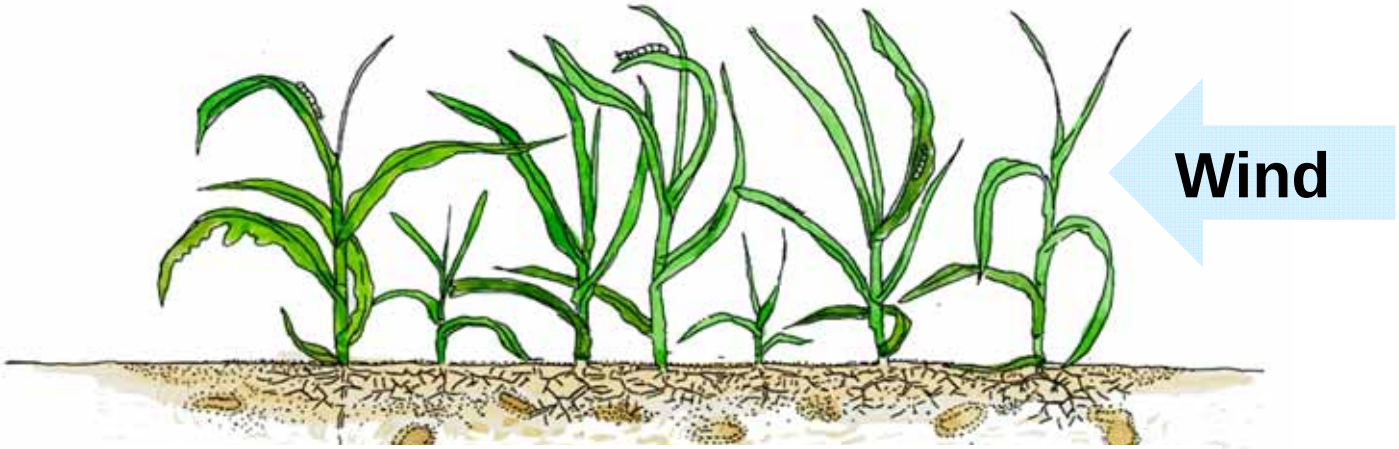
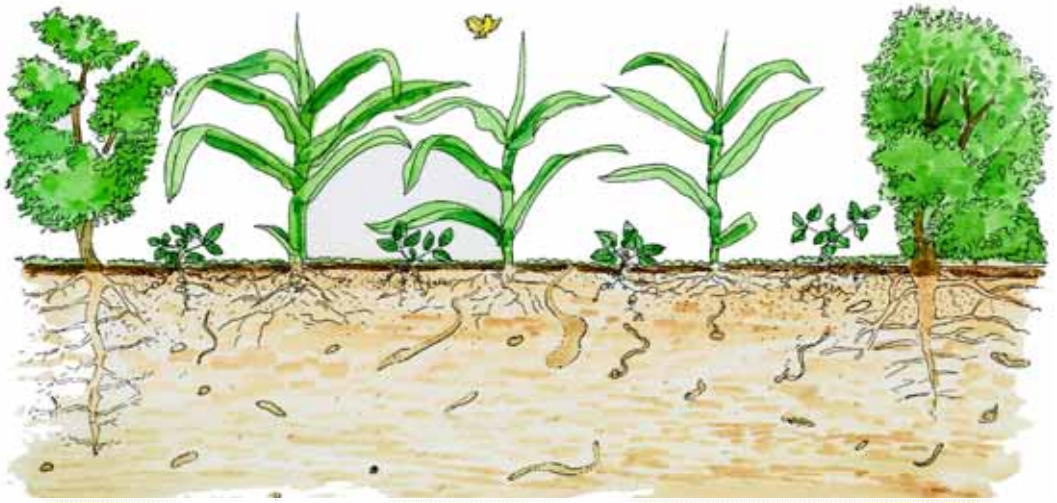
Environmental influences on plant health

