POSTER SERIES

USER GUIDE

Four poster series covering the following topics:

Mixed alley cropping

Making biochar

Water harvesting pits and trenches

Fencing

KCOA
Knowledge Centre for Organic Agriculture and Agroecology in Africa

KHSA
Knowledge Hub for Organic Agriculture and Agroecology in Southern Africa

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INTRODUCTION

Welcome to this guide on how to use the exciting series of posters developed by the Namibia Nature Foundation through its partnership with the Knowledge Hub for Organic Agriculture and Agroecology in Southern Africa (KHSA).

KHSA is part of the Knowledge Centre for Organic Agriculture in Africa (KCOA), a collaborative country-led partnership funded by the German Federal Ministry of Economic Cooperation and Development (BMZ) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and non-governmental organisations across Africa. The KCOA aims to scale up the adoption of agroecological and organic farming practices through five knowledge hubs in Africa. The other hubs are implemented by GIZ with in-country partners in North, West, East and Central Africa.

The Namibia Nature Foundation is an in-country partner of KHSA working on a Multiplier Support Programme (MSP) with 30 lead farmers and trainer in Namibia's Zambezi region. The MSP has adopted a community-based agricultural extension model to cost effectively increase the amount and quality of the organic/agroecological extension support available to small-scale farmers. The programme encompasses production training, mentorship and personal capacity building, among other topics.

PURPOSE OF POSTER SERIES

The need for this series of posters was identified during the MSP. During trainings, mentoring and discussions with the participants, the potential of the topics of rainwater harvesting, biochar making, fencing and enhanced resilience of rainfed cropping to improve agroecological production in the region became clear. No relevant and contextual knowledge products on these topics existed. The Namibia Nature Foundation has thus developed this series as learning aids for those working with and supporting small-scale farmers in the region. The illustrative format was chosen to bypass literacy issues and the back of each poster provides guidance to the trainer or extension officer on how to use the posters, and key messages that need to be conveyed. The posters should be used alongside practical demonstrations to share and reinforce these practices with small-scale farmers. There are four poster series, each providing detailed information about the topic and acting as a guide to implementing these agricultural practices. The intent is to promote the uptake of practices that will help households be more waterwise, resilient to climate change and food secure.

- **Mixed alley cropping – 8 posters**
- **Making biochar – 4 posters**
- **Water harvesting in pits and trenches – 4 posters**
- **Fencing – 7 posters.**

HOW TO USE THE AGROECOLOGY POSTER SERIES

- **Trialling practices:** If you have not tried out the practices yourself, trial them before conducting training with a group of farmers. It will enhance the training significantly if you can talk about your own experience!
- **Choose the order:** Posters of one series do not have a specific order, but can be used in the order most suited to the context and the situation on the ground. The following order of topics is commonly used:

a. Mixed alley cropping

i. Clearing crop fields
ii. Row spacing and conservation tillage
iii. Improving the soil
iv. Diverse crops planted between tree lines
v. Provide for a good start of seedlings
vi. Advantages of mixing crops
vii. “Green manure”
viii. The many benefits of pigeon peas.

b. Water harvesting in pits and trenches

i. Store water and nutrients underground in organic matter
ii. Types of water pits
iii. Roof run-off trenches
iv. Household garden benefitting from run-off water.

c. Making biochar

i. Preparations for making biochar
ii. How to burn biochar
iii. Charging biochar
iv. Biochar added to the deep litter in livestock shelter.

d. Fencing

i. Traditional fences are easily damaged by termites and rot
ii. Challenges of using mesh wire
iii. Improved fences from plant materials
iv. Maintaining a living fence
v. Prepare poles for strong wire fences
vi. Stretching wire for strong fences
vii. Filling wire fences with different materials.

Additional information:

There is additional information on the back of the posters. This will make it easier for you to prepare for the presentation and can help you to share relevant information with the specific target group. Key messages are points that are important to mention when presenting the poster.

It is possible to show the front of the poster to the participants and check on the back if all key messages are mentioned. When more familiar with the content, the posters can be placed on the ground so that everyone can see them well. Recall any of your own experiences with the topic you are presenting and refer to your own experience where possible and applicable.

GENERAL TIPS FOR USING POSTERS FOR SHARING KNOWLEDGE

- **Preparation:** Familiarise yourself with the content of the posters before the training session. This ensures that you can confidently explain the information to participants and answer any questions that arise. It might be helpful to practice by explaining the poster to a friend or relative first.

- **Introduction:** When introducing the posters, explain their relevance to the topic being discussed. Briefly outline what each poster covers and how it will contribute to the participants' understanding. Each group will need a different introduction, depending on their knowledge, experience and education.

- **Visual focus:** Use the posters as a visual aid during your presentation. Refer to specific sections or elements on the posters as you describe related topics.

- **Interactive discussion:** Encourage interaction with the posters by inviting participants to ask questions, share insights or make observations based on the information presented. This fosters engagement and allows participants to actively contribute to the learning process.

- **Hands-on activities:** Incorporate hands-on activities that involve the posters, such as group discussions or practical demonstrations of what is described on the posters (e.g. making biochar, making a shower pit, etc.). This allows participants to apply the information from the posters in a practical context.

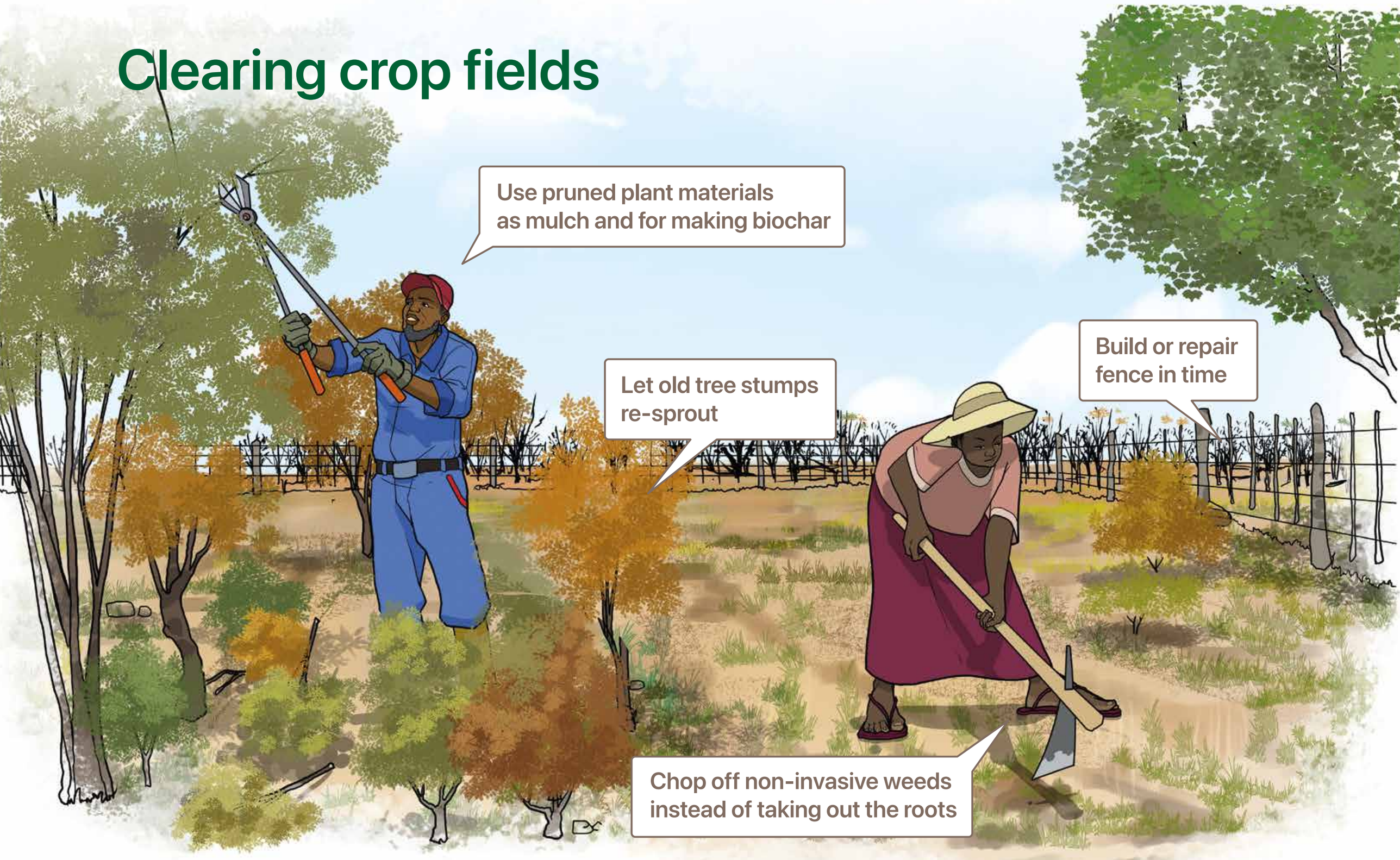
- **Visual reinforcement:** Use the posters to reinforce key concepts or important points throughout the training session. Point to relevant sections on the posters as you emphasise specific ideas.

- **Breakdown complex concepts:** Use the posters to visually break down complex concepts or processes into simple steps. Use the illustrations on the posters to simplify the information and make it easier for participants to understand.

- **Summarise:** Use the posters to summarise key takeaways or learning objectives at the end of the training session.

- **Accessibility:** Ensure that the posters are easily visible to all participants. Position the posters in a central location and point clearly to draw attention to specific areas as needed.

Clearing crop fields



Clearing crop fields

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Additional information to share

Choose field size that you can prepare and manage with available labour and resources. Always remember, a small field that is well taken care of and receives the required inputs will be more productive than a larger field that does not receive enough care and inputs.

In general try not to remove roots from unwanted plants. All roots of all plants contribute to the health of soil. There may be some exceptions, such as invasive star grass.

Do not burn the dry weeds and grass but rather gather and use it for mulch, making compost or for bedding in the deep litter of livestock kraals.

Mulching your field prevents the loss of water, protects seedlings against heat and cold and reduces the growth of weeds.

Old tree stumps left in fields can re-sprout and become valuable sources of plant material (also called biomass).

When trees that are left or specially planted in crop fields are cut, their roots stimulate (help) crop plants to grow better.

Every tree in the crop field helps to hold soil and to prevent erosion.

KEY MESSAGES

- Prepare and plant only as big a field as you can give all the necessary care and inputs
- Livestock love to eat all green leaves and stover - make sure the field is fenced or livestock herded
- No burning when clearing fields
- Leave some trees in the field
- Prune these trees to provide sugars and growth hormones for your crop plants

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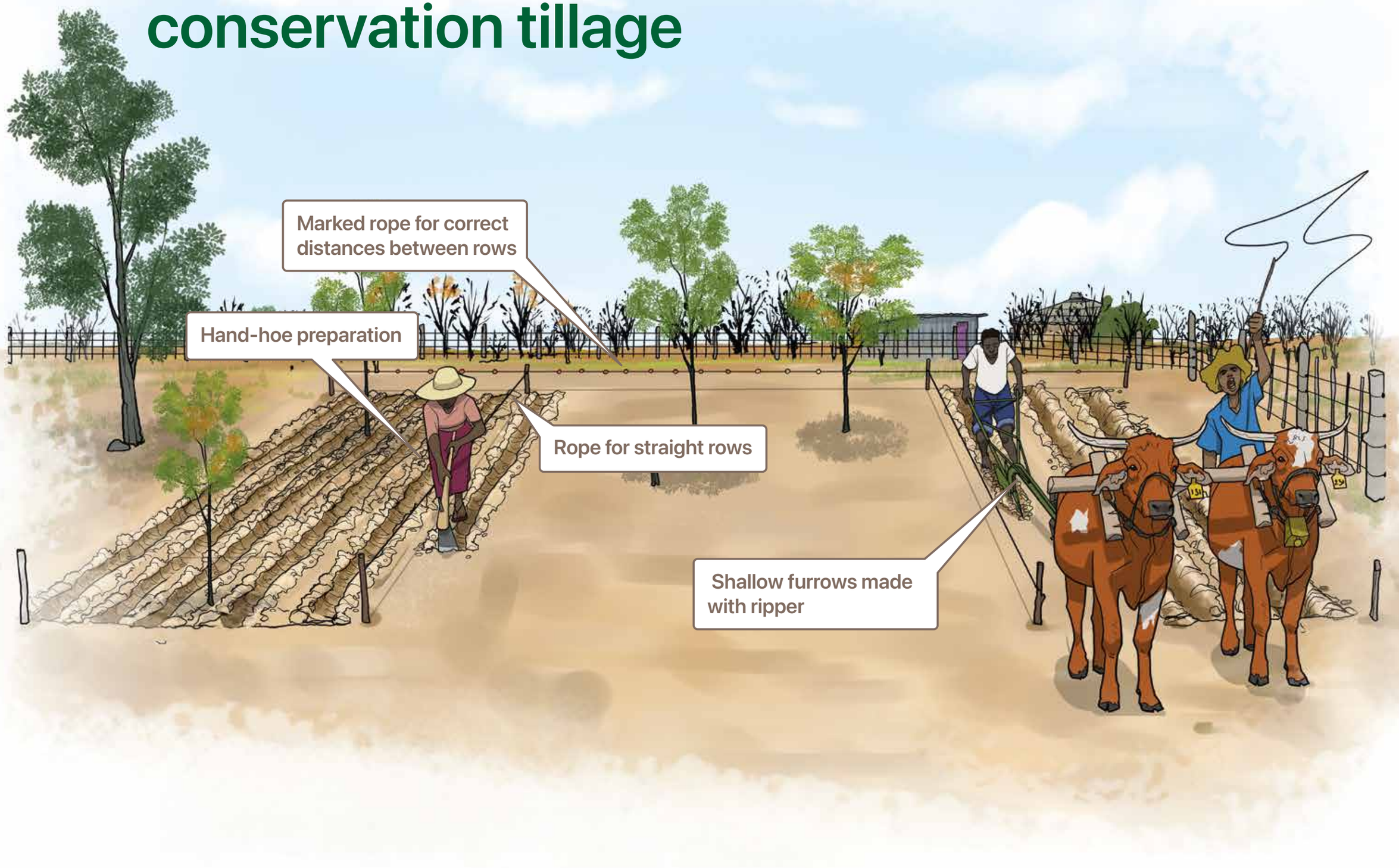
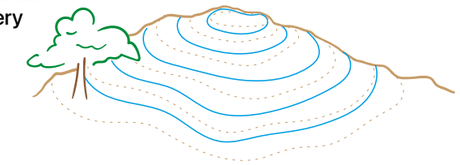
Row spacing and conservation tillage



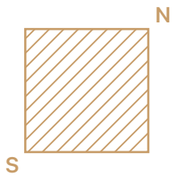
Row spacing and conservation tillage

Additional information to share

To give each plant equal growing conditions make sure the rows are parallel (equal distance from each other) and the distance between seeds in the rows is equal. Planting rows with markers at the correct distances are very useful for this.



Where land is sloped rows follow contour lines to make best use of water.



Otherwise, rows run North-South for good use of sunlight.

In sandy soil where there is no hard pan, shallow furrows are made by hoe or with ox-drawn ripper, depending on how big the field is.

Shallow furrows do not disturb helpful soil life. This low-till soil preparation also helps to reduce the damage to roots in the soil.

Where there is a hard pan under the sand, ripper furrowers may be used initially to allow roots to go deeper into the soil.

