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Module-5

Organically Manage



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Live Fencing

A Living Fence is a fence made of living trees and shrubs. Made from thorny or non-thorny plants, it can also be called a green fence, or hedge. There are many ways of using a barrier to prevent harmful pests from coming onto the land.

- Everyone knows that stone and mud, bricks, barbed wire, bamboo, or even cut branches can be used to make a fence.
- But the most productive form of barrier is the living fence, because as well as being a barrier, it can also produce many other benefits for the home.



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Benefits of the Live Fencing

- Crops are protected against harmful pests
- The living fence can act as a windbreak.
- As well as protecting the land, various products such as fodder, firewood, medicines, timber, nectar, etc. can be taken from the living fence.
- Beneficial animals such as predator insects can also find a place to live in the living fence.
- The living fence saves money.
- It prevents soil erosion.
- It can prevent terraces from collapsing.
- It can be used where materials for fencing are not found, e.g. plentiful rocks, barbed wire, large branches or trees, etc



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Where to make a living fence ?

- According to your location and its climate, landscape, soil, etc. there are many plants that can be used for a living fence.
- Planted on the edges of the land, the living fence protects against harm from the outside, including the wind.
- Within the farm, living fences are useful along edges such as pathways and edges of fields or terraces.
- They can give shade and shelter, as well as other useful farm produce



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Choosing what to plant in the living fence

- Many types of plant can be grown in home-made nurseries and planted in the fence when they are large.
- Many species grow from burying branches in the soil like cuttings.
- The fence can also be planted with suitable seedlings collected from the forest.



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Water Management in Organic Agriculture



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A. How to keep the water in the soil?

- Keep soil moisture
- Reduce evaporation
- Better use of season's rainfall

B. Harvesting Water

1. Increasing infiltration

- Planting Pits
- Contour Bunds and Catchment Strips
- Road Catchments
- Half-Moon Micro Catchments

2. Water storage



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C. Drip Irrigation System

- The major factors that determine the necessity of irrigation are the selection of crops and an appropriate cropping system.
- Some crops are very resistant to drought while others are highly susceptible. Deep rooting crops can extract water from deeper layers of soil and hence they are less sensitive to temporary droughts.
- With the help of irrigation, many crops can nowadays be grown outside their typical agro-climatic region. This may cause not only the above mentioned negative impacts, but also some advantages.

There are irrigation systems of higher or lower efficiency and with more or less negative impact.



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- One promising option are drip irrigation systems. From a central tank, water is distributed through thin perforated pipes directly to the single crop plants.
- There is a continuous but very light flow of water, thus allowing sufficient time to infiltrate in the root zone of the crops.
- In this way, a minimum of water is lost and the soil is not negatively affected.
- The establishment of drip irrigation systems can be quite costly. However, some farmers have developed low cost drip irrigation systems from locally available materials.
- Whatever irrigation system the farmer chooses, he will reach higher efficiency if it is combined with accompanying measures for improving the soil structure and the water retention of the soil, as described above.



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Nutrient management in organic agriculture

- The input and output of plant nutrients must be monitored through a soil testing program, to ensure that nutrient depletion does not take place.
- Improvement in agricultural sustainability requires, alongside effective water and crop management, the optimal use and management of soil fertility and soil physical properties.
- Both rely on soil biological process and soil biodiversity
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The main practices to enhance soil fertility include the use of organic fertilizers such as

A. Compost and vermicompost

1. The heating phase
2. The cooling phase
3. The maturing phase
4. Different systems and methods
 - Continuously fed systems
 - Batch-fed systems
 - Vermi-composting



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B. Green manures

1. Green manures have a number of benefits
2. Factors to consider before growing green manures
3. How to use green manures
 - Sowing the green manure
 - Working the green manure into the soil
 - ✓ Timing
 - ✓ Crushing
 - ✓ Depth of incorporation
 - How to choose the right species



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

D. Microbial fertilizers

- 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.



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E. Mineral fertilizers

- The mineral fertilizers, which are allowed in organic agriculture, are based on ground natural rock.
- However, they may only be used as a supplement to organic manures.
- If they contain easily soluble nutrients, they can disturb soil life and result in unbalanced plant nutrition.