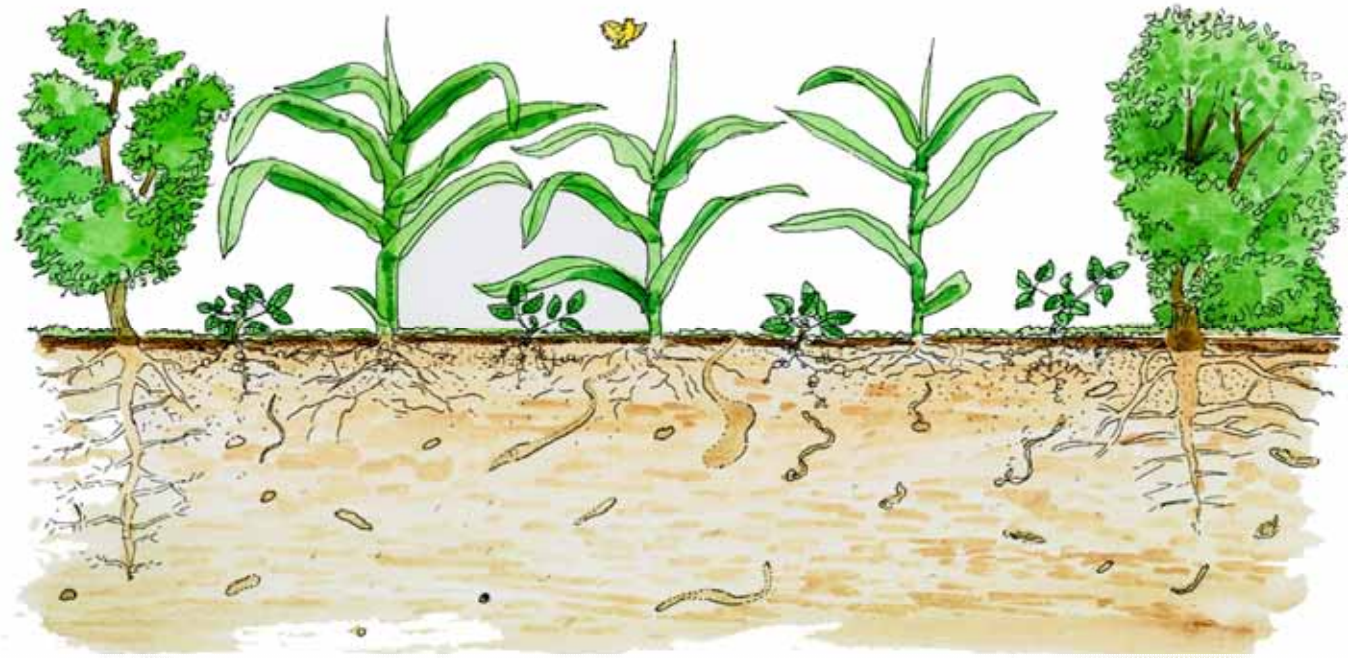


Poor crop on poor soil in an exposed environment



Healthy crop on fertile deep soil in a natural environment

A healthy soil is the basis for healthy plants



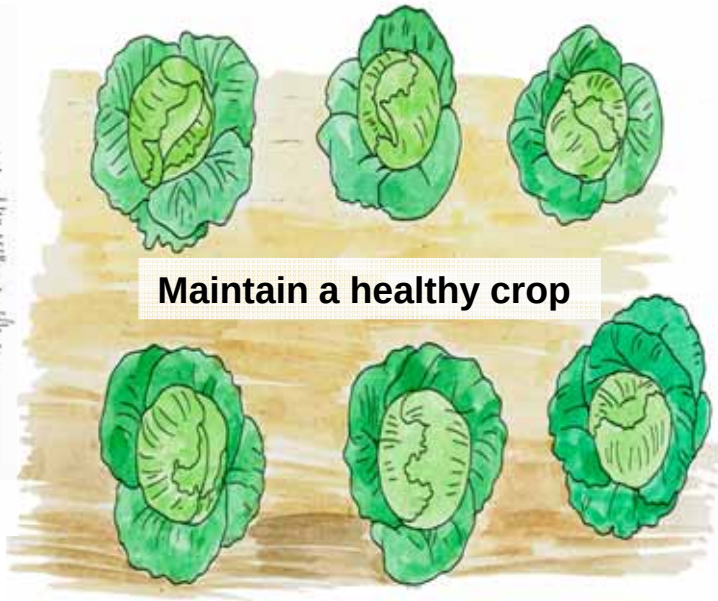
Wind

A healthy soil:

- Is rich in humus
- Is rich in microorganisms, flora and fauna
- Has a stable structure
- Allows water penetration through micro- and macro-pores
- Is resistant against soil erosion
- Harbours no pests, diseases or weeds

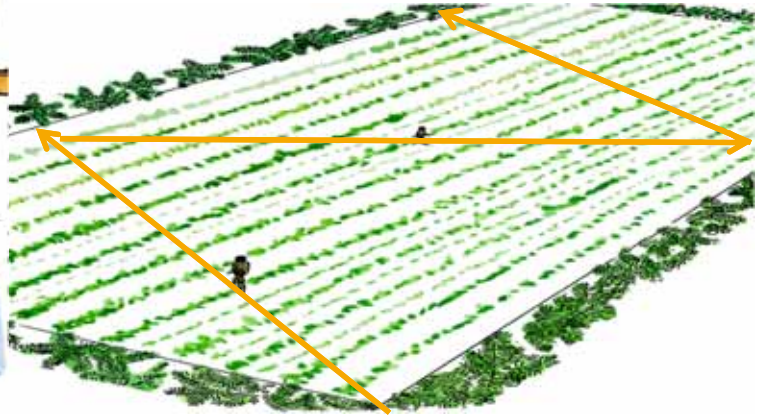
Basics of organic pest and disease management

Maintain a healthy soil



Use of natural pesticides

Use suitable varieties



Monitor the crop regularly

Promote natural predators

Comparison of human and plant health

3. Direct treatment: medicines

2. Natural remedies: homeopathy, vitamins, food supplements

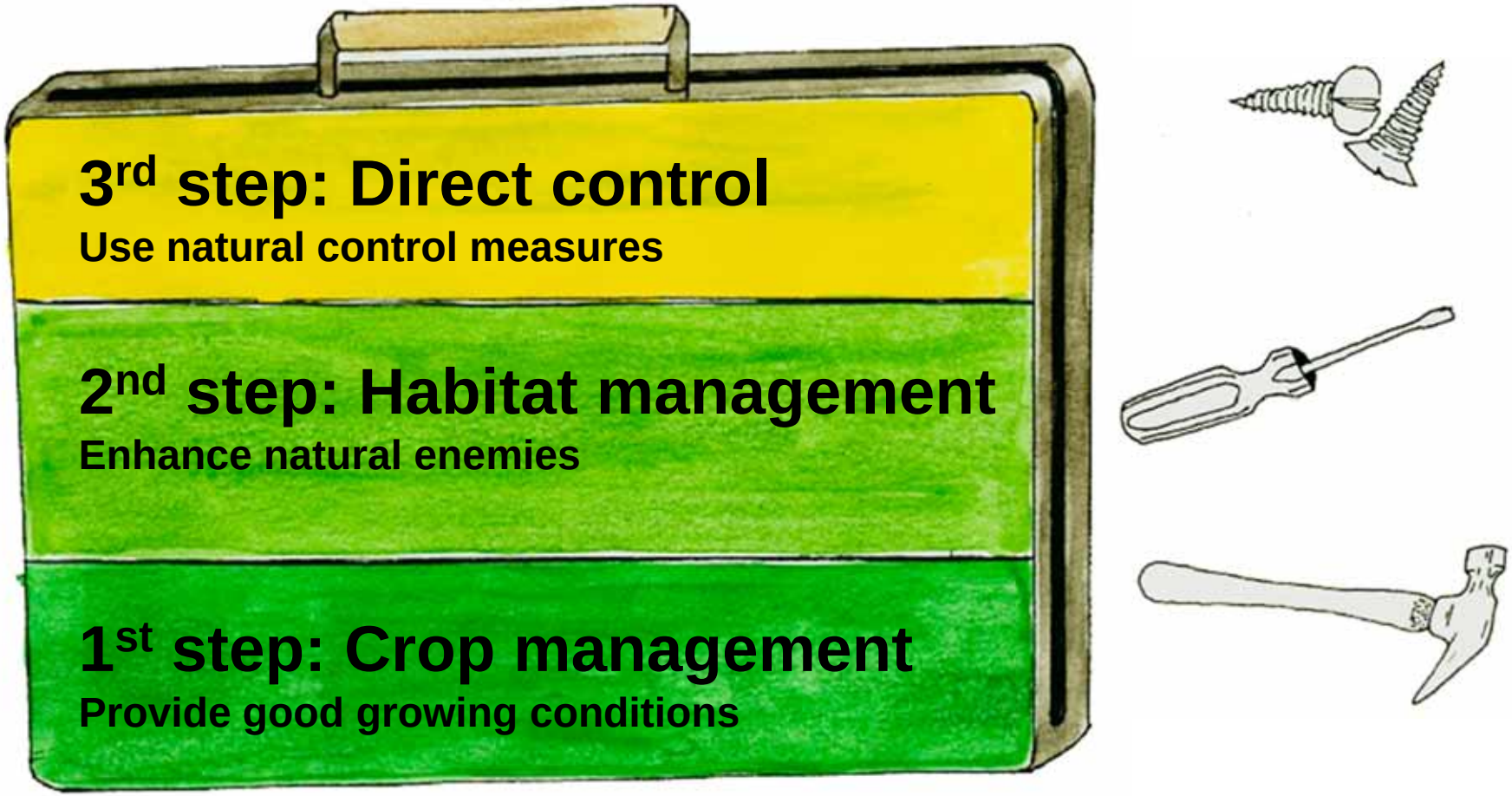
1. Healthy living: good food, water, exercise, hygiene, accomodation