KEY MESSAGES

- The distance between rows with cereals differs to distance between rows with beans and ground nuts
- Close plant spacing achieves better overall yield of field
- Distance between rows must be even (parallel rows)
- Where land is sloped, rows follow contour lines to make best use of water. Otherwise, rows run North-South for good use of sunlight
- Use marked planting ropes to remember spacing and what crop to plant where

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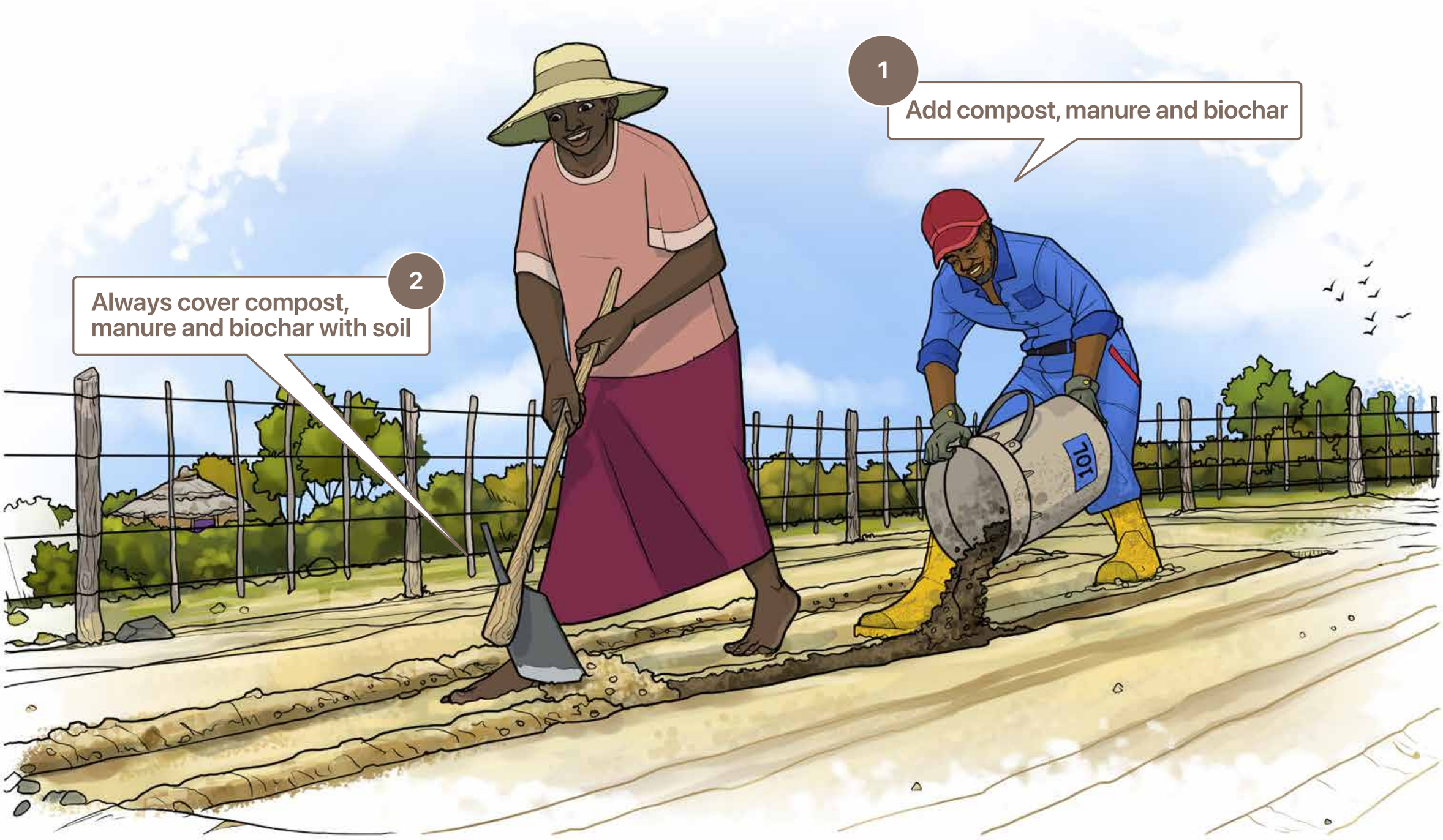
Improving the soil



Improving the soil

Additional information to share

Compost is only applied in the furrows where cereals (maize, sorghum, millet), sunflower or pumpkin are planted. Beans and groundnuts can produce their own nutrition together with soil life and do not need compost or manure.

Use a bucket or bag to pour compost evenly into the furrows. Use 15 litres for every 5 meters of furrow if the compost includes biochar. If it does not include biochar, use 10 litres of compost.

Immediately cover the compost with soil!

If farmers have a lot of charged biochar (without compost) this can be added to the rows where beans or ground nuts are planted as well. Use 10 litres for every 5 meters.

If you do not have sufficient compost manure can be used to add some nutrients to the soil.

KEY MESSAGES

- The best fertilizer is compost
- Compost with biochar prevents nutrients and water from leaching (or draining) from sandy soils
- Always immediately cover compost and biochar that you apply in the field with soil or mulch

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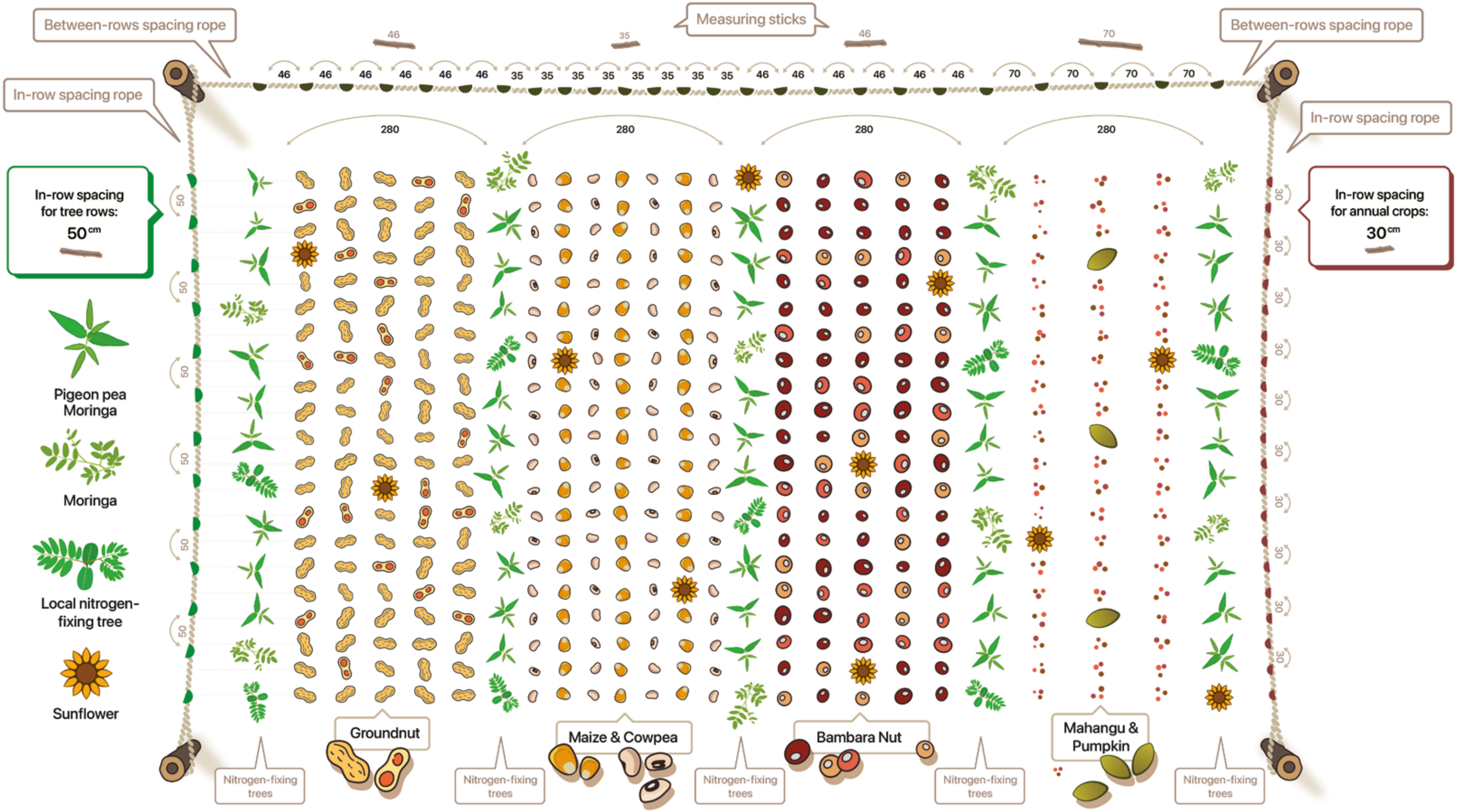
Diverse crops planted between tree lines



Diverse crops planted between tree lines

Additional information to share

The tree lines with the pigeon peas provide protection and nutrients for the annual plants.

Beans and ground nuts bring nitrogen into the soil.

Other crop plants such as okra and sorghum can be added depending on the amount of rain and local experience.

Many different types of plants growing together confuses pests.

Growing many different types of crops reduces the risk of total production failure when growing conditions are not good.

Different crops give and take different things/nutrients from the soil. Growing them together helps to keep the soil balanced and healthy.

If you have, use planting ropes to remember where to plant which seeds. Otherwise use measuring sticks cut to the lengths given on the front of the poster.

Plant all crop seeds and trees and shrubs with the first rains, except for the cowpeas and pumpkin. This allows enough time for seed development.

Plant cowpeas and pumpkin when maize is hand-high, about 2 to 3 weeks after sowing.

If you do not have seeds for certain beans or groundnuts, replace them with other beans or groundnuts.

KEY MESSAGES

- Growing many different crop plants together helps you reduce total crop failure and reduced damage from pests and weeds
- Tree lines create a good environment for the main crops and provide a habitat for beneficial insects and they provide material for mulching and green manure
- Sow and plant all crops, trees, and shrubs with the first rains, except cow peas and pumpkin
- Plant cow peas and pumpkin 2 to 3 weeks later
- Using planting ropes lets you remember what crop to plant where

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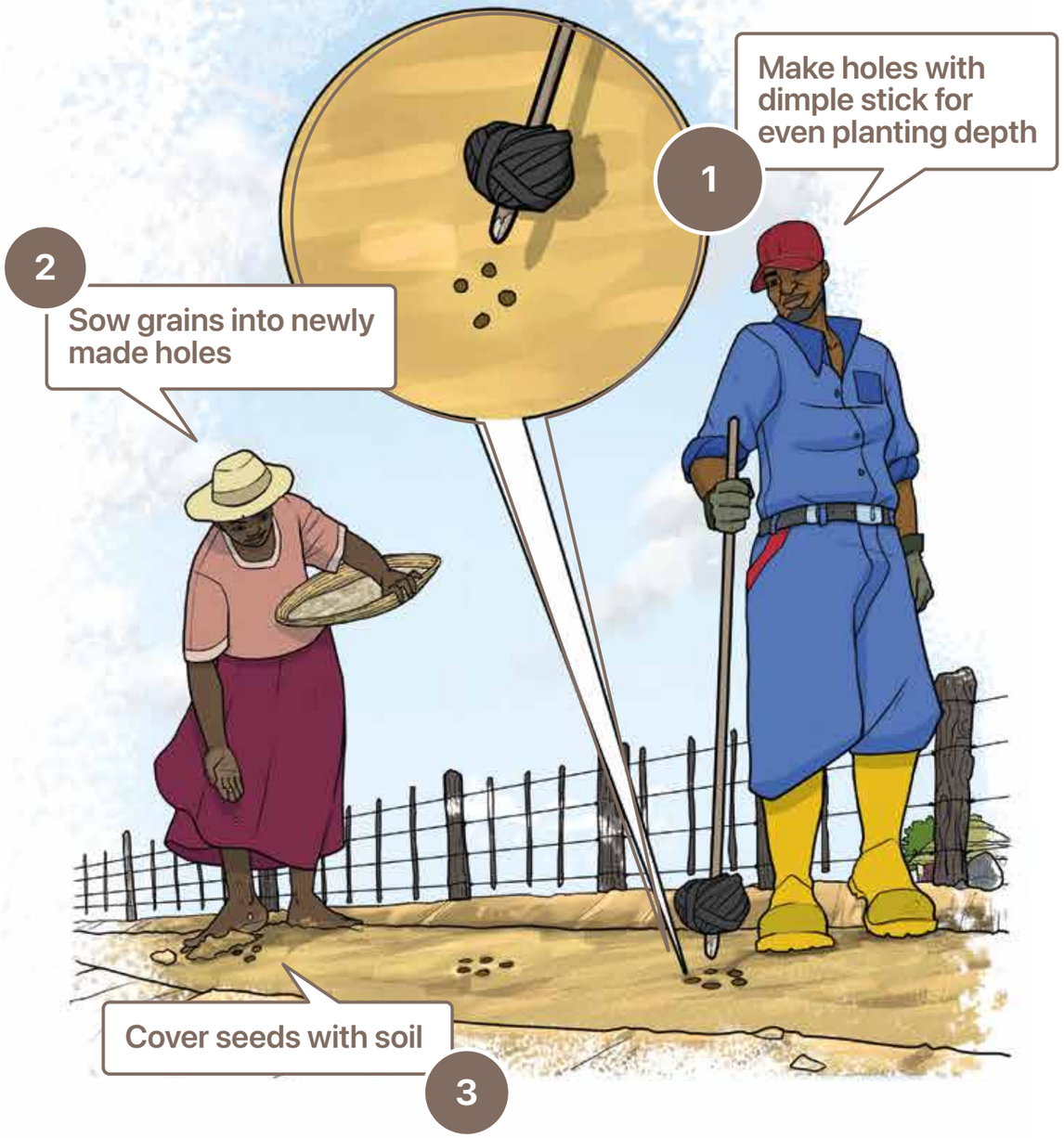
Provide for a good start of seedlings

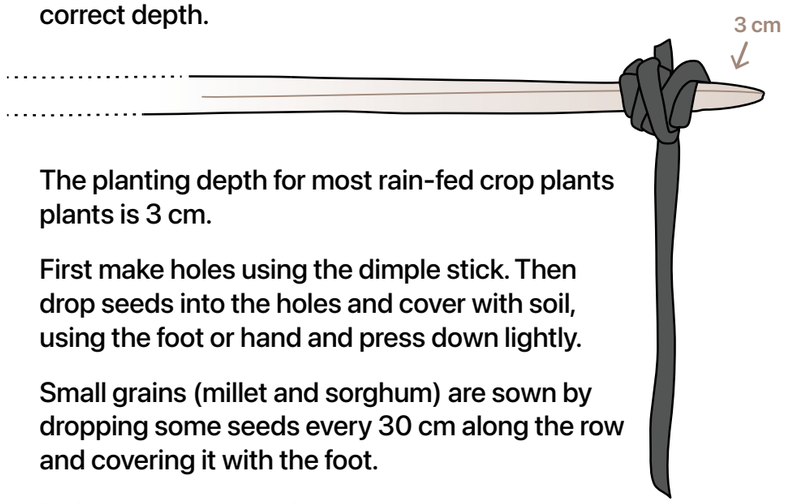


Provide for a good start of seedlings

Additional information to share

The dimple stick method is best used for all kinds of beans, groundnuts, maize and tree seeds.

A dimple stick can be made from a 3 cm thick stick with a rounded tip and some bicycle tire inner tubing to stop the planting stick at the correct depth.



The planting depth for most rain-fed crop plants plants is 3 cm.

First make holes using the dimple stick. Then drop seeds into the holes and cover with soil, using the foot or hand and press down lightly.

Small grains (millet and sorghum) are sown by dropping some seeds every 30 cm along the row and covering it with the foot.

Before planting your first alley system, collect large amounts of mulch during and right after the rainy season and store in the shade to use when needed. Once the tree lines are established these can provide much of the mulch material.

