organisms. Some farmers make their own microbial fertilizers to save on costs.

PEST & DISEASE MANAGEMENT

Pest and disease management consists of a range of activities that support each other. Most management practices are long-term activities that aim at preventing pests and diseases from affecting a crop.

Management focuses on keeping existing pest populations and diseases low. Control on the other and is a short-term activity and focuses on killing pest and disease. The general approach in organic agriculture to deal with the causes of a problem rather than treating the symptoms also applies for pest and diseases. Therefore, management is of a much higher priority than control.



Things to Remember

1) **Selection of adapted and resistant varieties:**

→ Choose varieties which are well adapted to the local environmental conditions (temperature, nutrient supply, pests and disease pressure), as it allows them to grow healthy and makes them stronger against infections of pests and diseases.

2) **Selection of clean seed and planting material:**

→ Use safe seeds which have been inspected for pathogens and weeds at all stages of production.

→ Use planting material from safe sources.

3) **Use of suitable cropping systems (see 6. Crop Planning and Management)**:

→ Mixed cropping systems: can limit pest and disease pressure as the pest has less host plants to feed on and more beneficial insect life in a diverse system.

→ Crop rotation: reduces the chances of soil borne diseases and increases soil fertility.

→ Green manuring and cover crops: increases the biological activity in the soil and can enhance the presence of beneficial organisms (but also of pests; therefore a careful selection of the proper species is needed).

4) **Use of balanced nutrient management**:

→ Moderate fertilization: steady growth makes a plant less vulnerable to infection. Too much fertilization may result in salt damage to roots, opening the way for secondary infections.

5) **Input of organic matter:**

→ Increases micro-organism density and activity in the soil, thus decreasing population densities of pathogenic and soil borne fungi.

→ Stabilises soil structure and thus improves aeration and infiltration of water.

6) **Application of suitable soil cultivation methods:**

→ Facilitates the decomposition of infected plant parts.

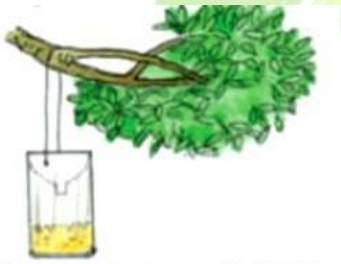
→ Regulates weeds which serve as hosts for pests and diseases.

7) **Use of good water management:**

→ No water logging: causes stress to the plant, which encourages pathogens infections.

→ Avoid water on the foliage, as water borne disease spread with droplets and fungal disease germinate in water.

Blue/yellow sticky traps -> pest insects



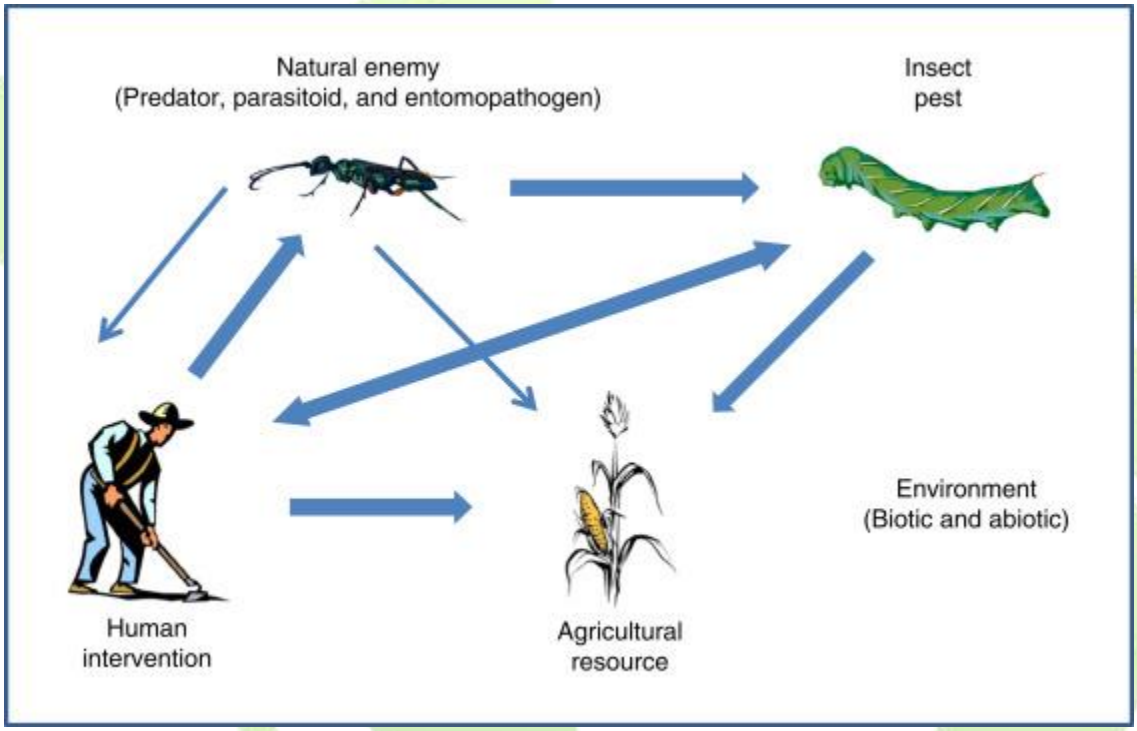
Homemade trap -> fruit flies

Pheromone trap -> pest insects

Light trap -> noctuids

BIOOGICAL CONTROL

Biological control is the use of natural enemies to manage populations of pests and diseases. This implies that we are dealing with living systems, which are complex and vary from place to place and from time to time.



Natural enemies that kill or suppress pests or diseases are often fungi or bacteria. They are called antagonists or referred to as microbial insecticides or bio-pesticides. Some commonly used antagonistic microbes are:

