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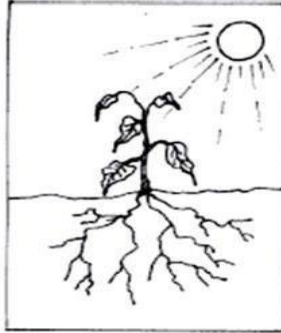
Management: Water, Nutrient, Weed, Pest and Disease



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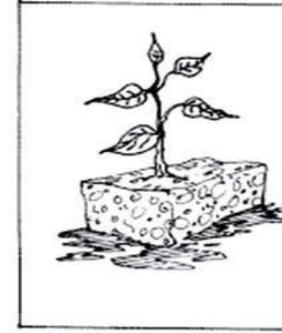
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Approaches for water conservation



Better storage

During dry periods, crops are depending on the moisture supply of the soil. Soil organic matter acts as a storage of water, just like a sponge.

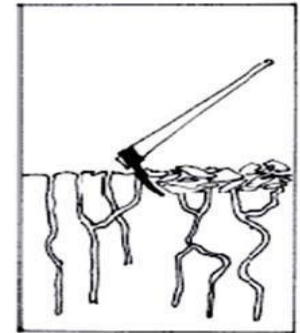


Organic Matter



Mulching

Apply mulch or plant cover crops to reduce evaporation and increase infiltration. Shallow digging of the dry top soil helps to reduce the dry up of the soil layers beneath.



Shallow Digging

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



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Harvesting Water

1. Increasing infiltration

- During strong rains, only a part of the water infiltrates into the soil. A considerable part flows away as surface runoff, thus being lost for the crop. In order to get as much of the available rainwater into the soil, the infiltration of rain water needs to be increased.



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2. Planting Pits

- Planting pits(known as *zai* in Burkina Faso and *tassa* in Niger)are hand dug circular holes which collect water and store it for use by the crop. Each pit is about 20cm across and 20cm deep. After planting, the holes are left partly open so they collect water. Leave the soil covered, and add compost or fertilizer to the pits to increase their fertility.



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3. Contour Bunds and Catchment Strips

Increase 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.

4. Road Catchments

Water from roads—and from other unproductive areas such as paths and home stead compounds—can be channeled on to fields.



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- **Half-Moon Micro Catchments**

Half moon micro catchments are small, semi circular 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 half moons.



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Drip Irrigation System

- The major factors that determine the necessity of irrigation are the selection of crops and an appropriate cropping system.
- 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 now a days be grown out side their typical agro-climatic region.



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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.



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- 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

- 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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Weed Management

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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- **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.

- **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 encouraged. There are different tools to dig, cut and uproot the weeds; hand, ox-drawn and tractor-drawn tools.



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Pest and disease

management Prevention practices and monitoring

- Some important preventive crop protection measures are the following ones:
- Selection of clean seed and planting material:
- Use of suitable cropping systems
- Use of balanced nutrient management:
E.g. Balanced potassium supply contributes to the prevention of fungi and bacterial infections
- Input of organic matter



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Natural pesticides

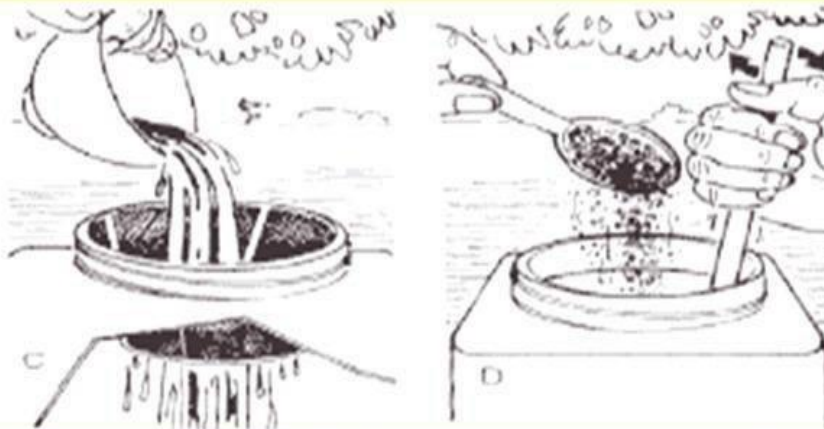
- **Neem**



**A. Handful of seeds to a coarse powder or bruise 1 kg of leaves.
To make a concentrate**



**B. Infuse them 15 minutes in
hot water or overnight in
cold water.**



**C. Working under shade filter the concentrate into a half
filled tank. Stir in a little soap powder and top up the tank
with clean cold water.**



**D. Spray the crop in the late
afternoon because neem
breakdown in the sun light.**



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- **Pyrethrum:** 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. Low doses do not kill but have a “knock down” effect. Stronger doses kill.
- **Chilli pepper:** To make the chilli extract grind 200g of chillies into a fine dust, boil it in 4L water, add another 4L of water and a few drops of liquid soap. This mixture can be sprayed against aphids, ants, small caterpillars and snails.



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- **Garlic:** Garlic is non-selective, has a broad-spectrum effect and can kill beneficial insects as well. Therefore, it should be used with caution.
- **Recommendations to farmers on preparation of garlic pesticides:** To make the garlic extract, grind or chop 100g garlic into, 5L of water. Allow mixture to stand for 24 hours, add, 5L of water and stir in liquid soap. Dilute at 1:20 with water and spray in the evening. To improve efficacy, chilli extract can be added.