KEY MESSAGES

- Use a dimple stick to achieve an even planting depth for beans and bigger grain seeds
- Use a planting rope to achieve even spacing in the rows
- Even planting depth is very important to achieve better germination and with that better yields
- Many farmers like the dimple stick method because one does not have to bend down so much

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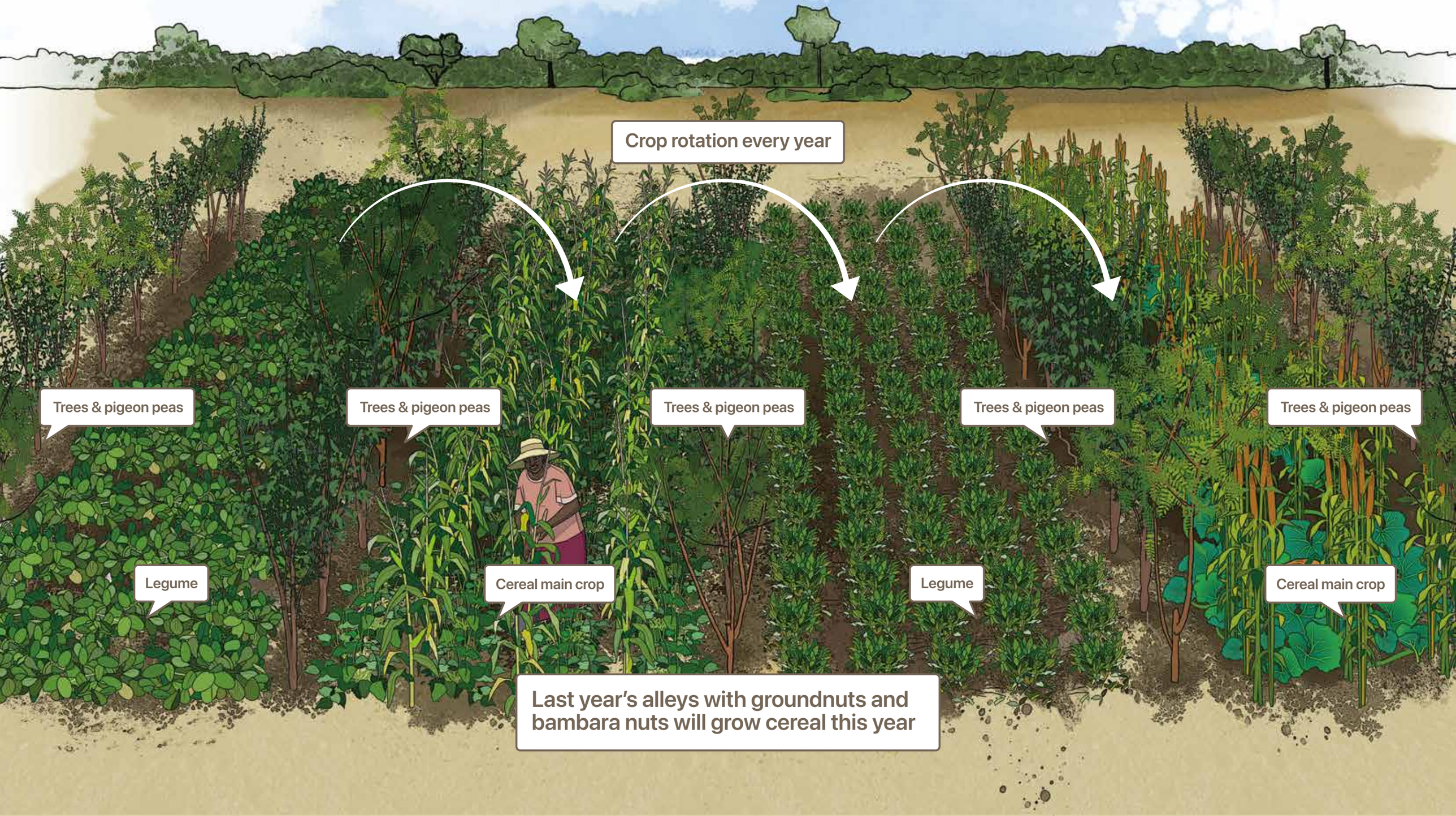
MIXED ALLEY CROPPING

Advantages of mixing crops



Advantages of mixing crops

Additional information to share

The benefits of a mixed crop alley system are many:

- Diversity of plants reduces total crop failure.
- The different heights of the plants create shade and wind protection and confuse pests.
- Reduces pest and disease damage.
- Smaller plants and pumpkin cover soil quickly, reduce weeds and prevent water loss from the soil.
- This system provides nutrition for people, animals, plants, and soil life.

Each year practise crop rotation: Where cereals (like maize, millet, and sorghum) are planted this year, plant legumes (beans, bambara nuts or groundnuts) next year. This increases soil fertility over the years.

KEY MESSAGES

- Many different crops planted close together reduce total crop failure
- It also makes best use of labour, water and land
- The different plants protect each other
- Small plants and pumpkin cover the soil, preventing evaporation and suppressing weeds
- Food for people, animals, plants and soil all grow together

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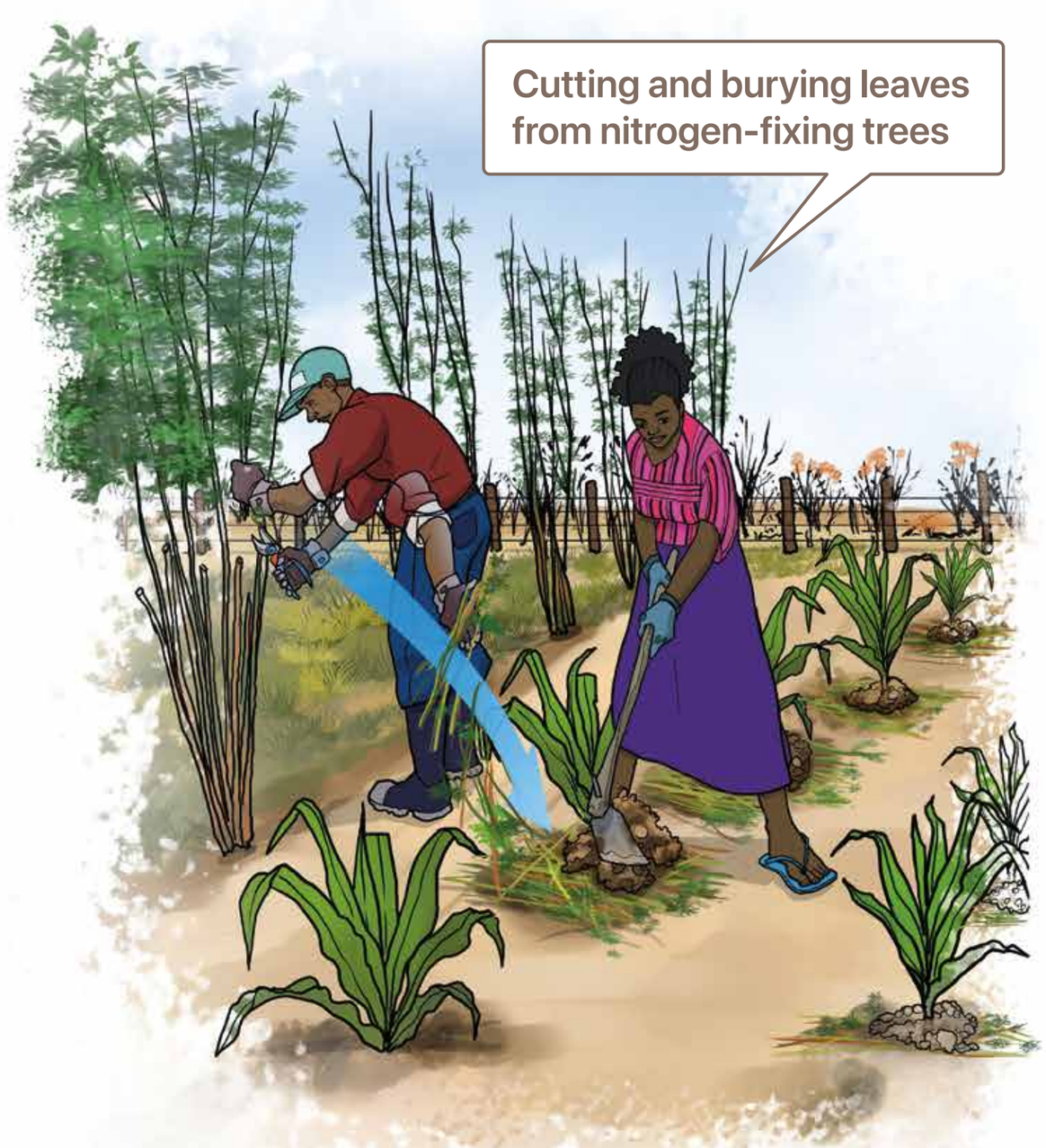
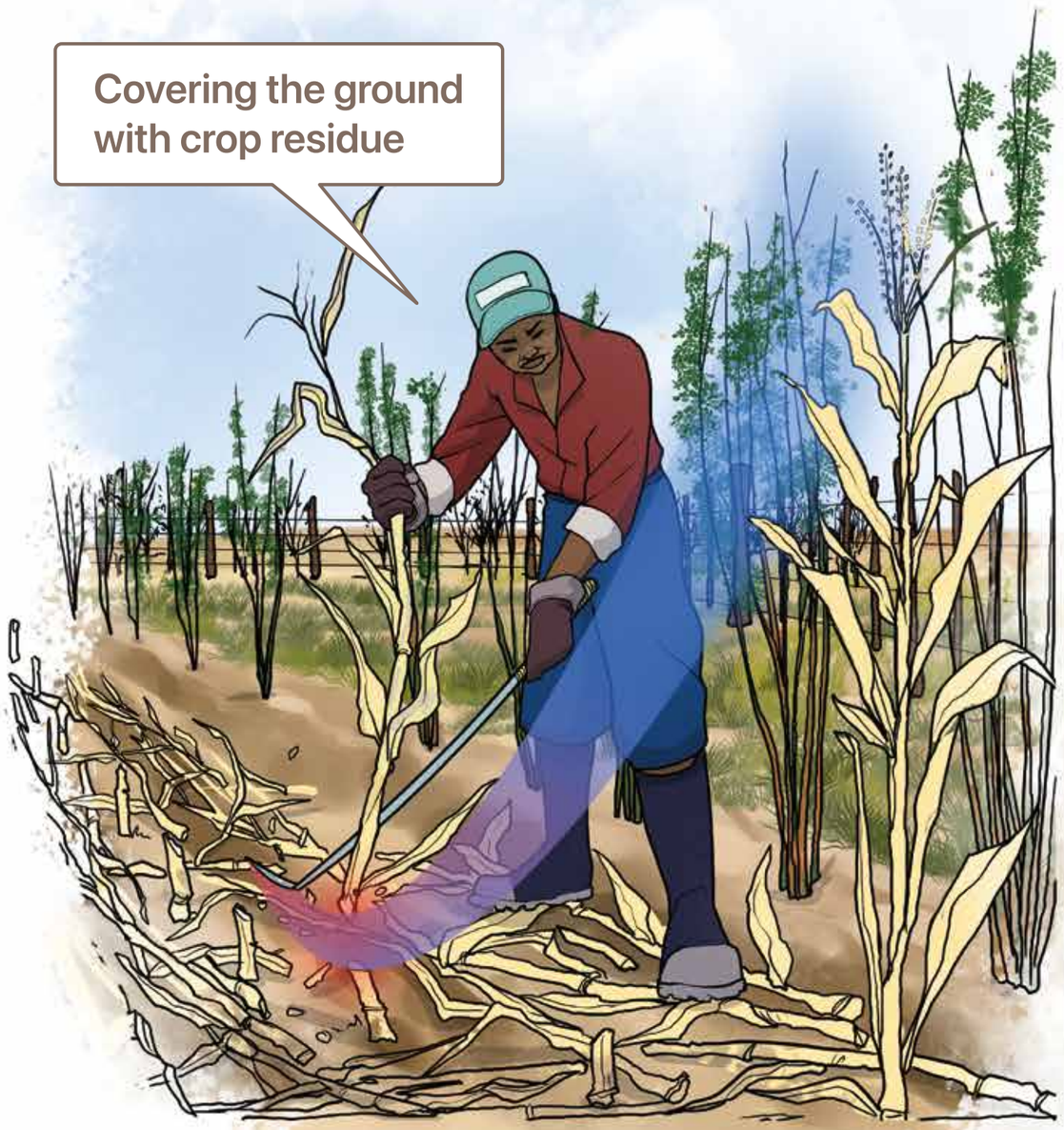
"Green Manure"





“Green Manure”

Additional information to share

Only weed when the weeds are bigger than the crop plants you want to grow. Use the weeds as mulch and green manure and always cover them with soil.

Chop off weeds before they go to seed to prevent them multiplying in your field.

Do not prune pigeons peas in the first year they are sown.

From the second year after sowing pigeon peas, check their height to see if they are throwing too much shade onto the emerging seedlings. If they have too many shoots after having been pruned to knee height with harvest, cut out the shoots at the time of sowing the cereals. Add compost and pruned plant material and sow the cereal seeds into the furrows all at the same time, then covering it with soil (3 cm). This way you make the best use of the nitrogen that grows on your field.

Once all annual crops are harvested slash the dry residue and let it lie on the ground as ground cover. Do not pull out the roots to protect the soil life.

The dry ground cover (also called mulch) is not covered with soil. It reduces evaporation and keeps the soil cooler during the day and warmer at night. It also provides organic materials for the microorganisms that must survive until the next growing season.

If your mixed crop alley field is close to water and your house, plant winter vegetables in the alleys between the tree rows to benefit from the good growing conditions that were created there during the summer.

KEY MESSAGES

- Trees and pigeon peas are cut (pruned) at times when their green leaves can be used to fertilize crop plants.
  For example cereal plants require more nitrogren from the green manure when the seeds are sown and again when they are knee high
- When green leaves from weeds, trees and legumes are used as green manure, it must be covered with soil immediately
- Dry crop residues are chopped off and left on the land to protect the soil and to provide nutrients for soil organisms
- If your rain-fed crop field is close enough to your house, use part of the field for growing vegetables that you give water. This will increase the production of the tree lines as well

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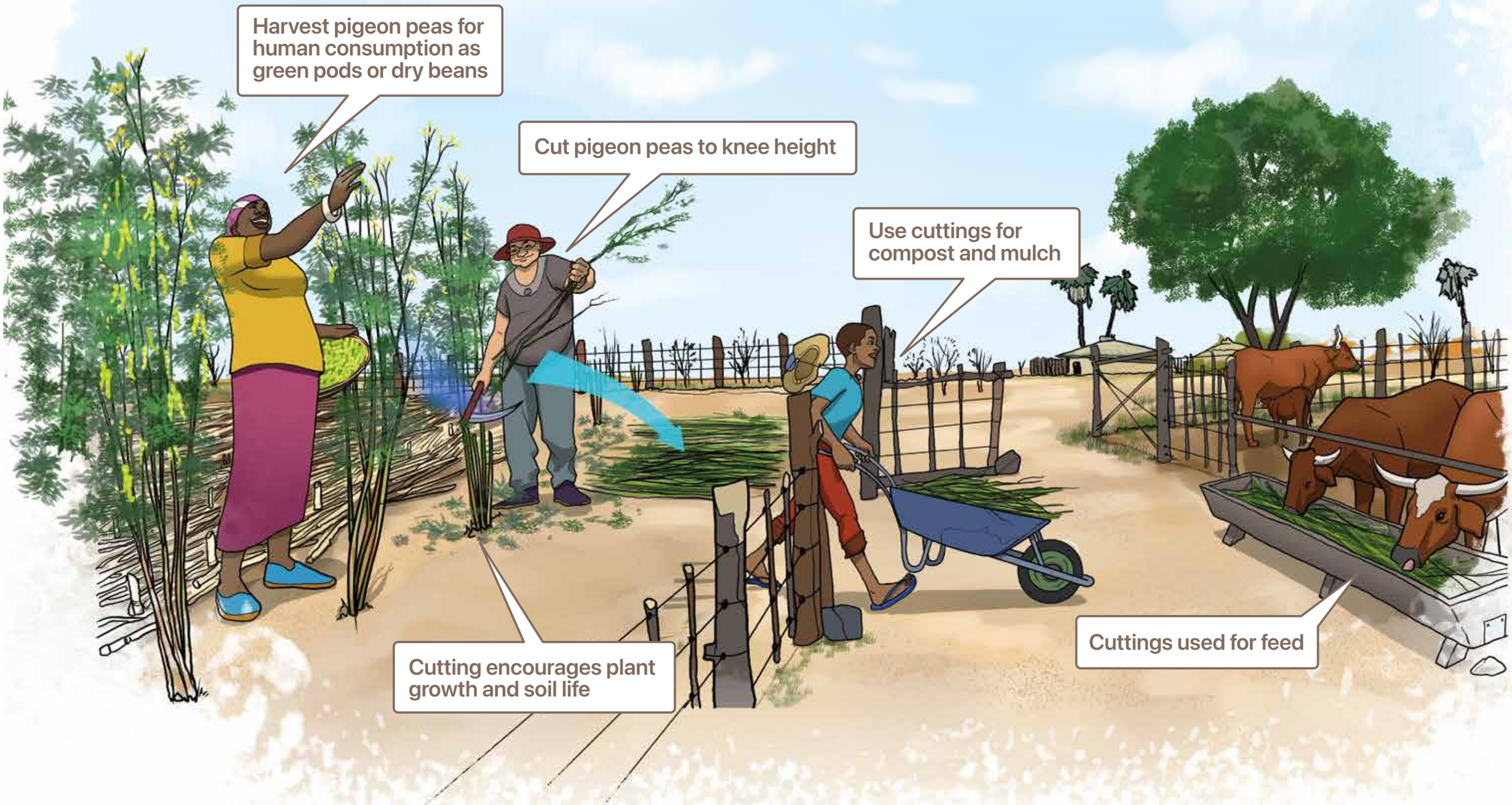
The many benefits of pigeon peas



The many benefits of pigeon peas

Additional information to share

Pigeon peas can be harvested fresh or green and the whole pod can be cooked and eaten as a relish. They can also be left on the plant to ripen and dry. Harvest them before their pods burst open. This is high protein food for people.