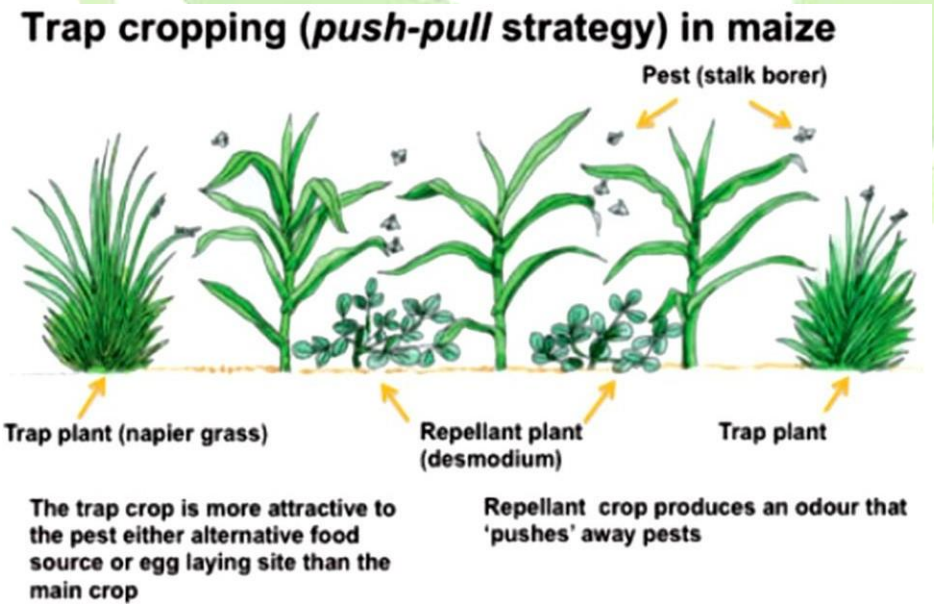
Bacteria such as Bacillus thuringiensis (Bt). Bt has been available as a commercial microbial insecticide since the 1960s. Different types of Bt are available for the control of caterpillars and beetles in vegetables and other agricultural crops, and for mosquito and black fly control.

Viruses such as NPV (nuclearpolyhedrosis virus), effective for control of several cater-pillar pest species. Every insect species, however, requires a specific. Many farmers in West-Sumatra are now producing NPV on-farm.

Fungi that kill insects, such as Beauveria bassiana. Different strains of this fungus are commercially available. For example: strain Bb 147 is used for control of corn.

Fungi that work against plant-pathogens. Some examples include: Trichoderma sp., widely used in Asia for prevention of soil-borne diseases such as damping-off and root rots in vegetables . Some Trichogramma species against the African bollworm are bred in some laboratories in Africa against lepidopteran pests and aphids.

Other Methods



1) **NEEM**: Neem derived from the neem tree (Azadiracta indica) of arid tropical regions, contains several insecticidal compounds. The main active ingredient is azadiractin, which both deters and kills many species of caterpillars, thrips and whitefly. Neem cake (ground neem seed or neem kernel powder) has also a considerable potential as a fertilizer and at the same time it will hinder nematode attacks of the crop roots (e.g. tomato). Put neem cake in the planting pit (200g per m2) and mix it with substrate. The neem cake will repel and even kill nematodes and other root pests. Insecticidal agents (azadirachtin) will be translocated to above-

2) **PYRETHRUM**: Pyrethrum is a daisy-like Chrysanthemum. Pyrethrins are insecticidal chemicals extracted from the dried pyrethrum flower. The flower heads are processed into a powder to make a dust. This dust can be used directly or infused into water to make a spray. Pyrethrins cause immediate paralysis to most insects

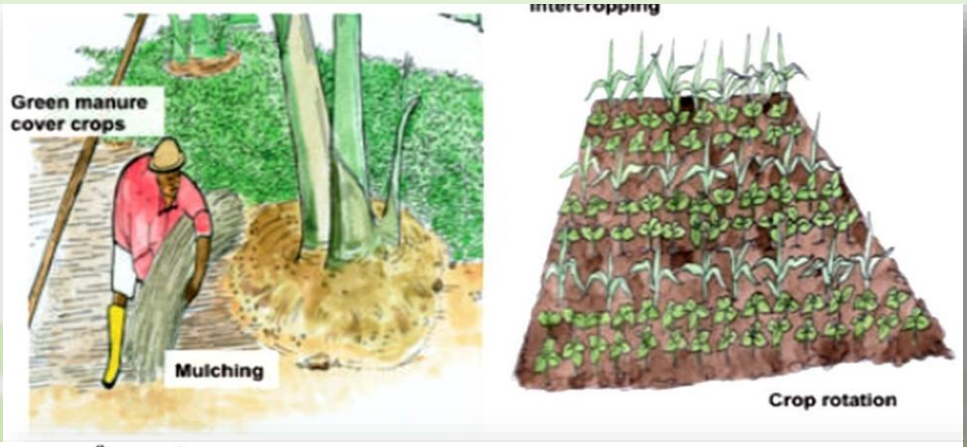
3) **CHILLIPEPPER:** Chillies and capsicum pepper have both repellent and insecticidal effects. To make the chilli extract grind 200 g of chillies into a fine dust, boil it in 4 L water, add another 4 L of water and a few drops of liquid soap. This mixture can be sprayed against aphids, ants, small caterpillars and snails.

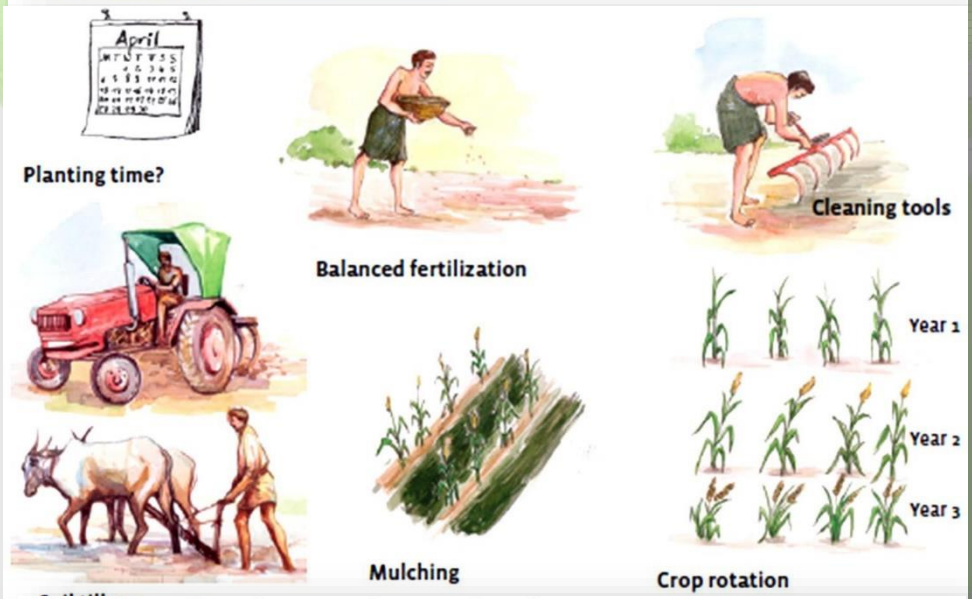
4) **GARLIC:** Garlic has antifeedant (insect stop feeding), insecticidal, nematicidal and repellent properties. Garlic is reportedly effective against a wide range of insects at different stages in their life cycle effect and can kill beneficial insects as well. Therefore, it should be used with caution.