3. Direct control: biological control, biopesticides

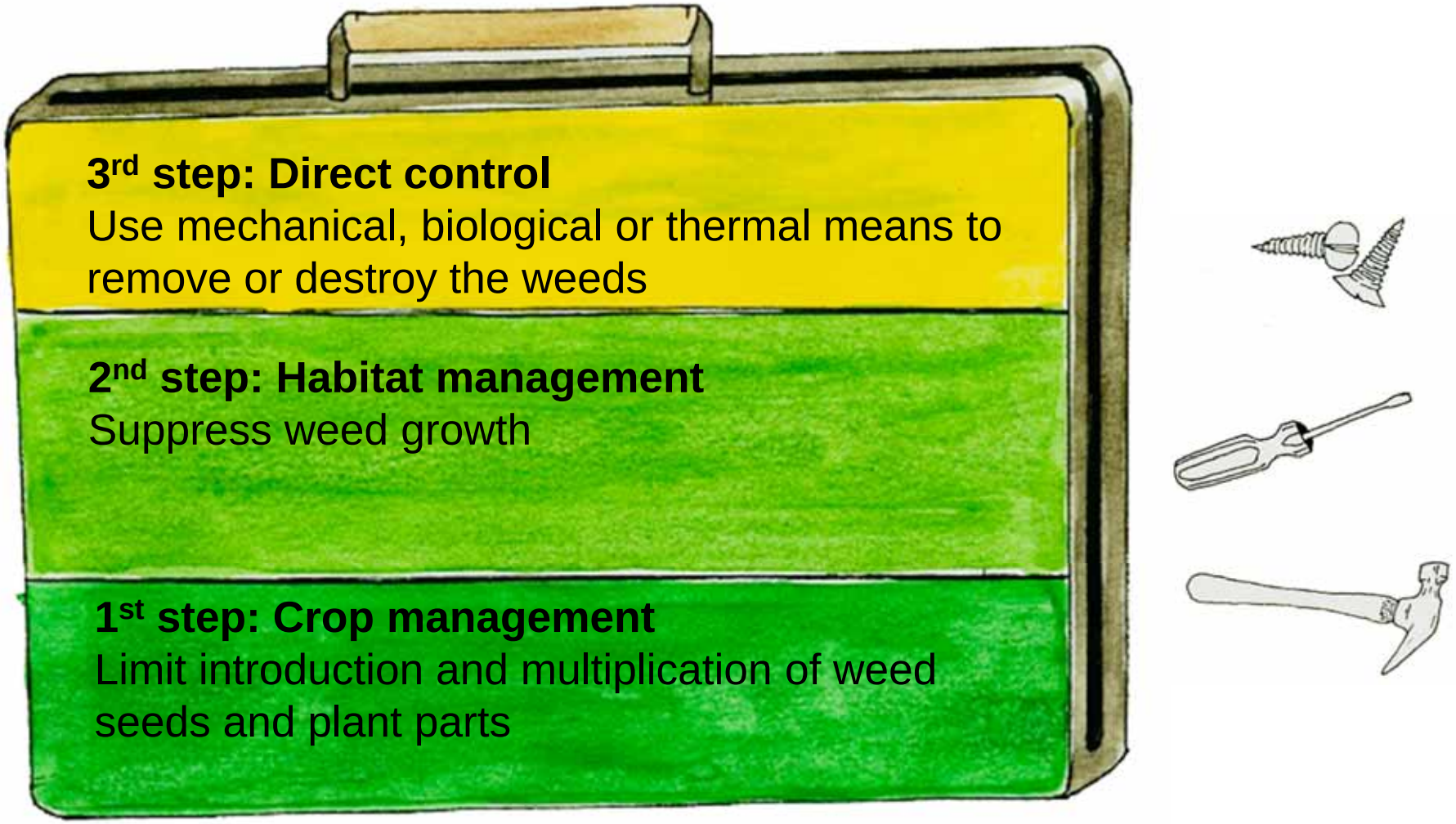
2. Natural enemies: conservation biocontrol, intercropping, quarantine