Prune the pigeon peas and trees in the winter after all the pigeon peas are harvested. If possible cut them before any frost occurs. Cut the thin stems at knee height.

The green leaves can be fed to livestock or used for compost making. Always store green feed or compost materials in the shade.

After 2 years, when the stems of the trees have hardened, livestock can graze in the fields, trampling down plant residues and contributing their manure and urine as fertilizer. Make sure that trees are not over-browsed, and enough mulch remains on the soil.

After 4 or 5 years when pigeonpea plants are dying, sow new seeds.

Make sure to let some plants of all species grow out to save seeds for re-planting.

Inspect and repair the fence around the plot also during the winter time as uncontrolled livestock can destroy the young trees.

KEY MESSAGES

- After harvesting, pigeon pea plants are cut at knee height
- The leaves and empty pods are used as animal feed, mulch, deep litter and compost material
- When cut branches and green manure are laid on the ground in the field they must be covered with soil immediately
- Crop residues are left on the land to protect the soil and to provide nutrients for soil organisms
- Repair fences also in the winter

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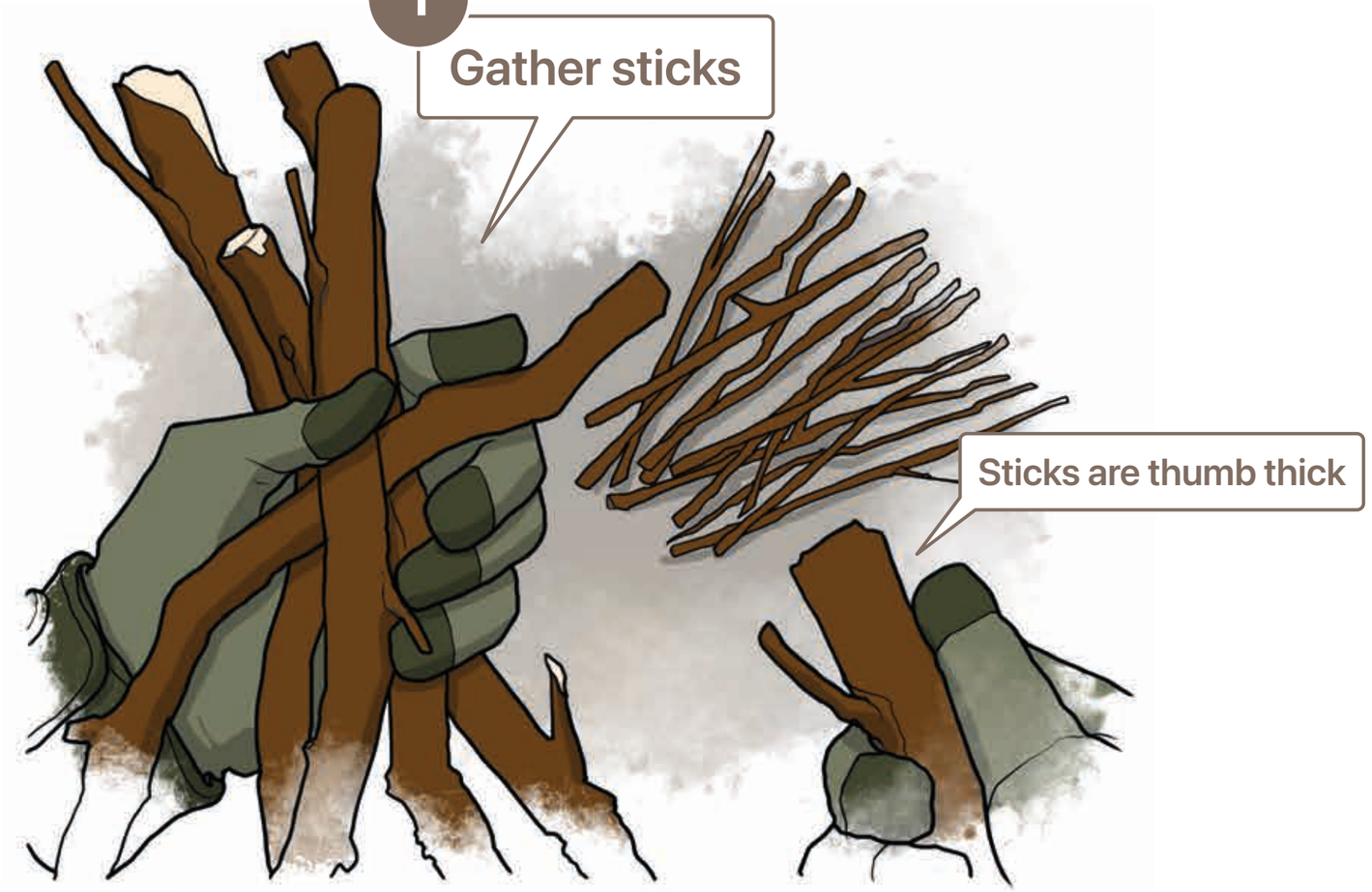
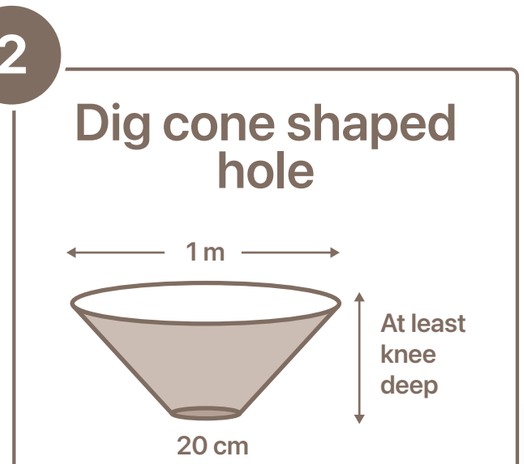
Preparations for making biochar





Preparations for making biochar

Additional information to share

Biochar is different from ordinary charcoal used for cooking fires.

Only thin branches and sticks are used – not the thick wood needed for charcoal.

The wood is burnt in a pit in such a way that very little oxygen reaches the fire. This prevents the wood from burning to ashes.

Always make sure that the area where you are making biochar is cleared to prevent wildfires.

Collect a big heap of sticks the thickness of your thumb.

Prepare enough of all the ingredients and place them close to the hole so you can reach everything easily and quickly – wood, water or sand, buckets, a spade or metal pole.

Try to wear closed shoes and clothes that are made from cotton to protect you from skin burns that can come from flying sparks. Long sleeves and trousers can protect you better from the heat of the fire than short sleeves, trousers and skirts.

Start with a small fire made with twigs and grass at the bottom of the pit.

Do not walk away from the fire because you need to feed it regularly with the next layer of wood.

KEY MESSAGES

- Biochar is produced from thin branches and sticks that should not be used for cooking or making charcoal
- Controlling the air for burning prevents the wood from burning to ashes
- One can use a cone-shaped hole in the ground to achieve this control of air flow and reduction of oxygen
- Start with a small fire made with grass and twigs
- Then add a thin even layer of sticks every time you see ash forming on the wood until the hole is filled

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How to burn biochar

1

Wait for wood to show thin layer of ash

2

Add wood in thin even layers - one stick thick at a time

3

When the pit is full, quench fire with water or sand

How to burn biochar

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Additional information to share

1. Start with a small fire made with twigs and grass.
2. Then add the first layer of wood, the thickness of one stick.
3. Adding more wood has to be done at the right time to make sure that the coal does not burn into ash.
4. Watch the wood to see when a thin layer of ash is forming on the wood.
5. Add wood in single layers and do not pile it over each other.
6. Always watch for the ash to form before adding another layer of wood.
7. When the pit is full and you see ash forming again, quench or kill the fire.
8. You can use water or if you do not have enough water, use sand. This takes away the air and prevents the wood burning to ash.
9. When using water quickly pour over enough water to completely kill all the flames and coals.
10. Water is beneficial, because it opens the pores for more air and space in the biochar and takes out all the oils that are still in the wood.
11. When using sand make sure that you quickly cover the whole area, using buckets. Cover the top of the wood with a layer of sand at least one hand thick. If you have some water you can pour it over the sand. You can use moist sand for this purpose.

KEY MESSAGES

- Watch the fire to see when ash is forming on the wood
- Then add wood in a single even layer
- Repeat this until the hole is full
- When the hole is full, use water or sand to quench or kill the fire quickly and completely

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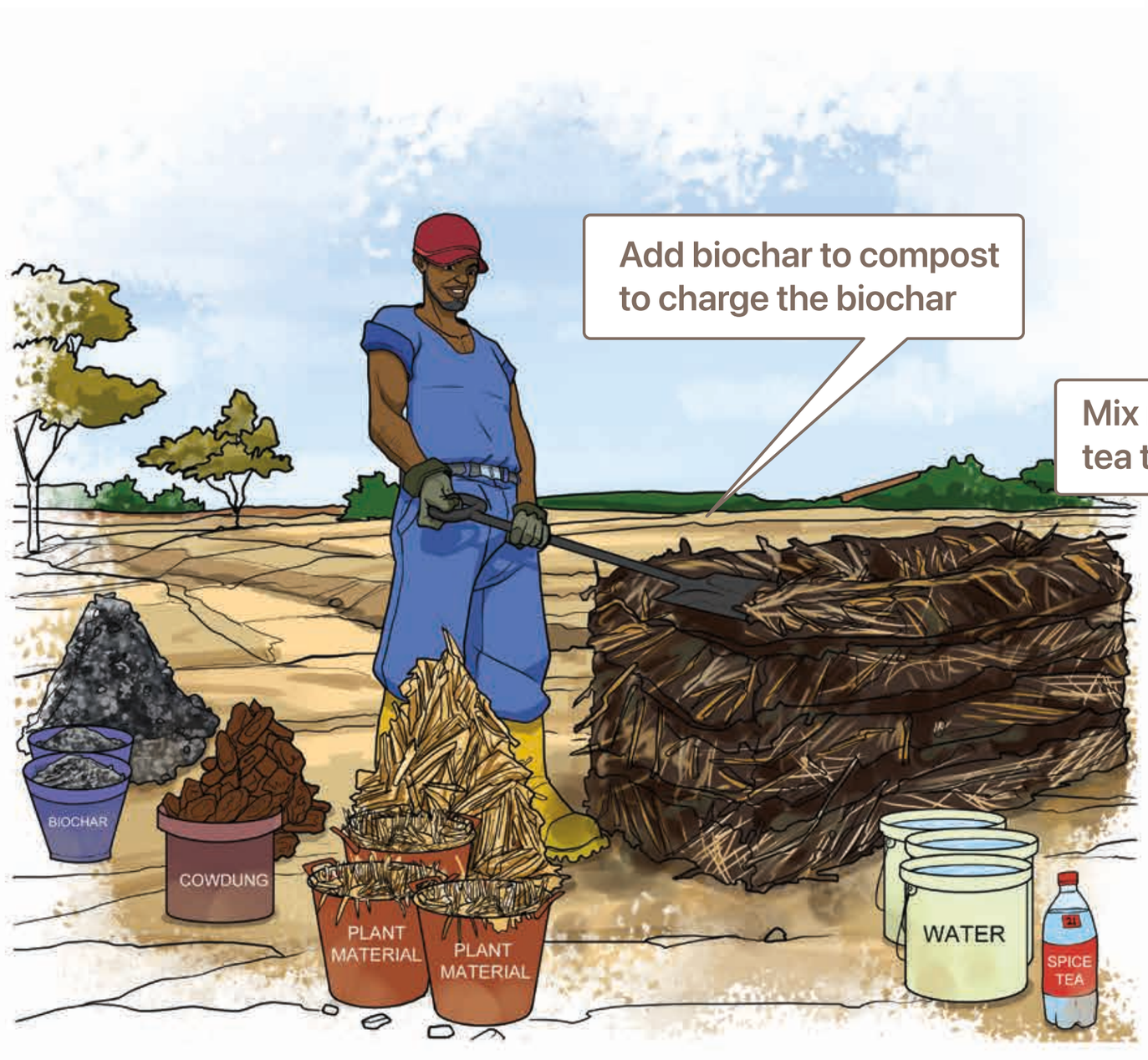
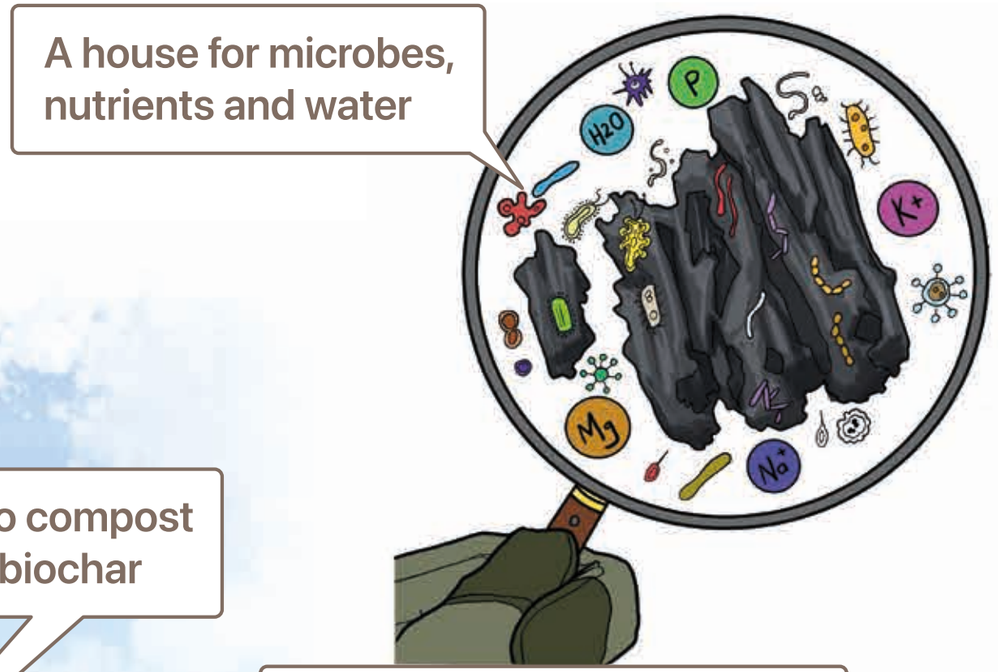
Charging biochar





Charging biochar

Additional information to share

1. Before the biochar is added to soil it must be "charged" i.e., filled with water, nutrients and microbes – life is added to the dead carbon, and it becomes alive.
2. If the biochar is directly added to soil after burning it, it sucks up nutrients and water from the soil and takes it away from plants that need these.
3. Biochar itself does not break down easily – it can stay in the soil for hundreds of years. It therefore only needs to be added once. However, one can add more over time as it becomes available.
4. Let the biochar and surrounding sand cool down before taking out the biochar.
5. Depending on how you will use it further, the pieces of biochar can be ground to smaller pieces by using a mortar and pestle or a pole and a bucket. It can be left as is to break up further when turned in compost or trampled by animals.
6. The easiest way to charge biochar is by adding it to a compost heap. A guideline for how much biochar to use is: Add up to 2 parts biochar for every 1 part of manure. This way it can take up nutrients, water and microorganisms. When one turns the compost, the bigger pieces of biochar break into smaller pieces – reducing the need to pound the biochar.
7. It is also possible to charge biochar by mixing it with fresh manure, urine, sour milk, plant tea or whey and some molasse to feed the microbes. If not all of these are available they can be left out. Daily turning adds oxygen and helps the microbes to multiply. After 5 days the biochar can be added to soil.