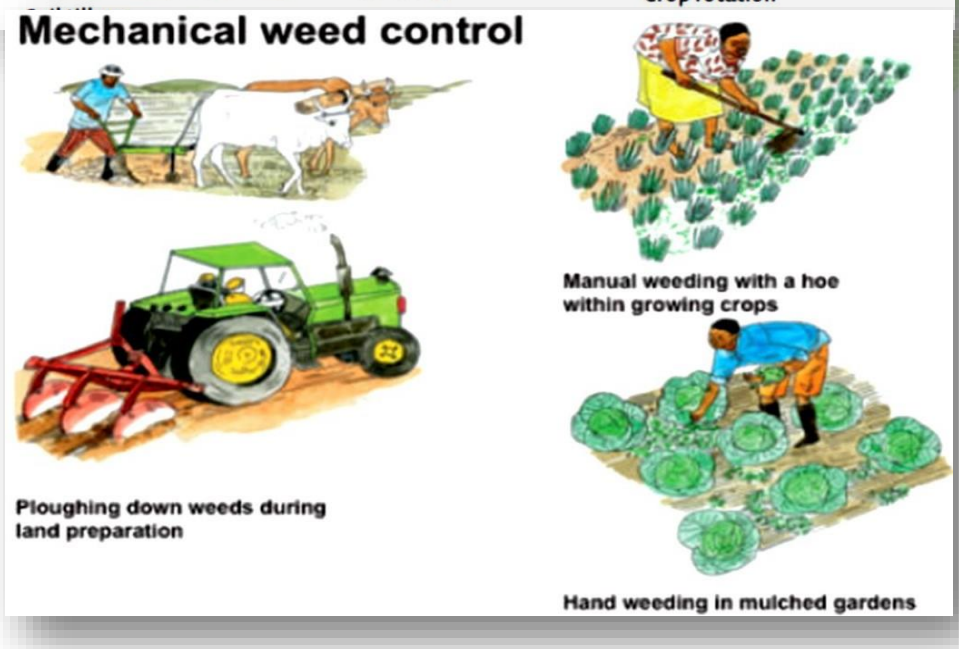
REFERENCES

FiBL. 2011. African Organic Agriculture Training Manual – Pest, Disease and Weeds. Version 1.0 June 2011. Edited by Gilles Weidmann and Lukas Kilcher. Research Institute of Organic Agriculture FiBL, Frick

WEED MANAGEMENT

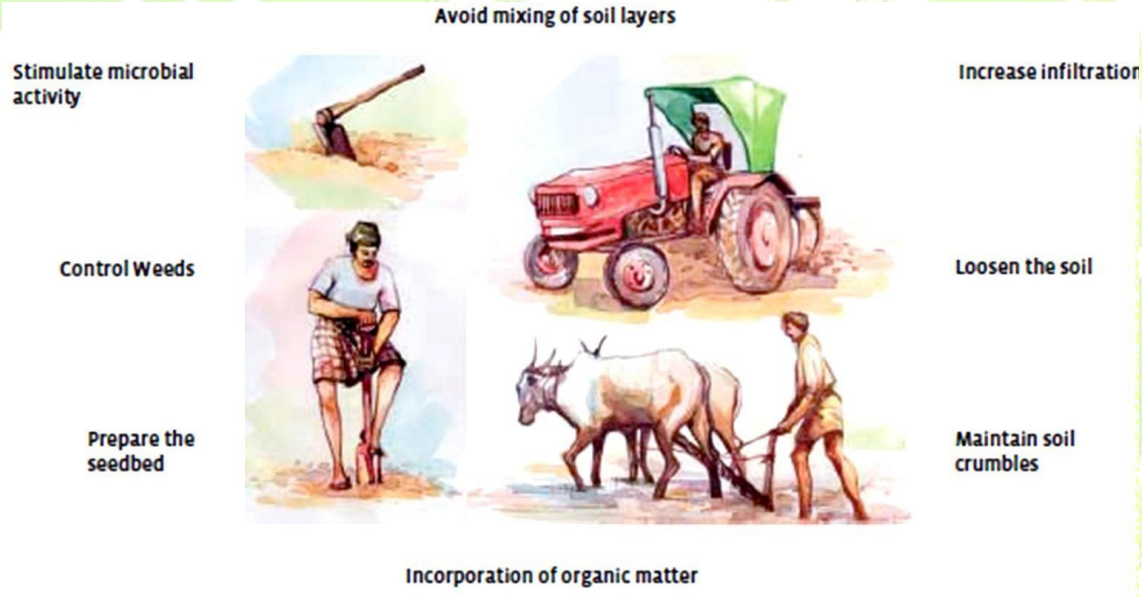
- 

- 

- 

SOIL CULTIVATION & TILLAGE

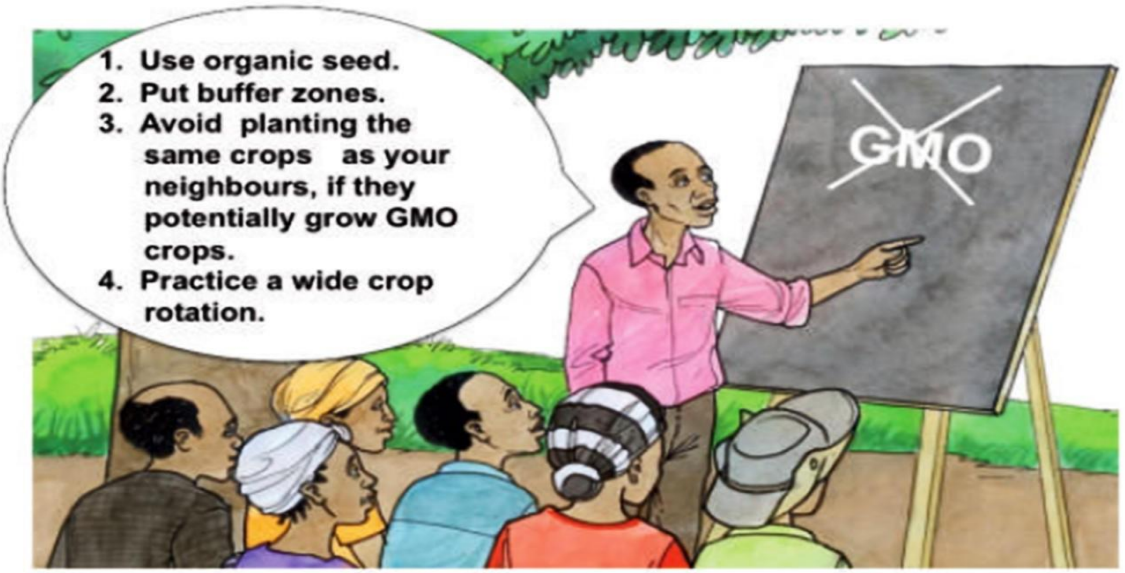
Soil cultivation includes all mechanical measures to loosen, turn or mix the soil, such as ploughing, tilling, digging, hoeing, harrowing etc. Careful soil cultivation can improve the soil‘s capacity to retain water, its aeration, capacity of infiltration, warming up, evaporation etc. But soil cultivation can also harm the soil fertility as it accelerates erosion and the decomposition of humus.