1. Good growing conditions: strong varieties, timely planting, soil fertility management

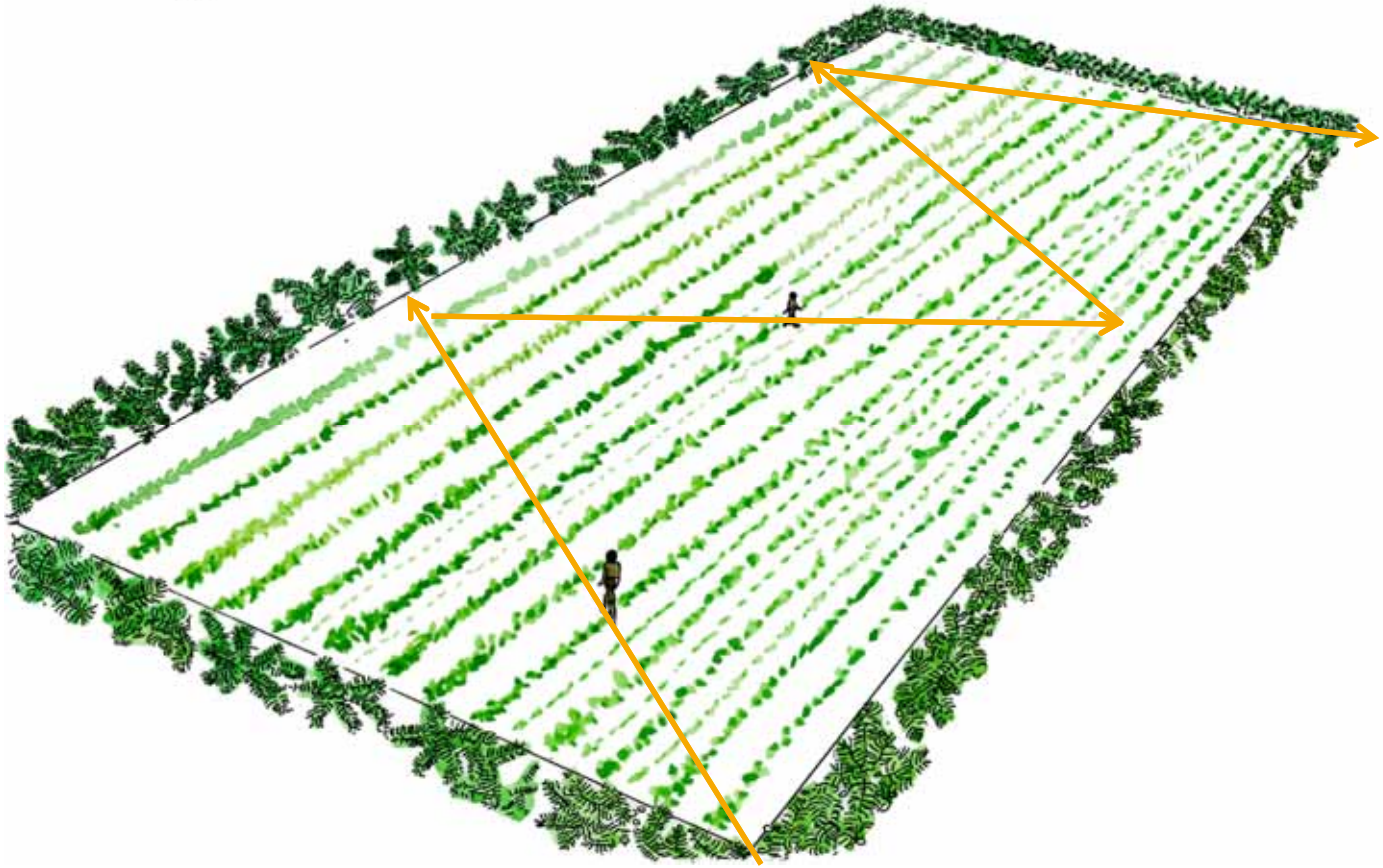
Pest and disease management toolbox



Weed management toolbox



Scouting patterns; Zigzag/M-shaped route through the field



Ensure careful and continuous monitoring of pest and disease levels during critical times of crop growth

Traps to monitor insect pests

Blue/yellow sticky traps -> pest insects

Homemade trap -> fruit flies

Pheromone trap -> pest insects

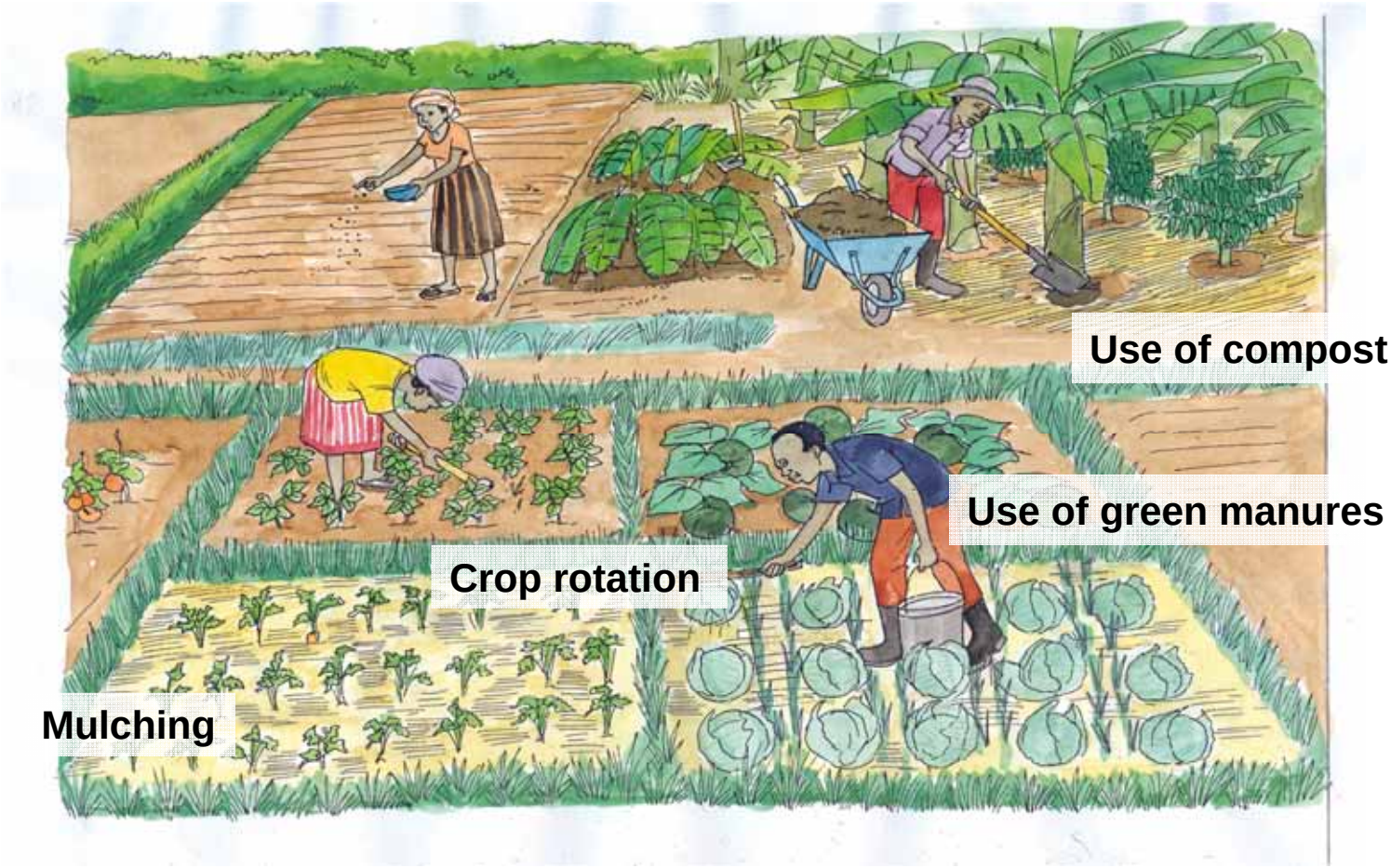
Light trap -> noctuids

Resistant varieties and timely planting

Look for varieties which are strong and resistant against common pests and diseases