KEY MESSAGES

- Biochar is like a sponge with lots of holes in it
- Biochar does not decompose easily and stays in the ground for hundreds of years
- If one wants to use the biochar to improve the soil, it first needs to be charged with nutrients, beneficial microbes and water. This is how it becomes part of the lifecycle
- Do not simply add the biochar to the ground. Biochar absorbs nutrients and microbes from the soil that the plants need to grow
- It can store water and nutrients for a very long time, preventing evaporation and draining of water and nutrients into deeper soil layers
- Biochar can simply be added to compost to charge it

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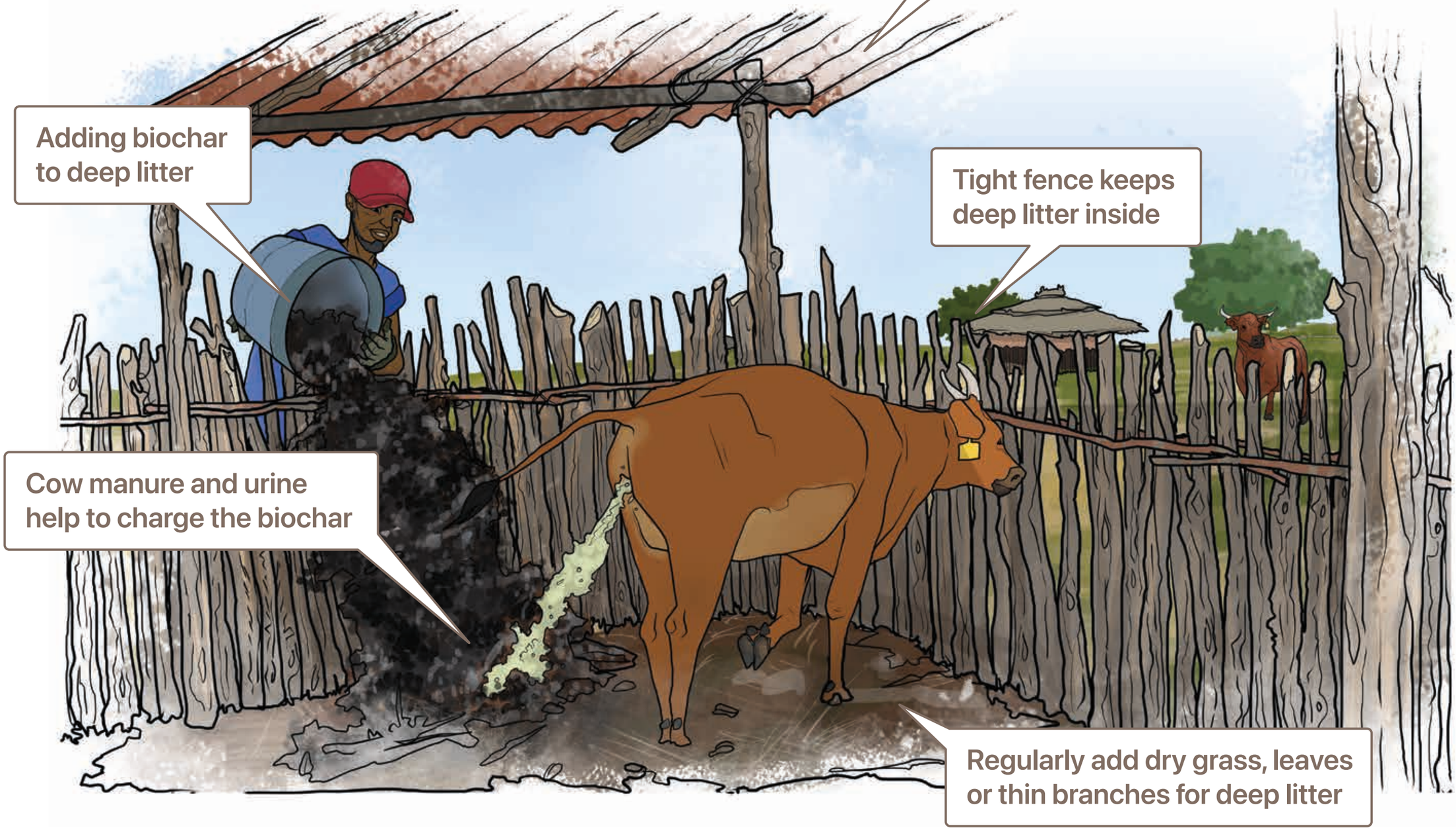
Biochar added to deep litter in livestock shelter



Biochar added to deep litter in livestock shelter

Additional information to share

Another way of charging biochar is to add it to the deep litter bedding of livestock shelters. Here it can soak up urine and the hooves of the animals can break up the bigger pieces.

When the layer of deep litter in the animal shelter is half a meter or more deep, it is taken out and piled with more plant materials and water into a heap for composting.

One can also use biochar to make a urinal for people. Place some biochar into a bucket with a lid and urinate into the bucket. Close the lid when not using it. Add more biochar as the bucket fills up. The biochar soaks up urine and there is less smell. When the bucket is full (or daily, as you prefer) empty the bucket onto your compost heap and cover with plant materials. This is an excellent and cheap source of nitrogen for your garden. Fresh urine is sterile and does not contain pathogens.

Seedling mix with 30 - 50% charged biochar helps to maintain moist conditions for emerging seeds.

Burning “waste” plant material or wood without making biochar from it is like throwing away money.

KEY MESSAGES

- Adding biochar to the deep litter in a livestock shelter has many benefits:
  - It saves work to pound it, because the animal hooves break up the char
  - Nutrients and microbes from the dung and moisture from the urine are added at the same time, charging the biochar
  - Animals move the litter around, adding valuable oxygen
  - The char soaks up water, leaving the surface dry and clean for the animals
- One can make a bucket urinal for people to add nitrogen to biochar
- Especially sandy soils can become more drought resilient when they are amended with biochar

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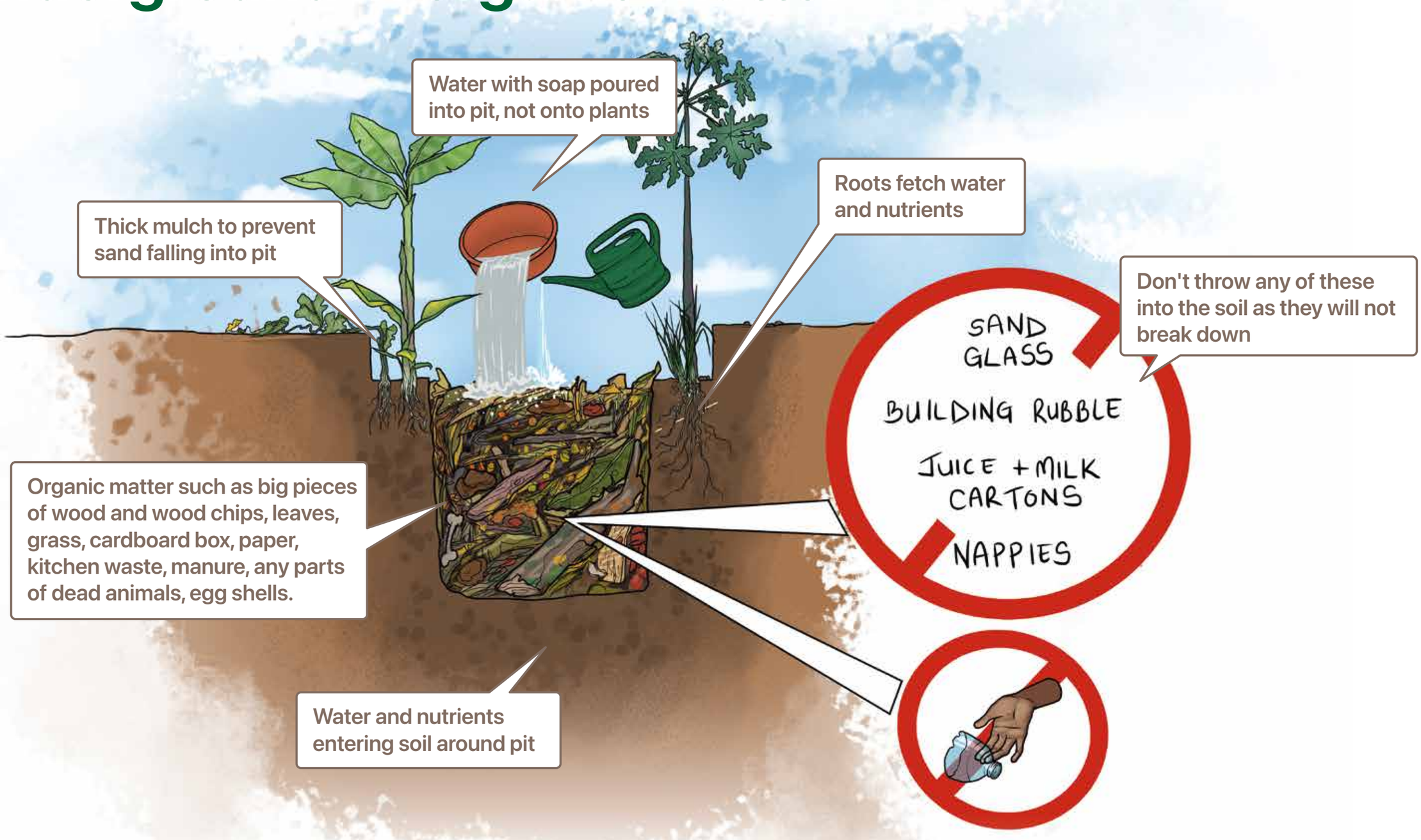
Store water and nutrients underground in organic matter



Store water and nutrients underground in organic matter

Additional information to share

Farmers can dig holes into the ground and fill them with organic matter. Organic matter is anything that used to be living and is now dead and rotting, e.g., plants, animals, insects, trees etc.

The organic matter holds water that flows into the hole.

Over time the organic matter breaks down and becomes compost for the plants nearby. This is a cold composting method.

The compost is not intended to be removed from the pit but left there for the roots of neighbouring plants to find the water and nutrients themselves with the help of soil life.

As the material in the pit decomposes you must add more material at the top.

The soap from washing is broken down (eaten up) by the micro-organisms in the organic matter and it does not harm the plants and fruit we eat.

Do not add sand to the pit. It slows the breakdown of material and harmful micro-organisms can become a problem.

Materials to add to the pit are:

- pieces of tree trunks and big branches
- non-glossy newspaper and cardboard box
- leaves and grass
- bones, feathers, fish gut, animal hide, dead rodents
- any manure from large or small animals, human urine
- kitchen waste (peelings, egg-shells, left-over food)

NO glass, plastic, stones, sand or nappies are added to the pits as they do not break down.

KEY MESSAGES

- Instead of storing water in a container, farmers can store water in organic matter in the soil
- This water is protected from sun and wind and does not evaporate
- The plants fetch water and nutrients themselves with their roots and with the help of soil life
- Grey water with soap and “dirt” is cleaned by the micro-organisms that live in the organic matter
- No nappies, glass, plastic, sand or stones may be added to the pit or trenches

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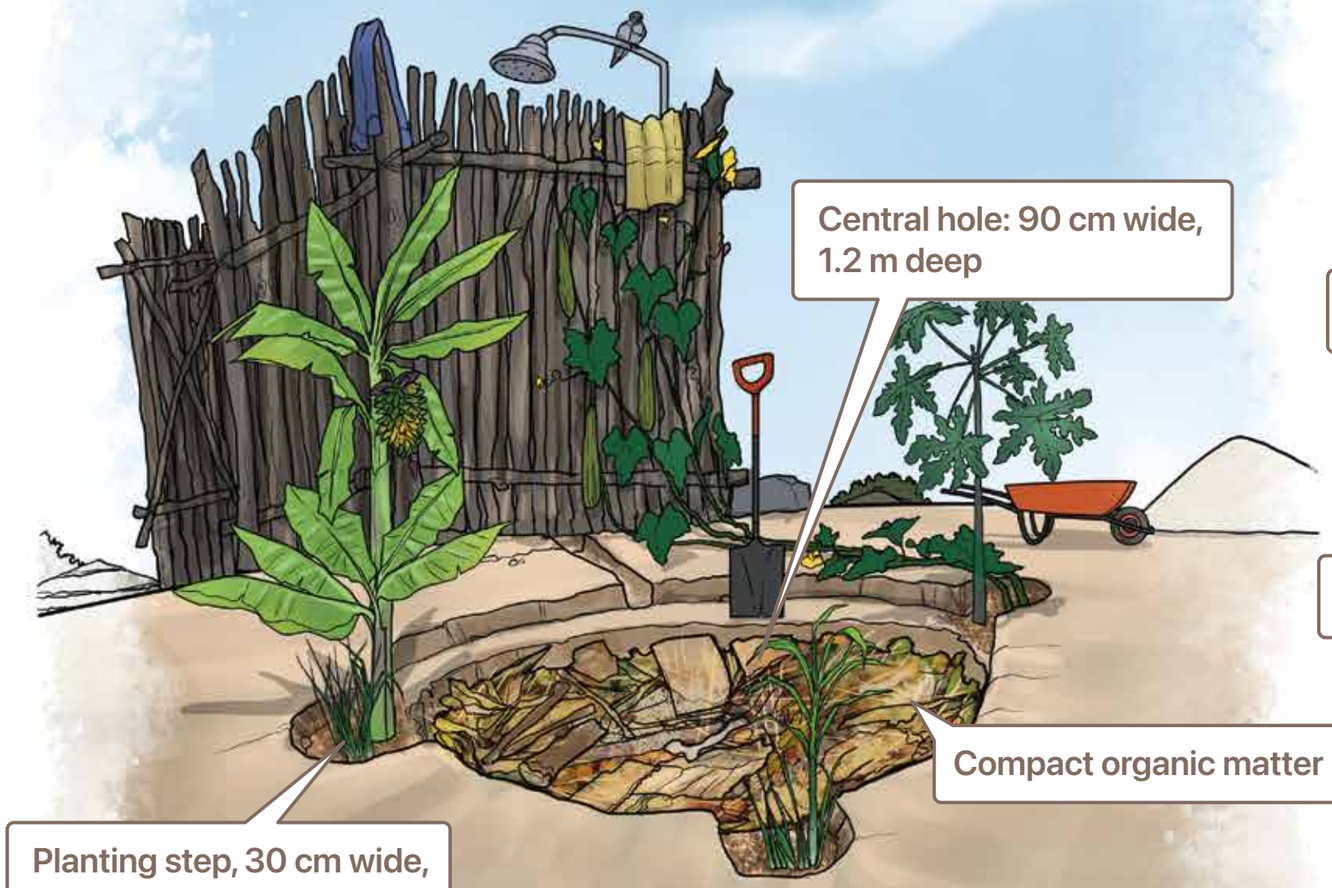
Types of water pits

Shower pit



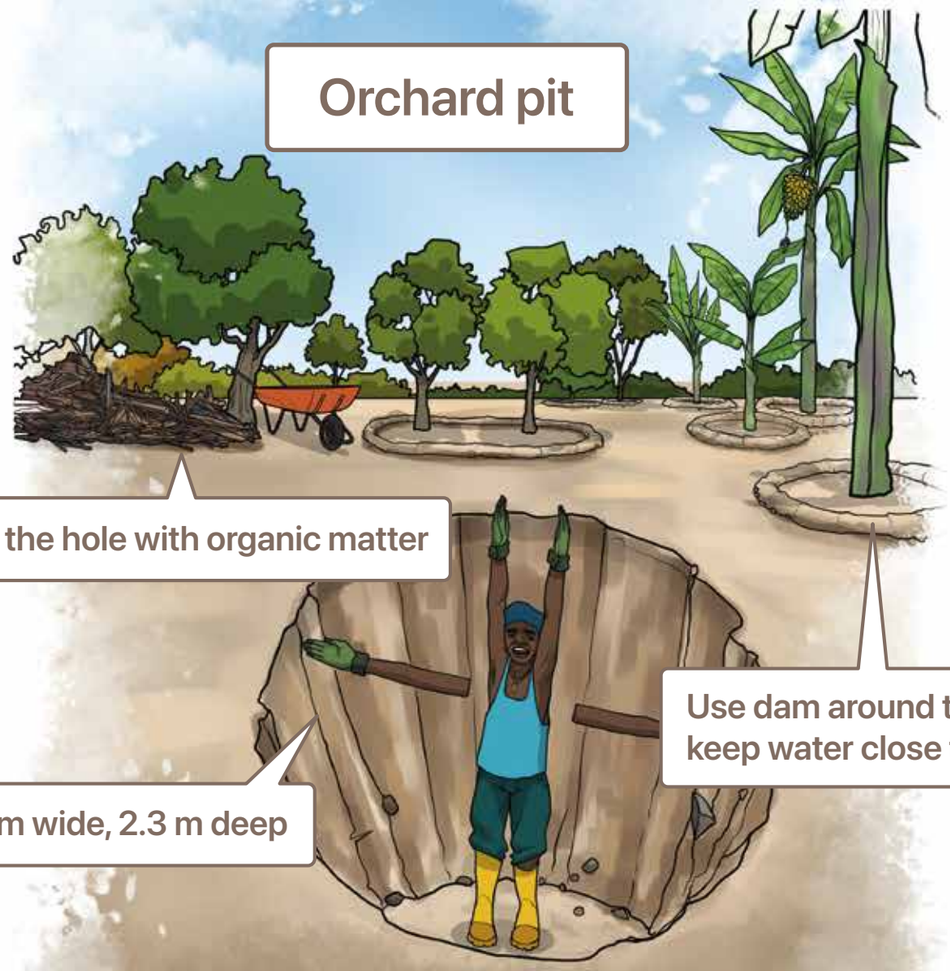
Central hole: 90 cm wide, 1.2 m deep

Compact organic matter

Planting step, 30 cm wide, 30 cm deep

No soil on top of shower or orchard pit

Orchard pit



Fill the hole with organic matter

Use dam around trees to keep water close to tree

1.2 m wide, 2.3 m deep

Types of water pits

Additional information to share

Shower pits have the advantage of getting a constant supply of water throughout the year.