- 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

PLANT PROPAGATION

The choice of high quality organic seed and plant propagation material of suitable varieties is an important key to successful organic farming, allowing for improved yield and product quality, for crop resilience, considerate use of non-renewable resources and for increased genetic and species diversity.



Hot water treatment of own seed to prevent seed-borne diseases such as black rot, black leg, black spot and ring spot of crucifers is very effective. It reduces the seed-borne pathogens such as *Alternaria* spp., *Colletotrichum* spp., *Phoma* spp., *Septoria* spp. and bacterial pathogens *(Pseudomonas* spp. and *Xanthomonas* spp). However, hot water treatments are delicate as seeds can rapidly be destroyed by too hot temperatures.

Therefore, specified temperature and time intervals must be strictly followed in order to maintain seed viability. **Use a good thermometer** or **ask for assistance** from an experienced person or from your local extension officer. To make sure that the seed is not damaged it is advisable to test the germination of 100 heat-treated and 100 untreated seeds. Hot water treatment can also be used for potato tubers (10 minutes in water at 55° C) to control blackleg infection, powdery scab and black scurf, and banana suckers to control nematodes and banana weevils.

Hot water treatment recommendations:

- **Potato tuber, banana suckers: 55°C for 10 minutes**
- **Spinach, Brussels sprouts, cabbage, pepper, tomato, eggplant: 50°C for 30 minutes**
- **Broccoli, cauliflower, carrot, collard, kale, kohlrabi, turnip:50°C for 20 minutes**
- **Mustard, cress, radish:50°C for 15 minutes**
- **Lettuce, celery, celeriac: 47°C for 30 minutes**

Importance of Traditional Varaities

- Traditional seeds are locally available because farmers collect good seeds from their own plots and keep them for the next season.
- Farmers either buy or exchange their seed with other farmers or grow their own seeds. Therefore the cost of seeds is minimal.
- Native seeds are geared to a subsistence economy as the farmers first grow food for his subsistence and/or stock seed for the next season and market only the surplus.
- Native seeds embody indigenous knowledge. A farmer who uses native seeds use his/her traditional knowledge, skills and wisdom to grow them, promoting self-reliance.
- An outstanding feature of native seeds is diversity.
- Native seeds are hardy, as they have, over the years, developed resistance to the pests and diseases.
- Traditional seeds have high level of tolerance to conditions of stress and are adapted to local agro-climatic conditions.

REFERENCES

FAO. 2011. Climate change and food systems resilience in Sub-Saharan Africa. Edited by Lim Li Ching, Sue Edwards and Nadia El-Hage Scialabba, p. 361-377

FiBL. 2011. African Organic Agriculture Training Manual – Pest, Disease and Weeds. Version 1.0 June 2011. Edited by Gilles Weidmann and Lukas Kilcher. Research Institute of Organic Agriculture FiBL, Frick

ANIMAL HUSBANDRY IN ORGANIC AGRICULTURE

Integrating animal husbandry into crop producing farms is one of the principles of organic farming. In temperate and arid zones, animal husbandry plays an important role in the recycling of nutrients, while it is less emphasised in the humid tropics.

→ Produce dung which is of great importance for soil fertility.

→ Yield products such as milk or eggs for sale or own consumption continuously.

→ Recycle by-products such as straw or kitchen waste.

→ Serve as draught animals for tillage or transport.

→ Produce meat, hides, feathers, horns etc.

Breeding Goals

The «ideal» organic poultry breed

- **Feeding on kitchen wastes and farm by-products**
- **Satisfying egg production**
- **Useful as meat**
- **Good health, good resistanc against diseases**

The «ideal» organic cattle breed

- **Utilising roughage and farm by-products**
- **Satisfying milk production**
- **High fertility**
- **Good resistance against diseases**
- **Long life with continuous production**

Organic animal breeding should optimize the overall use of farm animals, with consideration given to the local conditions and available fodder: breeding goals for poultry and cattle breeding.

REFERENCES

IFOAM. 2003. Training Manual for Organic Agriculture in the Tropics. Edited by Frank Eyhorn, Marlene Heeb, Gilles Weidmann, p 190-209, http: //www.ifoam.bio/

INSTITUTES

INTERNATIONAL ORGANIZATIONS-

- **ISO**- International organization for standardization Geneva-1947.
- **WWOOF**- Worldwide Opportunities on Organic frms, England, 1971.
- **ISO**- International Federation of Organic Agriculture movement Germany-1972.
- **FIBL**- Research Institute of Organic agriculture, Switzerland-1973.
- **NOFA-** North east Organic Farming Association, New York – 1982.
- O**FRF**- Organic farming Research Foundation, California- 1990.
- **IOIA**-International Organic Inspectors Association-USA-1991.
- **IOAS**-International Organic Accreditation Service-Germany-1997.

➢NATIONAL ORGANIZATIONS-

- **ISRO-** Indian Space Research Organization, Bangalore- 1969.
- **NPOP**- National Programme for Organic Production, New Delhi- 1985.
- **APEDA**-Agriculture & processed food products Export Development Authority –New Delhi- 1985.

- **CFQCTI**- Central Fertilizer Quality Control & Training Institute , Faridabad- 1985.

NIOF- National Institute of Organic farming, Ghaziabad- 2003.