Plant at the beginning of the rainy season so that plants grow quickly and strong before pests and diseases increase and attack

Soil fertility management



Field hygiene and sanitation

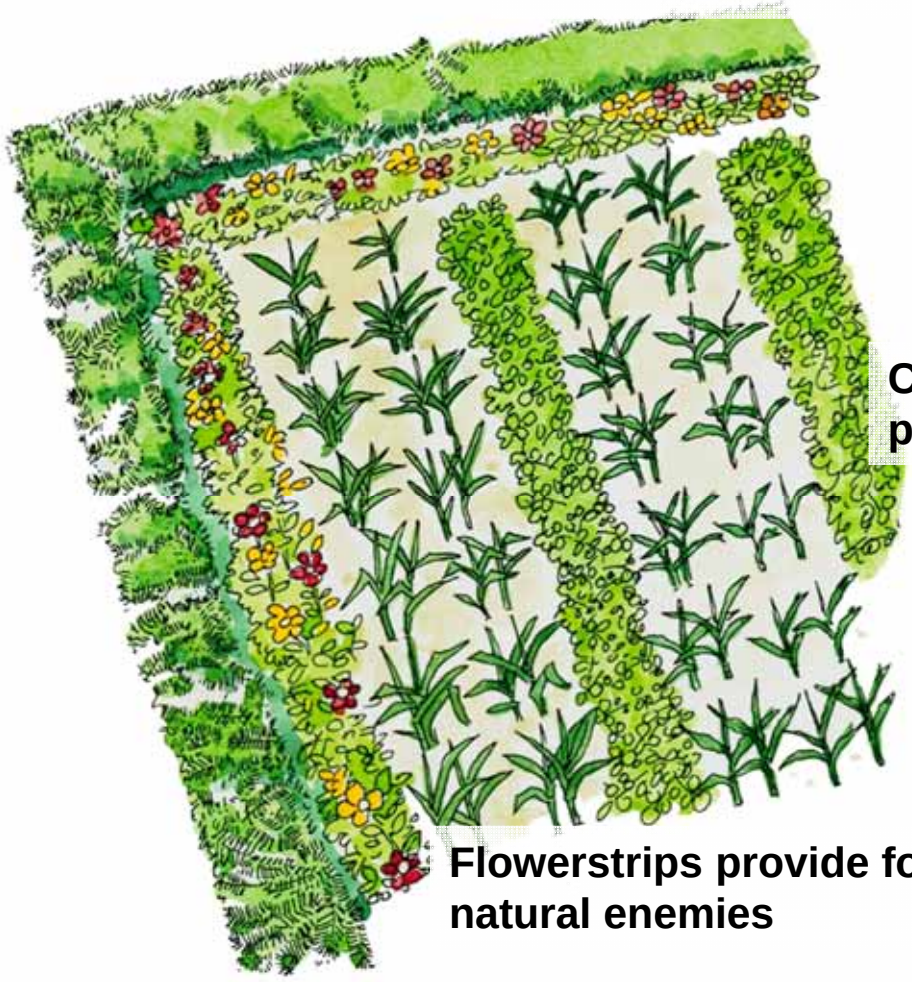
Remove all infected plants or plant parts to minimise spread of the infections

Clean all tools that come into contact with infected plants with alcohol or by heating over fire

Burn all diseased plant parts

Conservation biocontrol

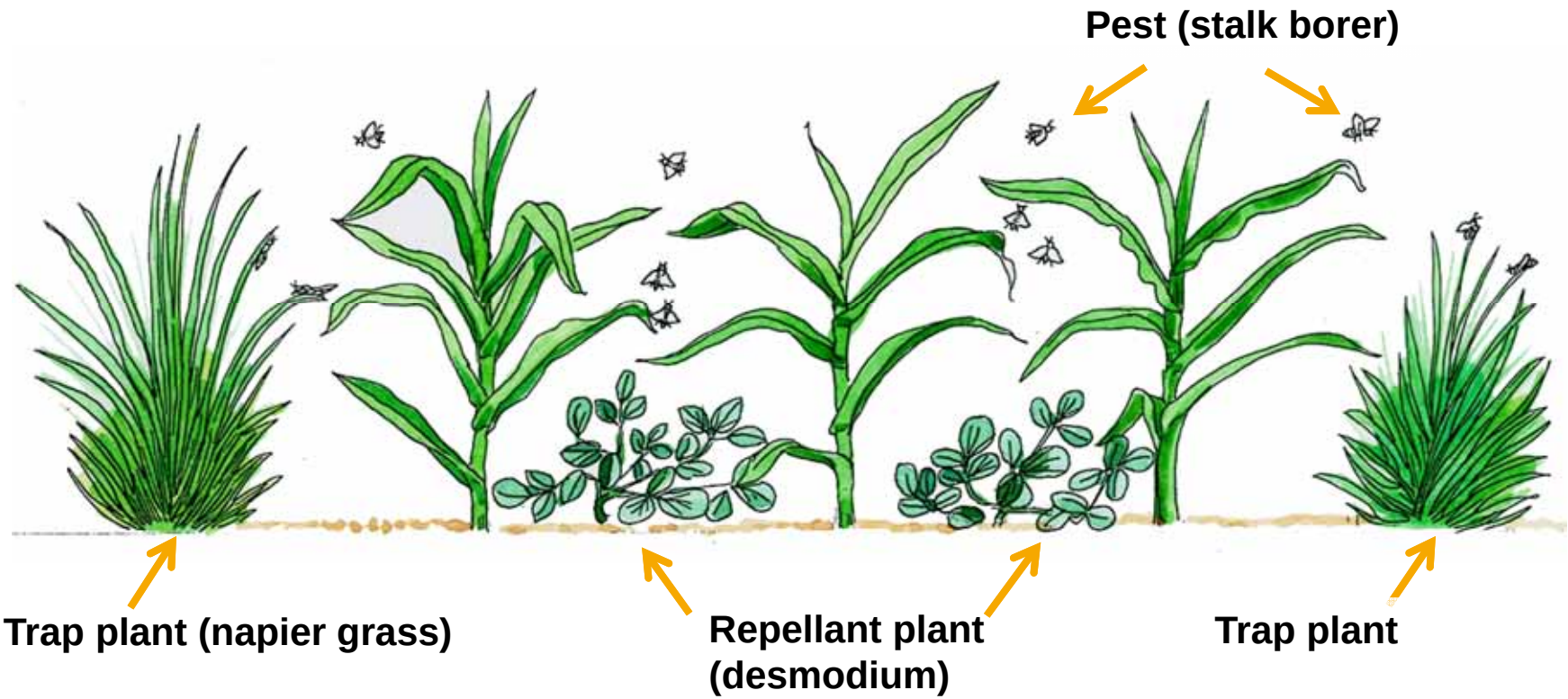
Natural hedges of indegenous shrubs attract natural enemies