The central pit is belly button deep (1.2 m) and one spade length in diameter.

Shower and water pits are always filled with organic matter only. Do not add sand!

The soap from washing is broken down (eaten up) by the micro-organisms in the organic matter and it does not harm the plants and fruit we eat.

Around shower pits, start planting bananas and pawpaw as they grow quickly. Then add other shrubs and plants and vegetables between them.

Orchard pits can be watered with laundry or kitchen water, run-off from a nearby roof or any other available water.

Orchard pits are much deeper than shower pits (2.3 m) and approximately 1.2 m wide.

The best location for orchard pits between already big trees is where the leaf crown of the trees end. This is also the area where there are no big roots anymore that you would have to cut when making a hole directly under the trees.

You can have several orchard pits, if you have the space.

Around orchard pits it is not necessary to plant anything. However, if they come up by themselves, let pumpkins, sun flowers and other plants grow.

Use the sand taken out of the pit to make a small dam around trees to hold water. It is best to make the dam as big as the crown of the tree. Sand from the pit can also be used to fill plant nursery bags.

Never add sand to the pits! When sand is added to the pit it slows the breakdown and harmful micro-organisms can enter the pit.

KEY MESSAGES

- Grey water with soap and “dirt” is cleaned by the micro-organisms that live in the organic matter
- This water is available throughout the year
- Shower pits are as deep as your belly button
- Orchard pits are deeper – a person can stand inside with their arms stretched up. The pit is as wide as the arms stretched out
- Shower pits are planted first with fast growing fruit trees and creepers, then add other shrubs and smaller plants
- Orchard pits do not have to be planted as the roots of the trees around it will fetch water and nutrients

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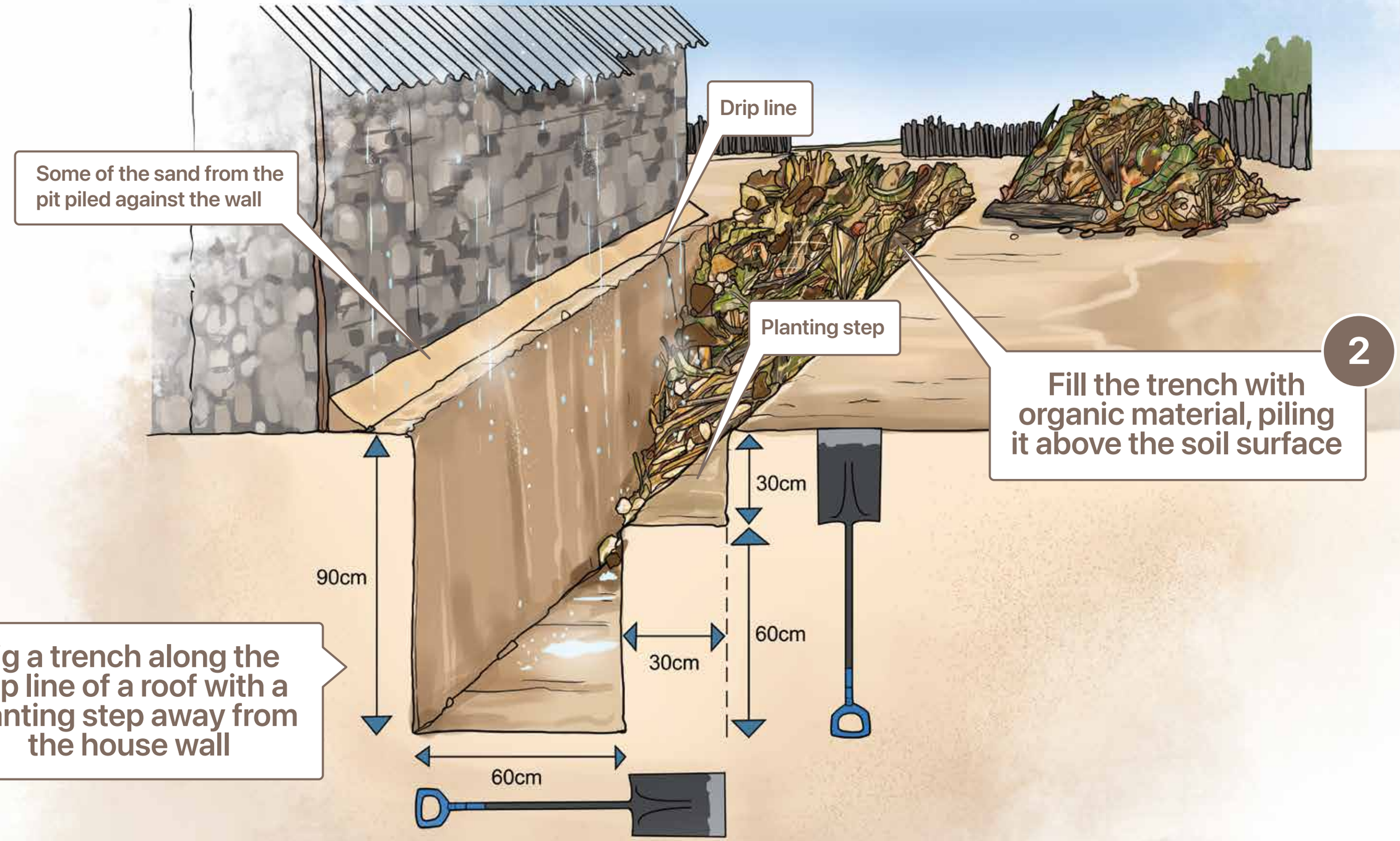
Roof run-off trenches



1 Dig a trench along the drip line of a roof with a planting step away from the house wall

2 Fill the trench with organic material, piling it above the soil surface

Roof run-off trenches

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Additional information to share

The purpose of digging trenches under the drip lines of roofs and filling them with organic material is to hold the water running off the roof and directing it to the plants grown in the trench

If the house has a roof with 4 sides where water runs down, choose the north-facing side. If you can choose between different houses that have only one side where the water runs down, first choose the house where the water comes down on the northern side. This provides the best sun and temperature conditions for plants, especially in wintetime. It also cools the house in summer.

Make sure that the water that drips off the roof is not washing sand into the trench.

The trenches are 90 cm deep (full length of a spade) and 60 cm wide (handle of a spade).

A step is dug next to the deep pit 30 cm wide and 30 cm deep. This allows for plants to be planted at a lower level so their roots can reach the nutrients and water in the pit more easily. Always fill the planting step completely with mulch to prevent sand from falling in.

Use the left-over sand from digging the trench to build rims around trees to hold mulch and water or fill nursery planting bags.

When filling the trench with organic matter do this in layers and jump on the material so that it is tightly packed.

Pile the organic matter 20 cm higher than the soil surface to prevent sand from washing in. Regularly top up organic matter in the trenches.

Fence your roof run-off garden to keep out chicken and other livestock.

Plant creepers along the fence or let them climb up wires that are fastened to the roof beams.

Never add sand or soil to the trench or on top of the trench.

Always cover all garden beds with a thick layer of mulch.

KEY MESSAGES

- Roof run-off trenches make use of free rainwater
- If you can choose, first make the trenches at the north-facing walls
- The trenches are 60 cm wide and 90 cm deep
- Dig a 30 cm deep planting step next to trench and plant fruit trees, shrubs, creepers and vegetables
- They are filled with organic matter such as tree trunks, branches, leaves, grass, cardboard boxes, animal skin, feathers, dung, human urine, egg shells
- Fill the trenches to form a slight heap on top
- Regularly top up the organic matter when it sinks down in the trenches

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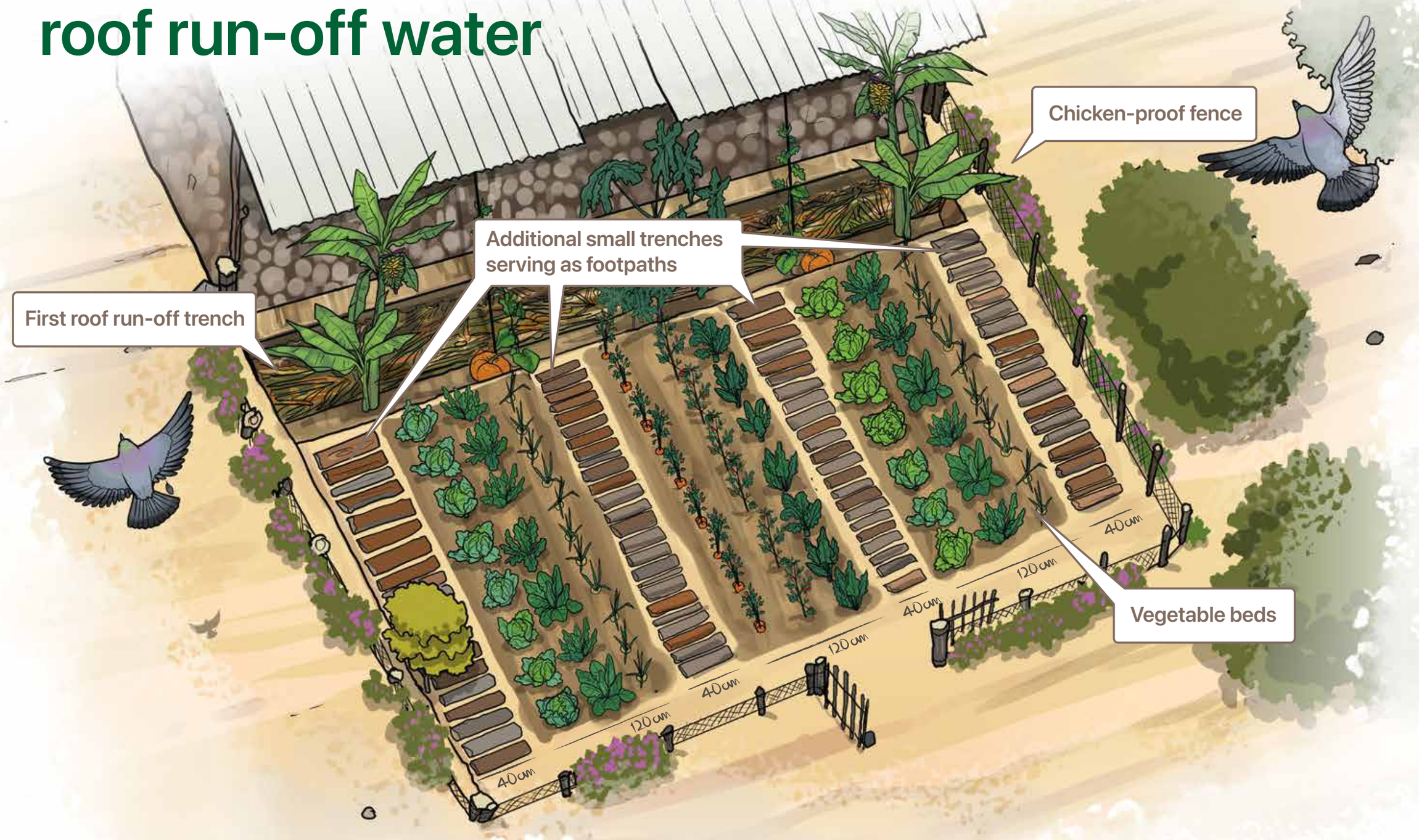
Household garden benefitting from roof run-off water



Household garden benefitting from roof run-off water

Additional information to share

When you see that your roof run-off trench is overflowing with water, it is time to extend the trench.

You can dig smaller trenches at a right angle off the main trench, like a comb.

Draw a line along the edge of the main trench. Then mark the small trenches of 40 cm width followed by a plant bed of 120 cm width, starting on one side with a 40 cm small trench.

The smaller 40 cm strips are the small trenches. Dig them 40 cm deep.

The 1.2 m wide strips are prepared as vegetable garden beds that can be 2 or 3 meter long.

Fill the smaller trenches with organic matter and use them as paths.

Vegetable roots will "collect" water and nutrients from this neighbouring compost trench.

Protect the garden with a fence from chicken and other livestock.

Making the vegetable garden directly next to the wall of your house helps you save on fencing materials.

It also helps you protect it from pests and theft.

First plant fast-growing trees such as Moringa, paw paw, banana and creepers such as beans, luffa and pumpkins on the terrace of the main trench.

Then fill in the spaces with smaller shrubs, grasses and creepers.

Dig into the organic matter of the smaller trenches and feel how wet the material is. If it is very wet it receives the overflow from the mother trench. Now plant vegetables of the season in the beds between the small trenches. Always add thick mulch on all surfaces around plants.

KEY MESSAGES

- Making your vegetable garden next to a roof run-off trench reduces the need for watering
- The smaller trenches are also the paths between the vegetable beds. They are 40 cm wide and 40 cm deep
- Fill the trenches with organic matter to form a slight heap on top
- Always mulch thickly around all plants
- Protect the garden with a fence from chicken and other livestock
- Making the vegetable garden directly next to the wall of your house helps you save on fencing materials
- It also helps you protect it from pests and theft

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Traditional fences are easily damaged by termites and rot

Traditional fences are easily damaged by termites and rot

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Additional information to share

Courtyard, garden and crop field fences use a lot of local plant materials.

This is seen as a helpful practice that can save farmers money.

Fences made from local materials are also celebrated as part of the local culture and tradition.

However, farmers see that these fences do not last long and have to be replaced.

Cutting poles for fences leads to over-harvesting of valuable trees, especially Mopane.

Reeds and stalks from millet and sorghum are needed for other purposes as well – such as livestock feed, roofs, mulch, compost material and making biochar.

Replacing poles and reeds and thornbushes is a lot of work and costs money again and again.