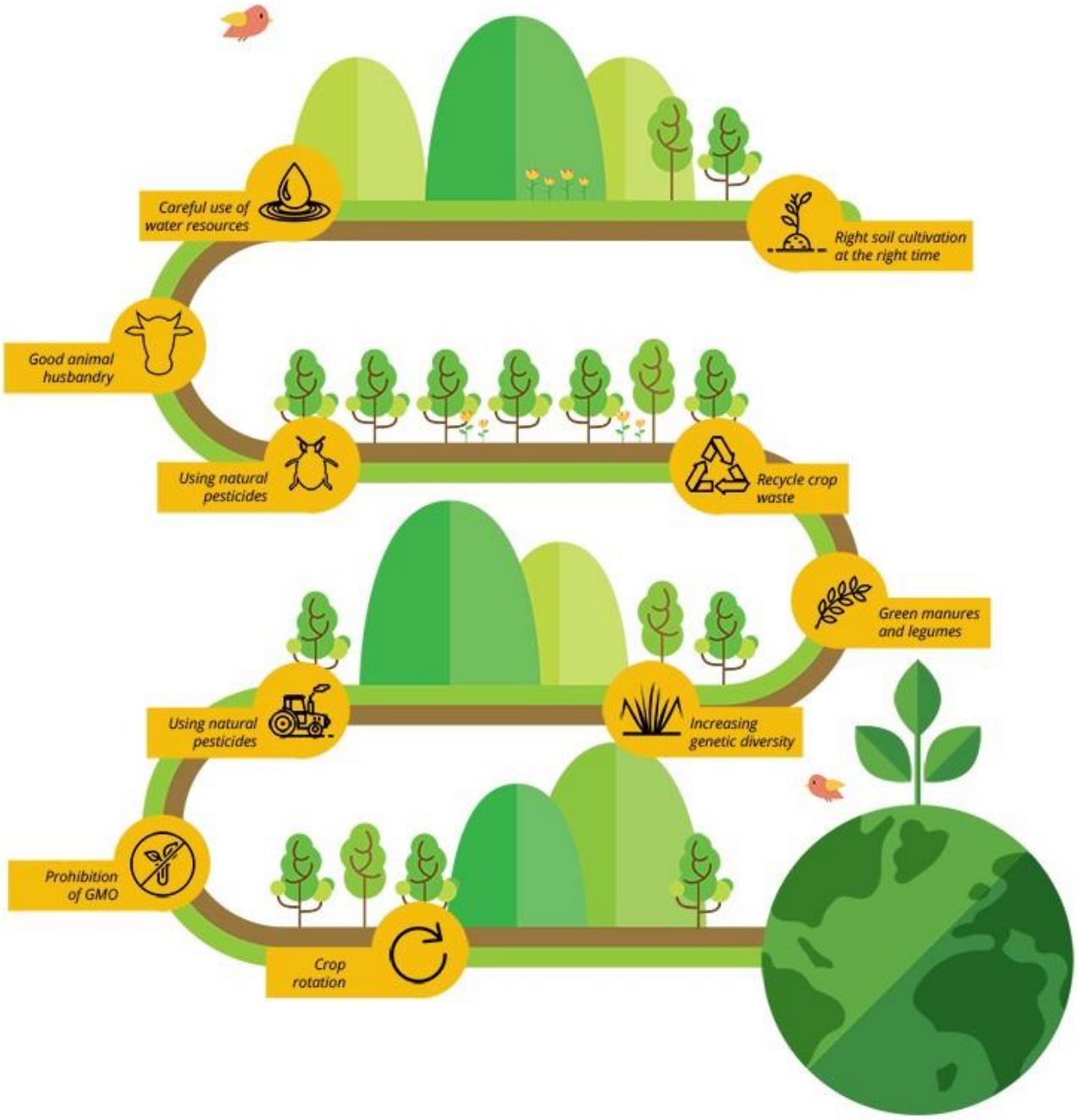
- **OFAI**- Organic farming Association of India, Goa – 2002.
- **NIOF**- National Institute of Organic farming, Ghaziabad- 2003.
- **ICCOA-**International Competence Centre for Organic Agriculture Banglore- 2004.
- **NCOF**- National Center of Organic farming, Ghaziabad- 2004.

NGO's INVOLVED

- **Haritika**- Bundelkhand, Madhya Pradesh focused on water harvesting & management, crop optimization, soil conservation practices etc.
- **Manuvikasa**- Sirsi, Karnataka, focuses on issues of water conservation(atleast four water tanks at every village), education improvement and livelihood development.
- **Rajasthan Bal Kalyan Samiti**- Udaipur, Rajasthan, works on healthy empowered and educated communities . It has assisted more than 8500 families in agriculture & horticulture based livelihood programmes.
- **Navdanya**- New Delhi, promotes bio diversity conservation, bio diversity, organic farming and the process of seed saving etc.
- **SEVA**- Tamil Nadu, works on agriculture & environment.
- **National Agro Foundation-** Tamil Nadu, working for integrated rural development with special focus on farm sector to create a sustainable livelihood model.
- **Myrada**- Karnataka, promoting livelihood activities, management and development of natural resources etc.
- **DHAN Foundation**- Madurai, Tamil Nadu, works on new innovations and upscale novel interventions in combating poverty and creating a fair and equitable society.