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Weed Management in Organic Agriculture



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A. Preventive Measures

- Choice of crops and varieties
- Mulching
- Living green cover
- Crop rotation
- Intercropping
- Sowing time and density
- Balanced fertilization
- Soil cultivation methods
- Pasturing



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B. Biological Control of Weeds

- The soil-borne fungus *Fusarium oxysporum* (different isolates from Burkina Faso, Mali and Niger) is very effective in reducing the witch weed (*Striga hermonthica* and *S. asiatica*) in different cereal crops, leading to yield increases in scientific trials.
- Other *Fusarium* species found in Sudan and Ghana are very effective, too (*Fusarium nygamai*, *F. oxysporum* and *F. solani*).
- This mycoherbicide is on the way to being formulated and registered in different countries in Africa.



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C. Mechanical Control

- **Manual weeding** is probably the most important one. As it's very labour intensive, reducing weed density as much as possible in the field will bring less work later on and should therefore be aimed at. There are different tools to dig, cut and uprooting the weeds; hand, ox-drawn and tractor-drawn tools.
- **Flame weeding** is another option: Plants are heated briefly to 100°C and higher. This provokes coagulation of the proteins in the leaves and a bursting of their cell walls. Consequently, the weed dries out and dies. Although it is an effective method, it is quite expensive, as it consumes a large amount of fuel gas and needs machinery. It is not effective against root weeds.



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Pest and disease management in organic agriculture



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A. Prevention practices and Monitoring

Knowledge about plant health and pest and disease ecology helps the farmer to choose effective preventive crop protection measures

- 1) Selection of adapted and resistant varieties
- 2) Selection of clean seed and planting material
- 3) Use of suitable cropping systems
- 4) Use of balanced nutrient management
- 5) Input of organic matter
- 6) Application of suitable soil cultivation methods
- 7) Use of good water management
- 8) Conservation and promotion of natural enemies
- 9) Selection of optimum planting time and spacing
- 10) Use of proper sanitation measures



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Monitoring

- a) Typical signs of pest attacks on crop plants
 - Pest damage
 - Mites
 - Nematodes
- b) Typical signs of disease attacks on crop plants
 - Fungi
 - Bacteria
 - Viruses

The most common pattern in pest and disease scouting programs involves walking along a predetermined zigzag or M-shaped route through a field.

- Fruit flies can be captured using bait traps.
- Yellow plastic cards coated with adhesive are also good for trapping aphids and leafhopper.
- Light traps are especially needed where noctuids (e.g. moths, cutworms, African armyworm, and cotton bollworm) are a problem.



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Inducing Plant Resistance

Organic management and control of diseases is based strongly on strengthening the plant with the aim of enhancing its self-defence and thereby preventing the outbreak of the disease.

- Compost extract is a fertilizer, but it also can induce plant resistance.
- Plant extracts can be obtained from stinging nettle, horsetail, comfrey, clover, seaweed and others, alone or mixed with marine by-products such as fish waste or fishmeal. Dilutions of 1:10 or 1:5 are used as foliar spray or soil drench.



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B. Curative Methods

Promoting and Managing Natural Enemies

- Minimize the application of natural pesticides (chemical pesticides anyway are not permitted in organic farming).
- Allow some pests to live in the field which will serve as food for natural enemies.
- Establish a diverse cropping system (e.g. mixed cropping).

There are many possibilities to enhance floral diversity within and the boundaries of crop fields

- Hedges
- Beetle banks
- Flower strips
- Companion plants



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Mechanical Control

Mass-trapping of pests is an additional control measure. They often can easily be built with cheap material.

- Light traps
- Colour and water traps
- Water traps
- Yellow sticky traps
- Fruit bagging



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Biological Control

Preventive release of the natural enemies at the beginning of each season. This is used when the natural enemies could not persist from one cropping season to another due to unfavourable climate or the absence of the pest.

Populations of the natural enemy then establish and grow during the season.

- Bacteria
- Viruses
- Fungi that kill insects
- Fungi that work against plant-pathogens
- Entomopathogenic nematodes



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Natural Pesticides

Some plants contain components that are toxic to insects.

When extracted from the plants and applied on infested crops, these components are called botanical pesticides or botanicals. The use of plant extracts to control pests is not new. Rotenone (*Derris* sp.), nicotine (tobacco), and pyrethrins (*Chrysanthemum* sp.) have been used widely both in small-scale subsistence farming as well as in commercial agriculture.

- Neem
- Pyrethrum
- Chillipepper
- Garlic