KEY MESSAGES

- Traditional fences from local plant material do not last long
- Termites crawl up from the soil and eat the wood
- Moisture in the soil lets the wood rot if the poles touch or are buried in the ground and if the poles are not treated with oil
- Replacing the poles and reeds and thornbushes is a lot of labour and costs money
- The cutting of new poles leads to deforestation
- Some species of trees cut for poles are over-harvested, such as Mopane

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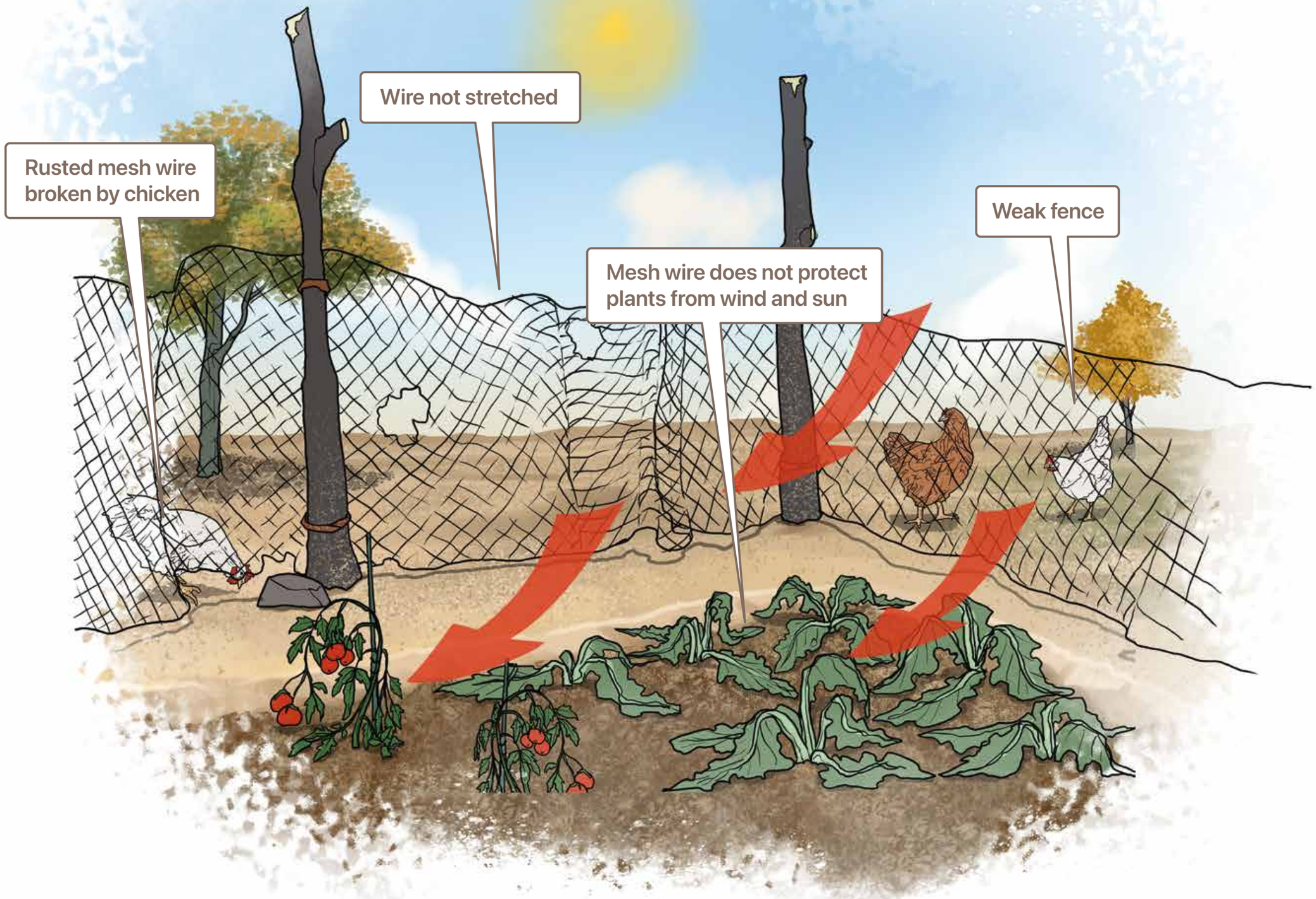
The challenges of using mesh wire



The challenges of using mesh wire

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Additional information to share

Many farmers now buy wire mesh because it can be put up without much effort and it often is cheaper than buying, transporting and putting up poles or reeds.

When mesh wire is buried in the soil the moisture leads to rust and this leads to breakages in the wire.

Mesh wire that is not stretched tightly and tied to line wires between poles is not strong and animals can easily push it over.

By combining the use of local wood and metal wire farmers can reduce the amount of wood needed. This helps to save trees. It also can save the farmer money and labour.

Building good fences with wire requires some special skills and tools.

Farmers are advised to use experienced fence builders as this can prevent wasting money and disappointment from fences that do not last long.

Some of these skills and tools may not be available in the community now.

Farmers need to find practical training for the skills.

Farmers can also share tools to reduce the cost.

There are helpful videos and guidelines on the internet:
https://agribank.com.na/page/fsp-training-manuals

KEY MESSAGES

- Cheap wire mesh is quick and easy to install, but it also does not last long, if not properly built
- The common mistakes are:
  - Mesh wire is not tied to properly stretched line wires
  - Mesh is buried in the soil
- Mesh wire should not be buried in soil as this leads to rusting
- Adopting different fencing methods can help to not only save money and labor, but also to create good living conditions for plants and people

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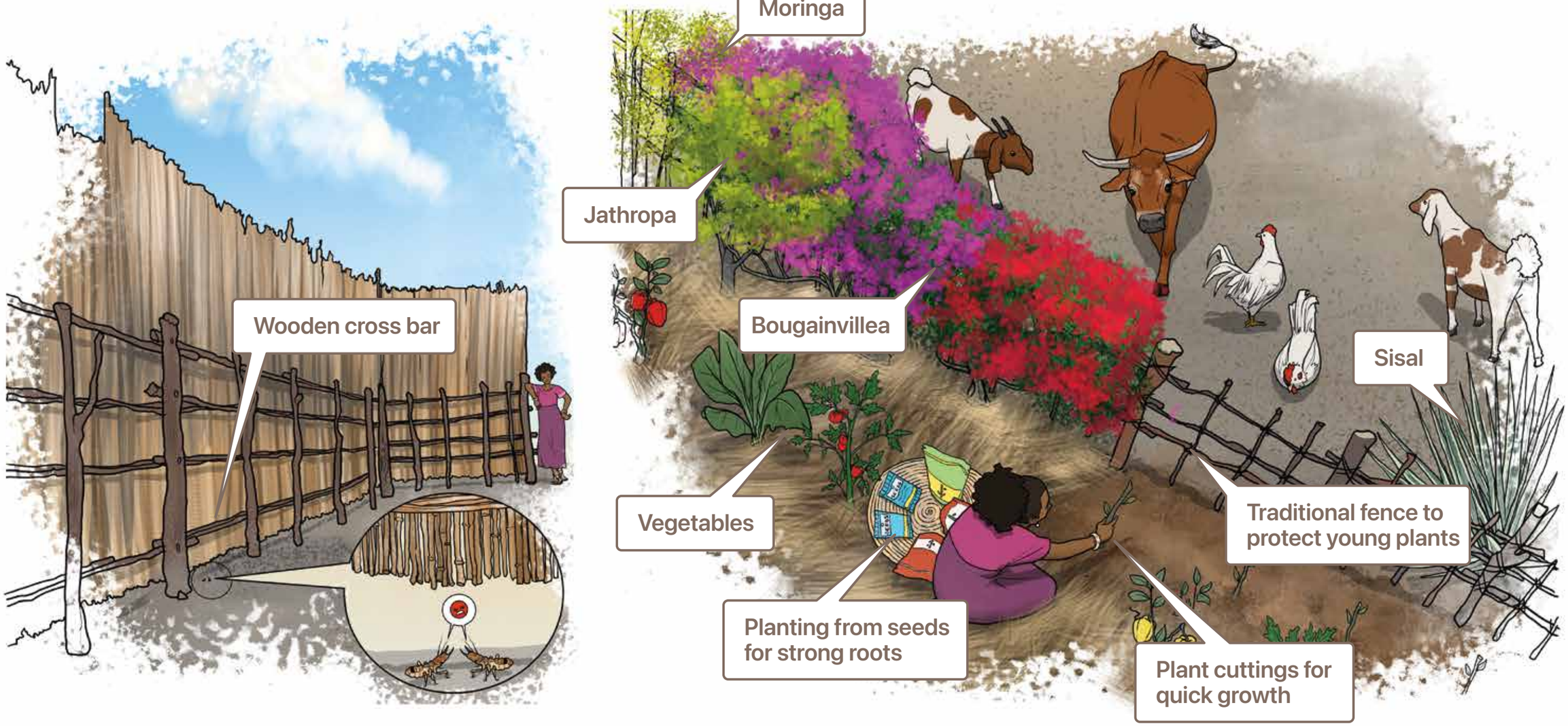
Improved fences from plant materials

Traditional fences last longer when they end above the ground

Living plants can become a fence



Improved fences from plant materials

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Additional information to share

Tree poles, river reeds and stalks from cereals were once living plants. All these are valuable local materials that farmers can use better if they are properly installed.

If reeds or stalks or thin timber is tied to poles instead of standing on the ground, they are not easily eaten by termites.

When the reeds, stalks and thin timber do not touch the ground, the lower end can dry off after rain. This prevents rotting caused by micro-organisms eating up the plant material.

Fences consisting of living plants are called living fences. They provide protection from intruding animals and people.

Until the plants in a living fence are big and dense enough they must be protected by a traditional fence.

Living fences create an environment that helps crops to grow better:

- The fence plants are like an air conditioner, cooling and moistening the air in summer.
- A living fence acts as a wind break protecting plants from strong winds by slowing down cold and hot wind.
- In winter the fence plants keep the cold wind outside.
- Many natural enemies of pest insects can live in the living fence (spiders, lizards, birds).
- Flowering plants in the living fence attract bees and other pollinators that are needed in the garden for good fruiting.
- A high and thick living fence with diverse plants can be effective in keeping wildlife outside.
- Living fences protect against erosion as roots hold the soil.
- Depending on the plants used they can feed and strengthen the soil.

Many plants suitable for living fences can be propagated from cuttings. However, cuttings never develop a tap root.

If seeds of these plants are planted, the plant will have a deeper and stronger root system.

Having different kinds and different heights of plants growing together, the fence can become more dense. One can also have more than one row of plants to make the living fence thicker and stronger.

KEY MESSAGES

- Grain stalks, reeds and timber are valuable local and re-growing fence materials
- When reed and stalk fences do not touch the ground, they last longer
- Living fences provide so much more than just protection against invading animals and people
- First the living fence must be protected with a traditional fence
- Hedge plants can be planted as cuttings
- However, if hedge plants are grown from seeds, they have stronger and deeper roots

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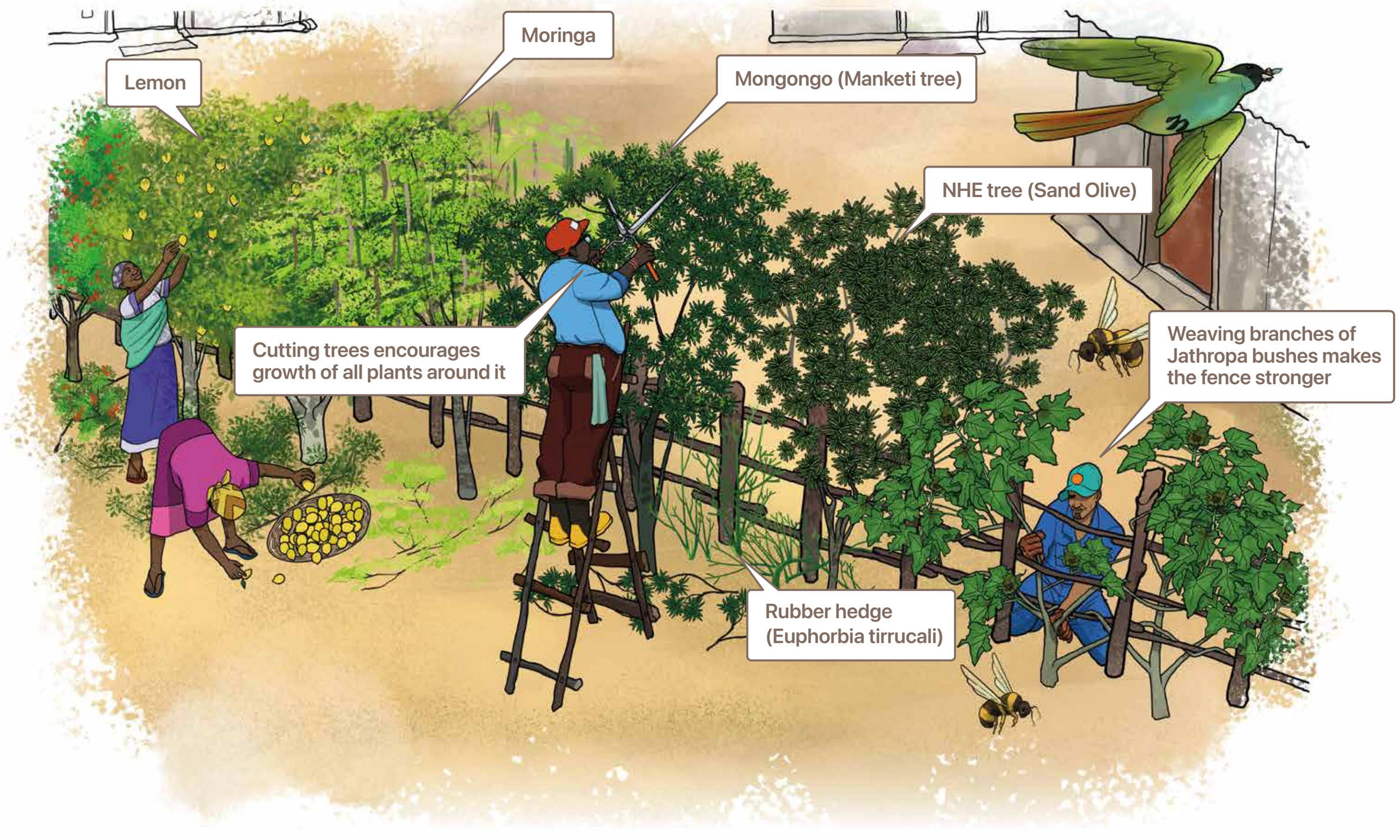
Maintaining a living fence



Maintaining a living fence

Additional information to share

Living fences can produce food when we integrate fruit and nut trees, vines and berry shrubs.

Some wildlife, people and livestock will eat some of the fruit growing on the living fence, then walk on and leave your crops alone.

Living fences can grow much higher than affordable wire fences.

One can include plants with sharp thorns that keep wildlife out more effectively than wire fences. This includes kei apple, sisal, fiderbia and buffalo thorn bush.

It takes time for a living fence to grow to a state where it keeps out all large and small animals. Therefore, it is important to maintain a traditional fence until the living fence is sufficiently high and dense.

Living fences need to be pruned and cut regularly to not over-shadow crop plants.

The pruned branches and leaves are valuable biomass for mulching, green manuring, compost, and deep litter bedding.

Some branches can be woven sideways into the branches and stems of neighboring plants to form a dense “mesh” fence.

Farmers are encouraged to try out many different wild and crop plants for living fences and to exchange their experiences with other farmers.