ENVIRONMENTAL BENEFITS OF ORGANIC FARMING

Agricultural system that works in harmony with nature



ORGANIC FARMING IN INDIA

NATIONAL PROGRAMME FOR ORGANIC PRODUCTION

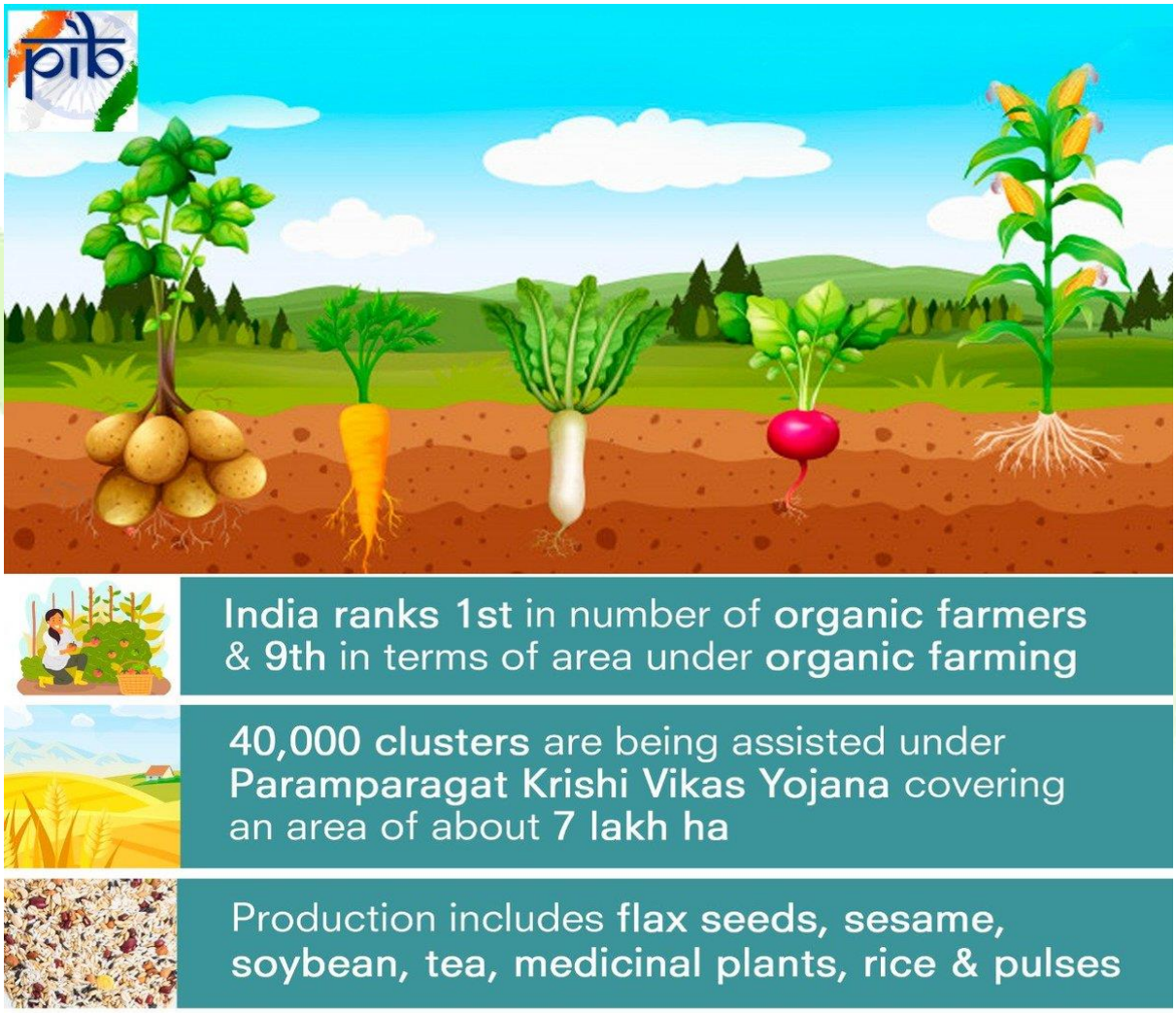
Organic products are grown under a system of agriculture without the use of chemical fertilizers and pesticides with an environmentally and socially responsible approach. This is a method of farming that works at grass root level preserving the reproductive and regenerative capacity of the soil, good plant nutrition, and sound soil management, produces nutritious food rich in vitality which has resistance to diseases.

India is bestowed with lot of potential to produce all varieties of organic products due to its various agro climatic conditions. In several parts of the country, the inherited tradition of organic farming is an added advantage. This holds promise for the organic producers to tap the market which is growing steadily in the domestic and export sector.

As per the available statistics, India's rank 9th in terms of World's Organic Agricultural land and 1st in terms of total number of producers as per 2022 data

The APEDA, Ministry of Commerce & Industries, Government of India is implementing the National Programme for Organic Production (NPOP). The programme involves the accreditation of Certification Bodies, standards for organic production, promotion of organic farming and marketing etc. The NPOP standards for production and accreditation system have been recognized by European Commission and Switzerland for unprocessed plant products as equivalent to their country standards. With these recognitions, Indian organic

products duly certified by the accredited certification bodies of India are accepted by the importing countries. APEDA is also in the process of negotiation with South Korea, Taiwan, Canada, Japan etc.



AREA

As on 31st March 2021 total area under organic certification process (registered under National Programme for Organic Production) is 4339184.93 ha (2020-21). This includes 2657889.33 ha cultivable area and another 1681295.61 ha for wild harvest collection. Among all the states, Madhya Pradesh has covered largest area under organic certification followed by Rajasthan, Maharashtra, Chhattisgarh, Himachal Pradesh, Jammu & Kashmir and Karnataka.

During 2016, Sikkim has achieved a remarkable distinction of converting its entire cultivable land (more than 75000 ha) under organic certification.

PRODUCTION

India produced around 3496800.34 MT (2020-21) of certified organic products which includes all varieties of food products namely Oil Seeds, fibre, Sugar cane, Cereals & Millets, Cotton, Pulses, Aromatic & Medicinal Plants, Tea, Coffee, Fruits, Spices, Dry Fruits, Vegetables, Processed foods etc. The production is not limited to the edible sector but also produces organic cotton fiber, functional food products etc.

Among different states Madhya Pradesh is the largest producer followed by Maharashtra, Karnataka, Rajasthan and Uttar Pradesh. In terms of commodities Oil seeds are the single largest category followed by Sugar crops, Cereals and Millets, Tea & Coffee, Fiber crops, fodder, Pulses, Medicinal/ Herbal and Aromatic plants and Spices & Condiments.

EXPORTS

The total volume of export during 2020-21 was 888179.68 MT. The organic food export realization was around INR 707849.52 Lakhs (1040.95 million USD). Organic products are exported to USA, European Union, Canada, Great Britain, Korea Republic, Israel, Switzerland, Ecuador, Vietnam, Australia etc.

In terms of export value realization Processed foods including soya meal (57%) lead among the products followed by Oilseeds (9%), Cereals and millets (7%), Plantation crop products such as Tea and Coffee (6%), Spices and condiments (5%), Medicinal plants(5%), Dry fruits (3%), Sugar(3%), and others.

SOURCES – *APEDA*

Organic Agriculture Statistics at a Glance in (2020-21)

AREA

Cultivated Area (Organic + In-conversion)	**2657889.33 ha**
Wild Harvest Collection Area	1681295.61 ha
Total Area **(Cultivated + Wild Harvest)**	**4339184.93 ha**

PRODUCTION

Farm Production	**3468991.98 MT**
Wild Harvest Production	27808.36 MT
Total Production	**3496800.34 MT**

OPERATORS

Individual farm producers	***3495***
ICS Groups	*4781*
Total Processors	*1703*
Total Trader	*745*

Wild Operators	*71 (Total collectors 8724)*
Total Operators	*10795 No.*
Total Farmers	1599010

ORGANIC EXPORTS

Total exports quantity	**888179.68 MT**
Total Export Value (INR)	707849.52 Lakhs
Total Export Value (US$)	1040.95 million USD

Total area under organic certification process during last 6 years (cultivated + Wild Harvest) (in ha)

S. No.	State Name	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
1	Madhya Pradesh	2275567.10	2292697.39	1156881.40	918303.08	1161015.03	1637730.46
2	Rajasthan	553447.70	539522.12	442133.72	632701.23	539245.81	481862.38
3	Maharashtra	266299.24	292391.78	304074.81	261571.74	293135.19	371798.28
4	Chhattisgarh	180924.94	179752.14	191464.66	206180.71	208392.80	286684.52
5	Himachal Pradesh	1358449.24	14376.72	170153.47	203847.50	204836.35	203736.47
6	Jammu & Kashmir	54515.01	181608.32	180870.34	187002.89	215275.95	192769.82
7	Karnataka	133647.27	81948.81	105515.02	104962.37	170418.49	174423.56
8	Uttar Pradesh	106292.39	101459.95	192734.40	205980.82	132031.67	159307.73

ORGANIC CERTIFICATION

Though organic certification can be obtained for all types of agricultural produce including processed food and food served in restaurants. Large scale farmers or small size land holder growers groups (minimum of 25 and maximum of 500 farmers having lands in the same geographical area) can apply for Organic certification of their produce. The point to note here is that the land is not certified as organic. Rather the produce from it is certified.