Companion plants attract and provide alternative food for pests

Flowerstrips provide food for natural enemies

Trap cropping (*push-pull* strategy) in maize



The trap crop is more attractive to the pest either alternative food source or egg laying site than the main crop

Repellant crop produces an odour that 'pushes' away pests

Biofumigation

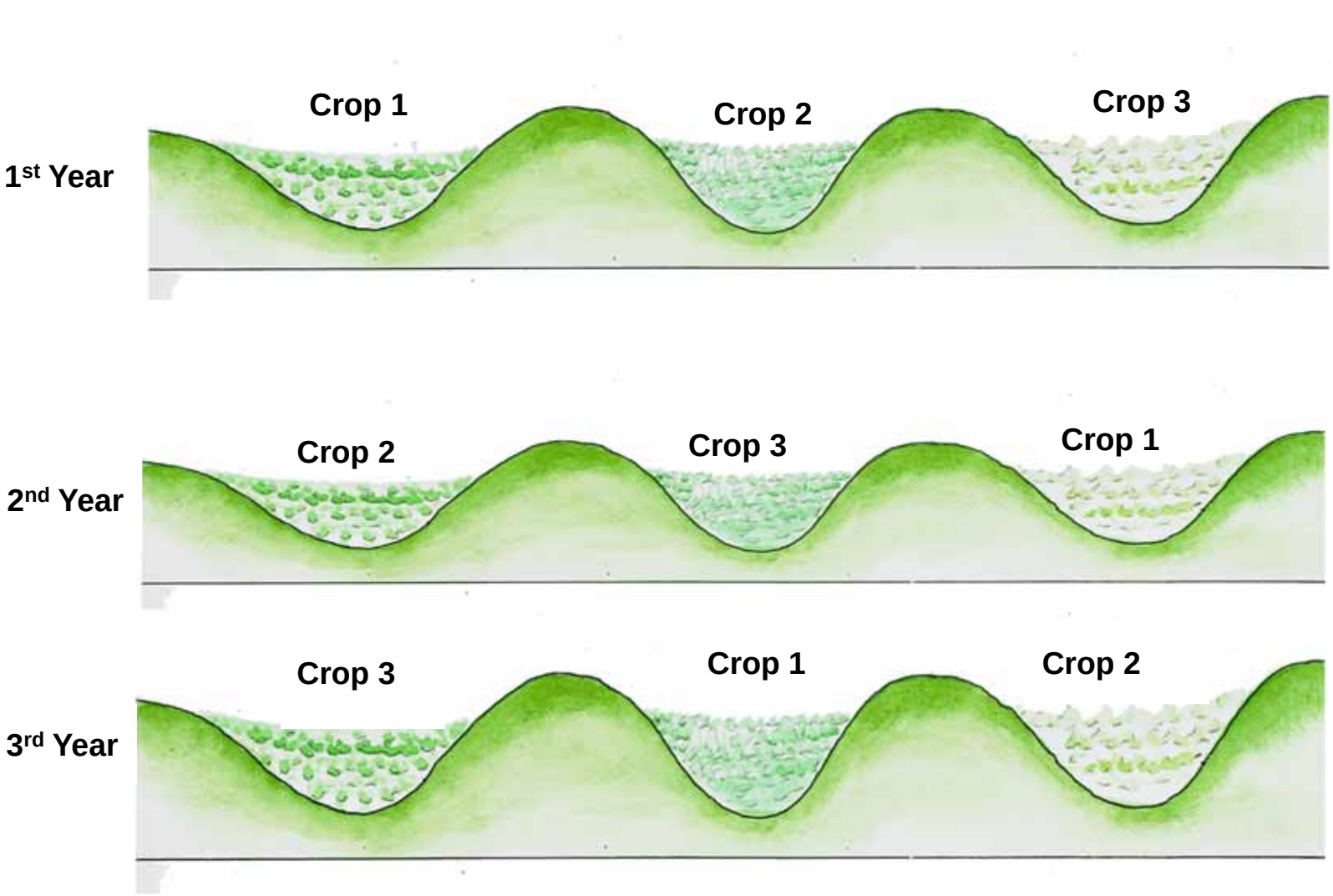
Prepare the seedbed

Sow indian mustard seeds (brassica family)

Flowering indian mustard

Incorporation of plant material into the soil. Sow new crop only after two weeks

Regional rotation of crops



Extracts of African plants known to have insecticidal properties

- **Neem** (*Azadirachta indica*): against many insect pests and as neem cake against nematodes
- **Pyrethrum** (*Chrysanthemum cinerarifolium*): against most insects and mites
- **Fish bean** (*Tephrosia vogelii*): against caterpillars, mites
- **Chili** (*Capsicum frutescens*): against many insect pests
- **Tobacco** (*Nicotiana spp.*): against all insects and mites (very toxic for humans)
- **Mexican and African marigold** (*Tagetes spp.*): repellent effects against insect pests, effects agains nematodes
- **Garlic** (*Allium sativum*): anti-feedant for insect pests
- **Wild basil** (*Ocimum suave*): repellent effect on insects

Elephant fence and chilli-dung bombs as repellents against mammal pests

Chilli-dung bombs (mix dung with chilli)