APEDA offers an internet based e-service called Tracenet to collect, record and report data on organic certification and thus facilitating the process of organic certification. It is also used to trace any organic produce all the way to the farm from anywhere in the supply chain.

Organic certification process is carried out by accredited bodies under NPOP.

Process of Organic certification

- Receipt of application by any accredited organic certification body from farmer.
- The certification body provides standards and operational documents to farmer(s).
- There is an agreement of roles and commitments between the farmer(s) and the body.
- Demand of fees by accredited body.
- Document audit.

- Regular Field inspection by internal quality system manager and external inspector and documentation of the same.
- Compliance verification through inspection and audits.
- Preparation of reports by the field inspector.
- Review of report by a reviewing body.
- Decisions on certification.

The field inspection is one of the most important process step in Organic certification in India. Here is a summary of the inspection methods.

- Visit of external inspector to fields and facilities.
- Review of records and accounts.
- Calculation of input and output norms and preparation of production estimate from a farm.
- Assessment of production system
- Interview with responsible person(s).
- Risk assessment from neighboring farms.
- Inspection of use of any GM products.
- Inspection of use of off-farm inputs.
- Analysis of residue tests by certified laboratories for pesticides, heavy metals if required.
- Inspection of sustainable practices.
- Inspection and study of entire production unit.
- Organic certificate for any produce is valid for 3 years only. It must be renewed after expiry of 3 years.

INITIATIVES BY GOVERNMENT

The Government of India provides assistance for promoting organic farming across the country though different schemes.

1. Paramparagat Krishi Vikas Yojana (PKVY)

Paramparagat Krishi Vikas Yojana promotes cluster based organic farming with PGS (Participatory Guarantee System) certification. Cluster formation, training, certification and marketing are supported under the scheme. Assistance of Rs. 50,000 per ha /3 years is provided out of which 62 percent (Rs. 31,000) is given as incentive to a farmer towards organic inputs.

2. Mission Organic Value Chain Development for North Eastern Region (MOVCDNER)

The scheme promotes third party certified organic farming of niche crops of north east region through Farmer Producer Organisations (FPOs) with focus on exports. Farmers are given assistance of Rs 25,000 per hectare for three years for organic inputs including organic manure and bio-fertilisers among other inputs. Support for formation of FPOs, capacity building, post-harvest infrastructure up to Rs 2 crore are also provided in the scheme.

3.Capital Investment Subsidy Scheme (CISS) under Soil Health Management Scheme

Under this scheme, 100 percent assistance is provided to state government, government agencies for setting up of mechanised fruit and vegetable market waste, agro waste compost production unit up to a maximum limit of Rs 190 lakh per unit (3000 Total Per Annum TPA capacity). Similarly, for individuals and private agencies assistance up to 33 percent of cost limit to Rs 63 lakh per unit as capital investment is provided.

4. National Mission on Oilseeds and Oil Palm (NMOOP)

Under the Mission, financial assistance at 50 percent subsidy to the tune of Rs. 300 per hectare is being provided for different components including bio-fertilisers, supply of Rhizobium culture, Phosphate Solubilising Bacteria (PSB), Zinc Solubilising Bacteria (ZSB), Azatobacter, Mycorrhiza and vermi compost.

5. National Food Security Mission (NFSM)

Under NFSM, financial assistance is provided for promotion of bio-fertiliser (Rhizobium/PSB) at 50 percent of the cost limited to Rs 300 per hectare.

As per international resource data from Research Institute of Organic Agriculture (FiBL) and the International Federation of Organic Agriculture Movements (IFOAM) Statistics 2020, India stands at 9th position in terms of certified agricultural land with 1.94 million hectare (2018-19).

BENEFITS

Benefits of organic farming

Better Taste and More Nutrition

Fruits and vegetables that are organically raised have a much better taste than other mechanically farmed ones. This is due to the fact that they are given a much longer time to develop and are not pumped with artificial things. The sugar structures in these crops have more time to mature and develop into a tasty and nutritious product.

Reduces pesticide and chemical residue in soil

Organic farming minimizes the use of pesticides and chemicals thereby reducing the major environmental issues. It ensures the health of soil, water, air and flora and fauna. Also reduces the major environmental issues like soil erosion, air pollution, water pollution etc.

Promotion of Biodiversity

Crop rotation to build soil fertility and raising animals naturally helps promote biodiversity, which promotes greater health across all living species. As organic farms provide safe havens to wildlife, local ecosystems also improve.

Consumes Less Energy

Organic farming does not rely on the use of synthetic fertilizers as opposed to conventional techniquesthat are generous with these external chemicals. Avoiding fertilizers contributes to a greater cause of energy conservation. This is because manufacturing synthetic fertilizers consumes a significant amount of energy. On average, it's safe to say that the energy usage is lower by at least 30-50% in the organic farming systems.

Long-term sustainability

Organic farming is a long-term, sustainable approach to food production. Organic farming takes a proactive, preventative approach instead of dealing with problems after they emerge which can be too

Reduced erosion and better water management

Both soil improvement and the concept of keeping the ground "covered" as much as possible, either by mulches or cover crops, reduces soil erosion. Soils with improved structure and higher content of organic matter and the more compact growth of an organic crop also reduces the water consumption in Agriculture The farming techniques are based on how well a farmer can make the best use of his immediate natural resources .

Conclusion

The phenomenon of 'Organic agriculture' is the only solution to nurture the land and to regenerate the soil by going back to our traditional method of farming i.e., free from chemicals, pesticides and fertilizers.

This is a possible step for sustainable development by choosing not to use chemicals, synthetic materials, pesticides and growth hormones to produce high nutritional quality food and in adequate quantities.Organic farming is an option agricultural system which quickly changes. farming rehearsals. It depends on composts of natural starting points, for example, fertilizer excrement,green excrement, and bone feast and so forth substantially more than deciding not to utilize pesticides,fertilizers.

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Major Problems and Constraints

Lack of Awareness:

The most important constraint felt in the progress of organic farming is the inability of the government policy making level to take a firm decision to promote organic agriculture.

Unless such a clear and unambiguous direction is available in terms of both financial and technical supports, from the Centre to the Panchayat levels, mere regulation making will amount to nothing. Many farmers in the country have only vague ideas about organic farming and its advantages as against the conventional farming methods.

Use of bio-fertilizers and bio pesticides requires awareness and willingness on the part of the farming community. Knowledge about the availability and usefulness of supplementary nutrients to enrich the soil is also vital to increase productivity. Attention on the application of composts/organic manure is also lacking.

The organic matter is spread during the months when the right moisture level is absent on the soil. The whole manure turns into wastes in the process. The required operation is of course labour intensive and costly, but it is necessary to obtain the desired results.

Output Marketing Problems:

It is found that before the beginning of the cultivation of organic crops, their marketability and that too at a premium over the conventional produce has to be assured. Inability to obtain a premium price, at least during the period required to achieve the productivity levels of the conventional crop will be a setback.

Shortage of Bio-mass:

Many experts and well informed farmers are not sure whether all the nutrients with the required quantities can be made available by the organic materials. Even if this problem can be surmounted, they are of the view that the available organic matter is not simply enough to meet the requirements.

Inadequate Supporting Infrastructure:

In spite of the adoption of the NPOP during 2000, the state governments are yet to formulate policies and a credible mechanism to implement them. There are only four agencies for accreditation and their expertise is limited to fruits and vegetables, tea, coffee and spices. The certifying agencies are inadequate.

High Input Costs:

The small and marginal farmers in India have been practicing a sort of organic farming in the form of the traditional farming system. They use local or own farm renewable resources and carry on the agricultural practices in an ecologically friendly environment. However, now the costs of the organic inputs are higher than those of industrially produced chemical fertilizers and pesticides including other inputs used in the conventional farming system.

Marketing Problems of Organic Inputs:

Bio-fertilizers and bio-pesticides are yet to become popular in the country. There is a lack of marketing and distribution network for them because the retailers are not interested to deal in these products, as the demand is low. The erratic supplies and the low level of awareness of the cultivators also add to the problem.

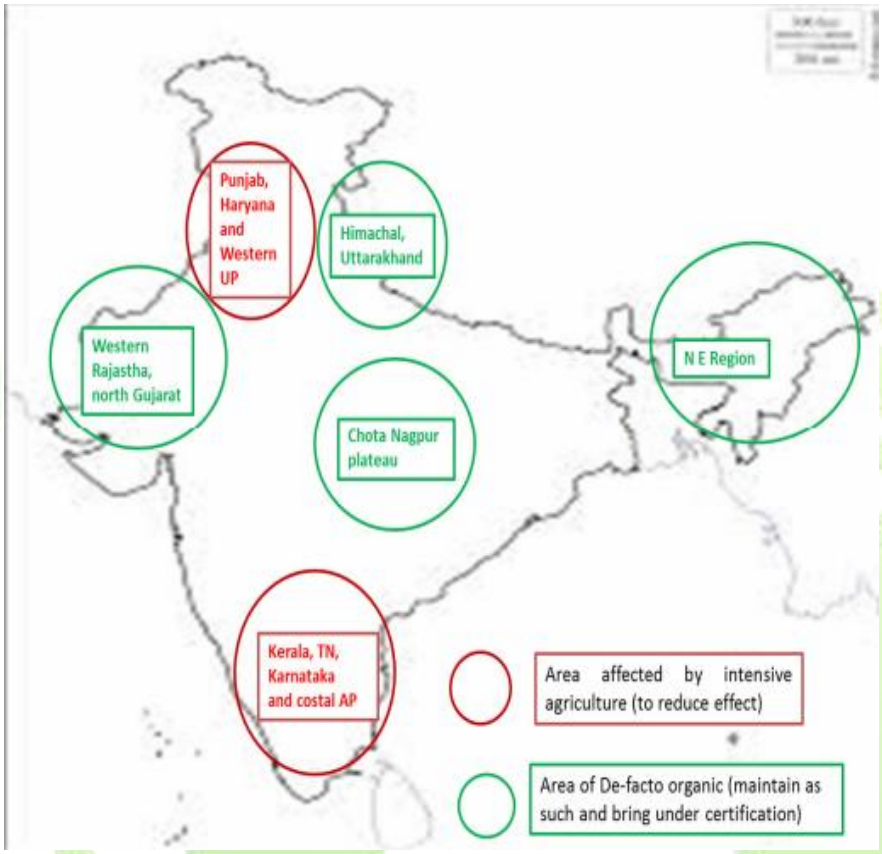
Higher margins of profit for chemical fertilizers and pesticides for retailing, heavy advertisement campaigns by the manufacturers and dealers are other major problems affecting the markets for organic inputs in India.

Low Yields:

In many cases the farmers experience some loss in yields on discarding synthetic inputs on conversion of their farming method from conventional to organic.

Restoration of full biological activity in terms of growth of beneficial insect populations, nitrogen fixation from legumes, pest suppression and fertility problems will take some time and the reduction in the yield rates is the result in the interregnum. It may also be possible that it will take years to make organic production possible on the farm.

FUTURE ASPECTS



Organic farming yields more nutritious and safe food. The popularity of organic food is growing dramatically as consumer seeks the organic foods that are thought to be healthier and safer. Thus, organic food perhaps ensures food safety from farm to plate. The organic farming process is more eco-friendly than conventional farming. Organic farming keeps soil healthy and maintains environment integrity thereby, promoting the health of consumers. Moreover,

the organic produce market is now the fastest growing market all over the world including India.

Organic agriculture promotes the health of consumers of a nation, the ecological health of a nation, and the economic growth of a nation by income generation holistically. India, at present, is the world's largest organic producers (Willer and Lernoud, 2019) and with this vision, we can conclude that encouraging organic farming in India can build a nutritionally, ecologically, and economically healthy nation in near future.

Organic agriculture will prosper in India and will contribute in feeding 1.5 billion people by 2030. According to statistics by Assocham and TechSci, the organic farming market in India will reach around $1.36 billion by 2020 with a growth rate of 25-30% per year. Organic farming is rapidly growing in India and investors agree that challenges do exist in this sector but as soon as awareness and educational training about the benefits and the set-up of organic farming is spread to the farmers, a positive economic outcome will follow.

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