Animal dung

+

Crushed chilli

Use brick mold to form solid dung

Chilli-dung bombs

Burn dried bricks at nightfall

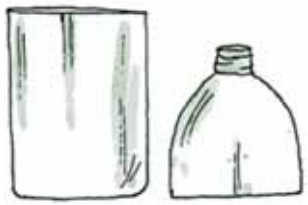
Elephant fence

Cloth soaked in petrol and chilli powder

Upper wire at 2.5 metres

Making the fruit fly trap

1. Cut a PET bottle



2. Remove the cap

3. Insert and glue the reversed upper part of the bottle into the bottom part

4. As a bait, use half a cup of vinegar, mix with water and add 4-6 drops liquid soap

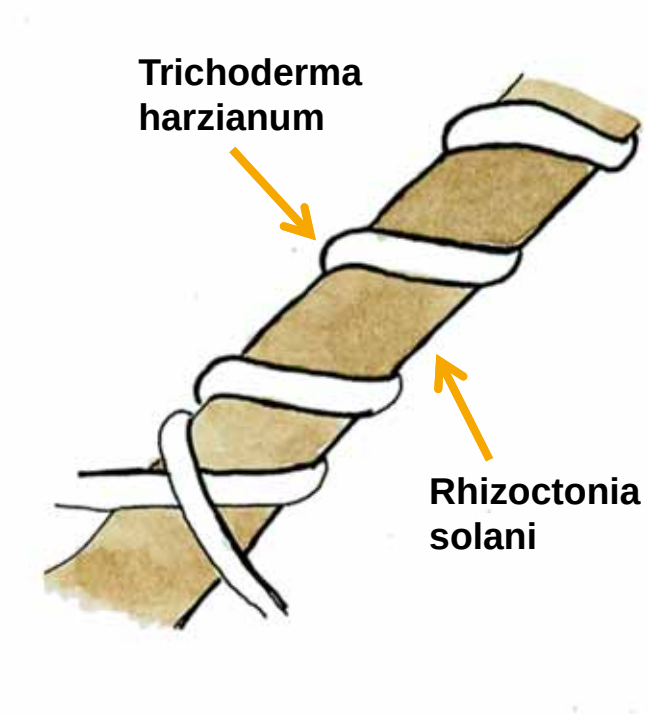
5. Hang the bottle in a tree where most fruit flies have been seen

Fruit bagging

Mango fruits in paper bags

Banana bunch in polythene bags

Biocontrol of plant diseases by no-pathogenic fungi



Biocontrol by *Trichoderma harzianum*

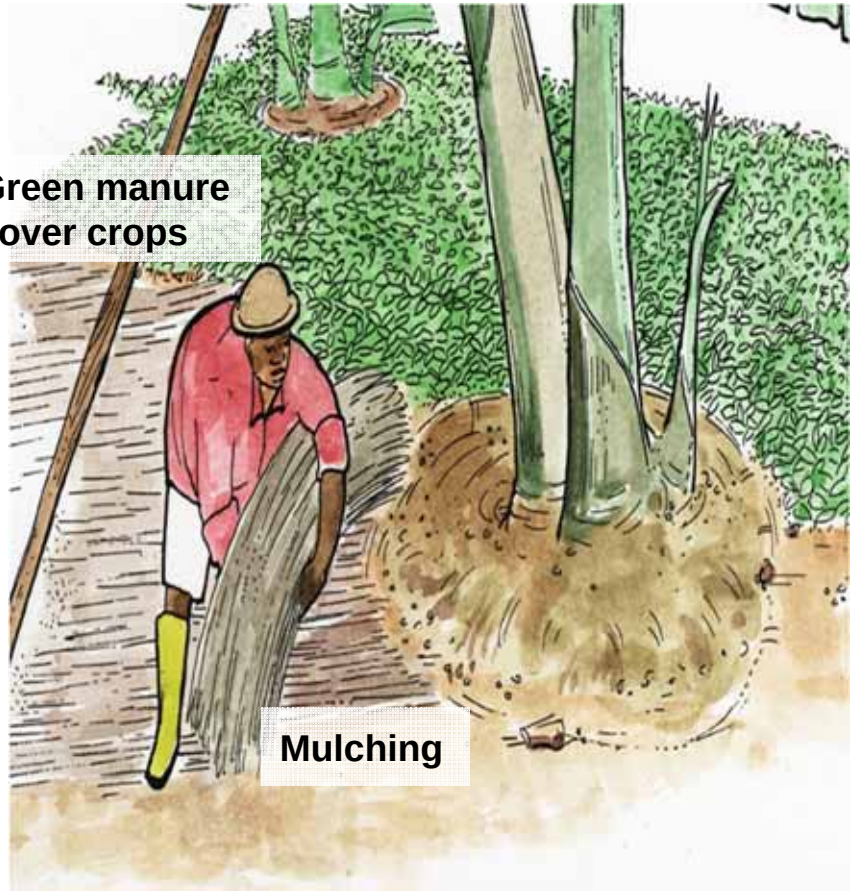
- **The fungi species *Trichoderma harzianum* is known to parasite important plant diseases like damping off (*Rhizoctonia solani*)**
- **Trichoderma species can affect plant diseases by antibiosis and competition**
- **In addition, Trichoderma works as a growth stimulant and improves yields and product quality**
- **Some products are available in African countries**

Hot water treatment of seeds

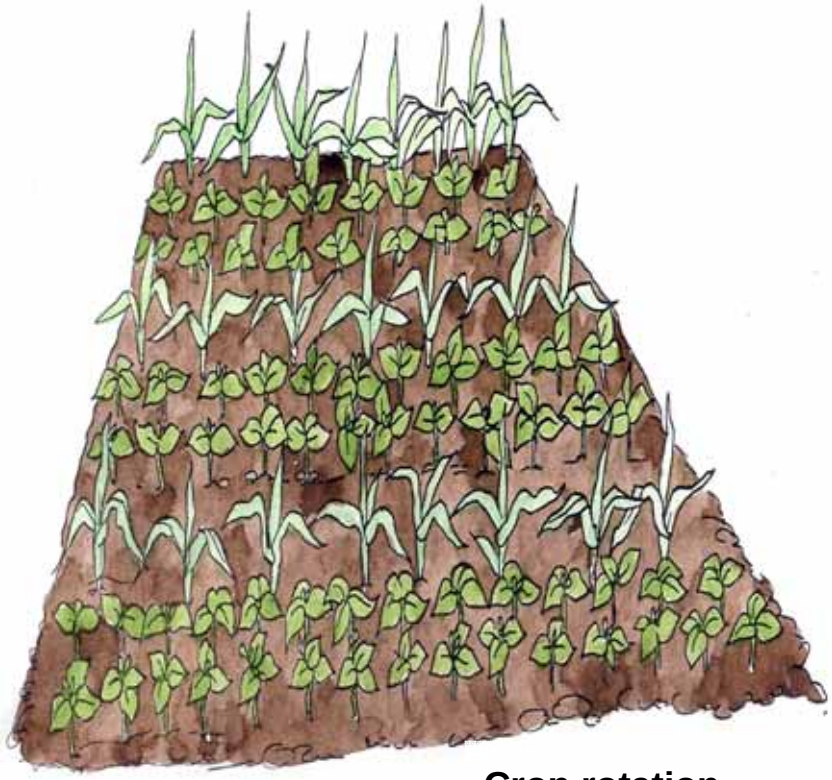
Hot water treatment recommendations:

- **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**

Cultural practices in weed management

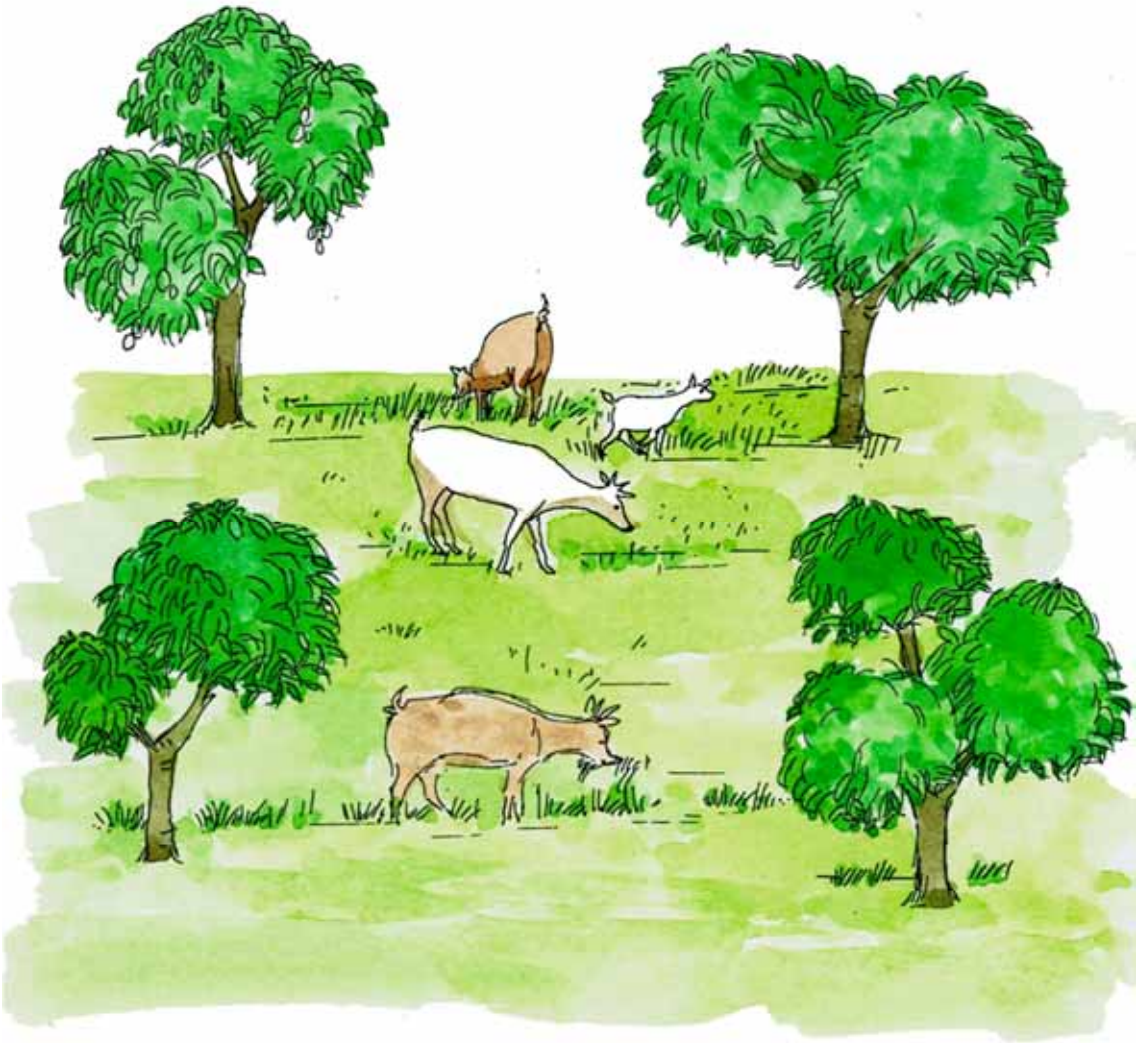


Intercropping



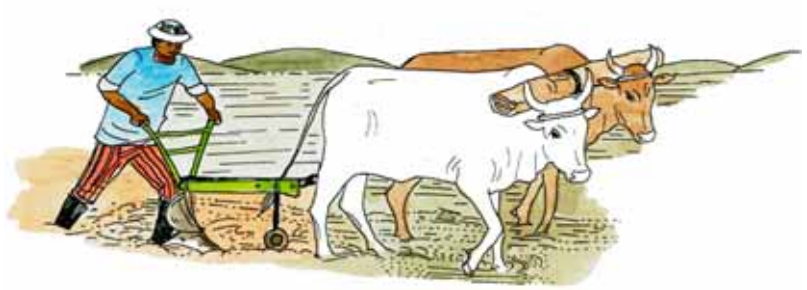
Crop rotation

Pasturing in tree crops



Rotate between goats, sheep and cattle to avoid selective grazing

Mechanical weed control



Ploughing down weeds during land preparation

Manual weeding with a hoe within growing crops

Hand weeding in mulched gardens

Preventive measures against storage pests and diseases

1. Timely harvesting and drying

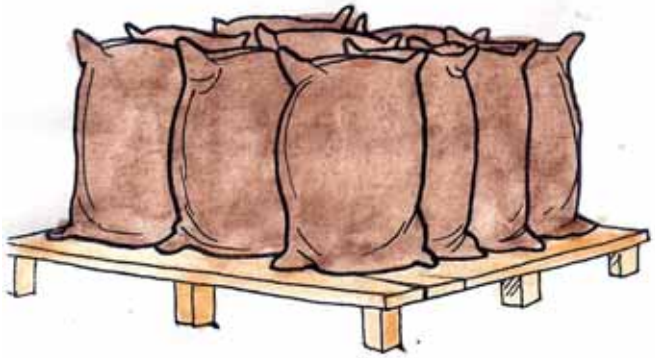
Harvest during dry weather

2. Proper threshing

3. Cleaning to remove the trash

4. Sorting to remove damaged beans

5. Proper packing and storage off the ground



Considerations for proper storage