KEY MESSAGES

- Living fences can provide additional food sources for people and animals
- Living fences can grow much higher than traditional fences
- They create pleasant courtyard space for people
- Living fences take time and good care to become effective
- The living fence must be protected by a traditional fence as it grows
- The pruned branches and leaves from living fences can be used for mulching, green manuring, compost and deep litter bedding
- Choose some high and some low plants with thorns to deter different species of wildlife

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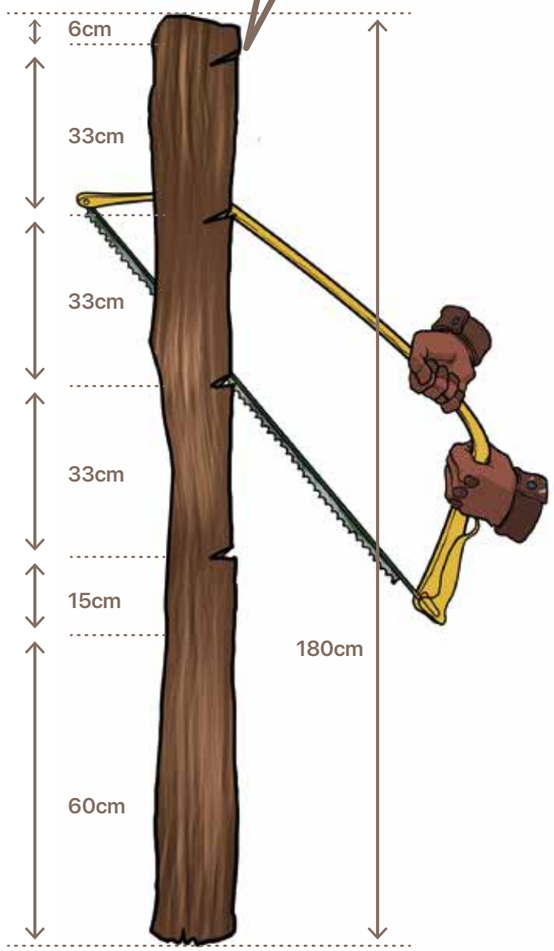
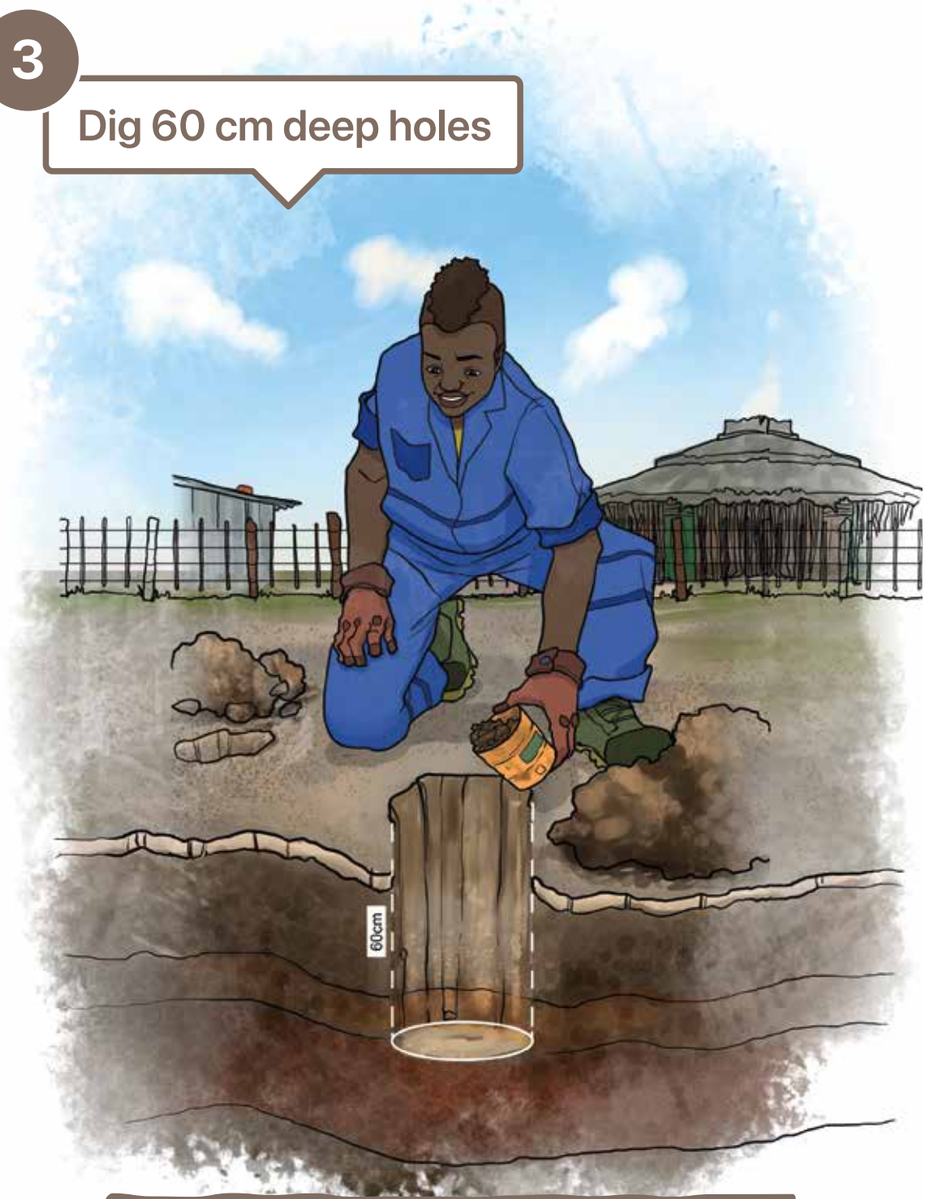
Preparing poles for strong wire fences

1 Cut grooves for line wires



2 Treat poles with old motor oil to protect against termites

3 Dig 60 cm deep holes



Local ways of preventing insect damage

- Remove bark from poles, put poles into water for 2-3 months and then let them dry.
- Burn bottom of pole (charing on the outside)
- Put ash into the hole.
- Use dead wood from the forest, not live cut wood, as it lasts much longer.

Preparing poles for strong wire fences

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Additional information to share

When cutting poles, select tree trunks that are as straight as possible and 10 cm or thicker.

After cutting poles to length of at least 1.8 m make 2 to 3 cm deep saw incisions where the line wires can hook into. For the distance between grooves on a pole follow the spacing on the poster picture.

Soak the end that goes into the ground in old used engine oil for a week. This protects the wood from rotting and from being eaten by insects. The oil must cover the 60 cm end of the pole that goes into the ground.

To achieve a straight fence, place the corner poles first and then Tie a string from one corner pole to the next marking the boundary or perimeter of the fenced area. Mark the additional holes for line poles along this line of string.

Dig 60 cm deep holes to place the poles so that they are not easily bent over.

Dig the holes shortly before placing the poles so that no animals can fall into the holes.

After placing the pole in the hole, fill the hole, putting the sand back in layers. After each layer is added push or stamp down the sand with another pole before pouring in the next layer of sand.

KEY MESSAGES

- Preparing poles well lets the fence last longer, it saves labour and money in the long run
- Fences with poles that are planted in a straight line and in 60 cm deep holes are stronger than those with poles in shallow holes
- Treating the poles with old engine oil protects the wood from rot and insect damage
- If you do not have old engine oil or drums use local practices to protect the poles against insect damage

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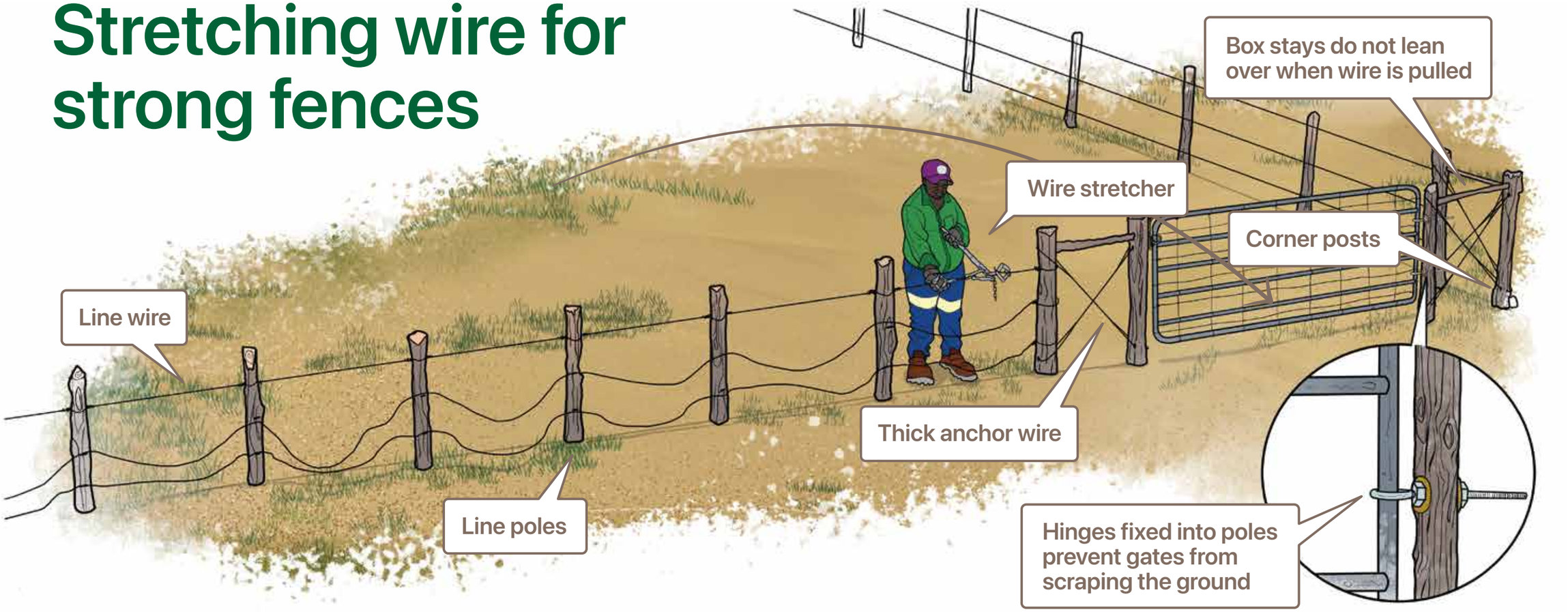
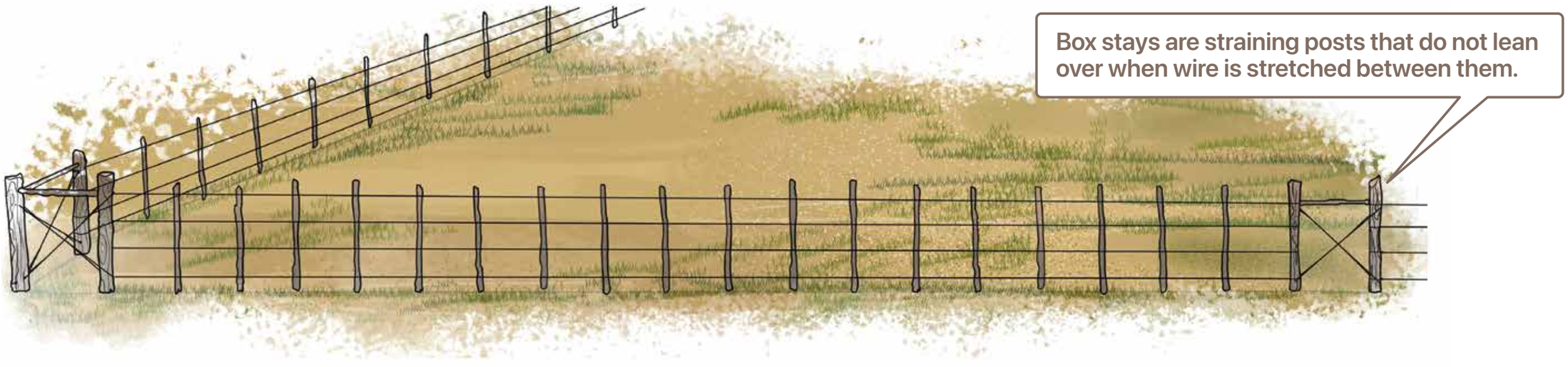
Stretching wire for strong fences





Stretching wire for strong fences

Additional information to share

A wire stretcher is a special tool that can pull wire much tighter than using only a pair of pliers.

Steel wire is stiff (hard) and can be pulled without breaking. Therefore, it is used for line wires.

Short pieces of soft binding wire are used to tie the lines wires to the posts.

Anchor wire is made of 4 mm thick binding wire which is used when making the cross connection between the poles of a box stay or other straining post.

A good quality wire tensioning tool lasts a long time and is a valuable investment that neighbouring farmers can share.

In sandy soil, a straining post (or stay) is best made from a set of two upright and one horizontal poles with a cross of thick anchor wire. This is called a box stay.

Straining posts (also called stays) are much stronger than single poles planted in the soil and will not lean over when pulling the line wires.

Gates are also attached to a box stay to prevent the poles from leaning over from the weight of the gate.

There are various gate hinges. They should be adjustable to make the gate hang straight.

The distance between poles that are planted in the ground depends on how much weight the wires must carry when tying floating poles to the line wires. If the fence is sagging down, you may need to add more poles.

Try to find an experienced person or team and look at their work before hiring them to build your fence. Look if they use the methods and the tools described on this poster. Ask them to use the methods on this poster when building your fence.

KEY MESSAGES

- Using the right types of wire and tools for different purposes is a good investment because your fence will last longer and be stronger
- Use experienced fence builders
- To pull line wires tight, they need to be fastened to good quality straining posts (also called stays) on both ends of the wire
- Corner and straining posts or stays need to be reinforced so they do not lean over. The box stay shown on these posters is a method best suited for sandy soils
- Gates last much longer and are opened and closed easily when they are fastened with proper hinges to a straining post
- The distances between poles planted in the soil and floating poles depends on what animals you want to keep out and how heavy the material is that is tied to the line wires
- When building a wire fence, it is best to use stiff steel wire for the long lines and softer binding wire to fasten the steel wire to the poles

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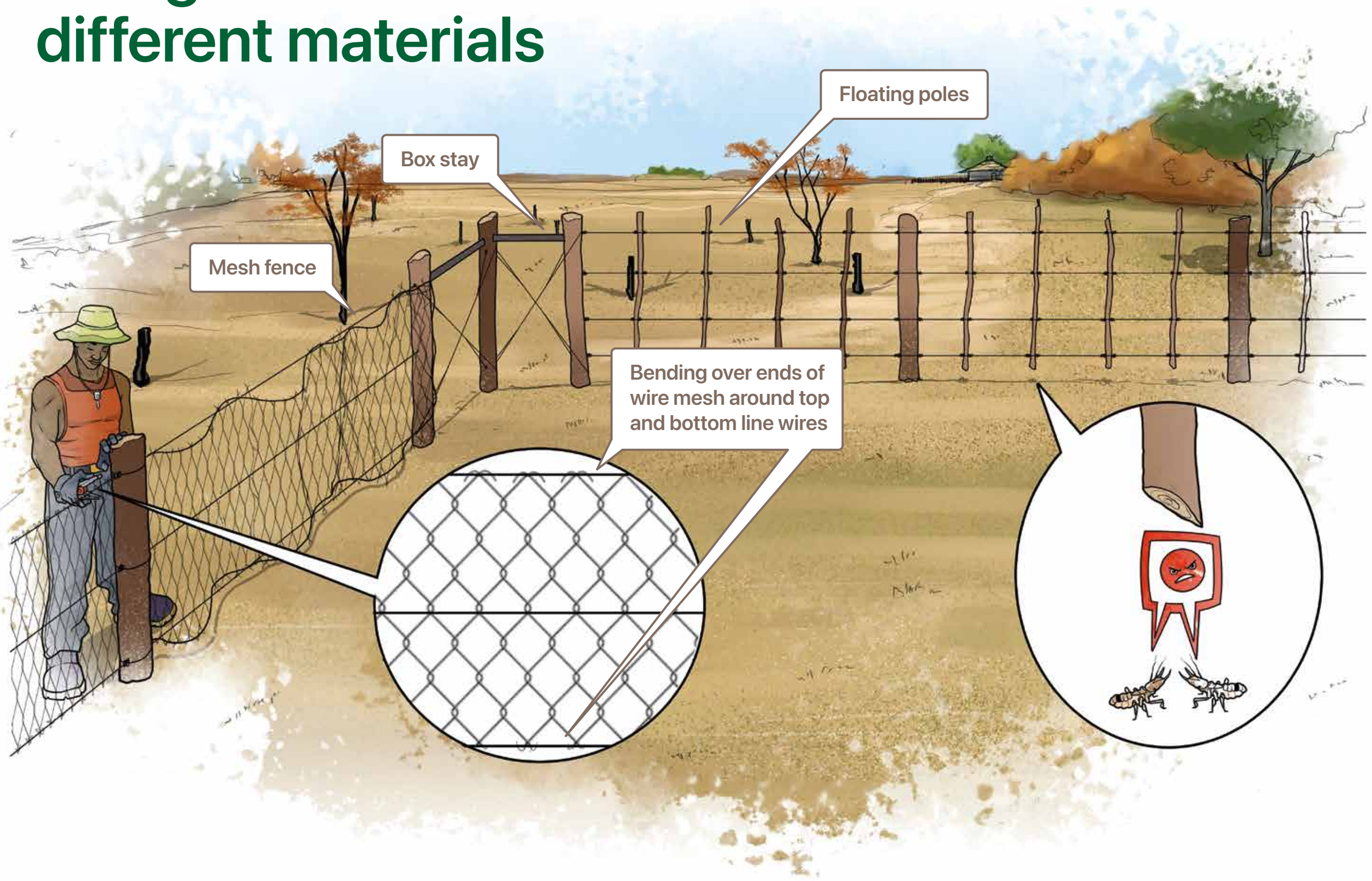
Filling wire fences with different materials



Filling wire fences with different materials

Additional information to share

The traditional practice of allowing livestock to graze in crop fields during the dry season can prevent the establishment of tree rows for alley cropping. Livestock can also eat up all the ground cover after the harvest, leaving the soil surface unprotected against sun and wind.

If livestock are not herded and moved out in time, cattle and goats will destroy the tree seedlings, such as pigeon pea when their stems are still soft and thin.

Therefore, until all livestock in the community are herded during the summer and winter, fences are needed to control where they go.

Wire, especially good quality wire, is expensive.

Wire fences are usually built to stay for a long time. Therefore, before building a fence be very sure that you put it in the right place.

Also carefully plan where to put gates so that people and animals can move easily from one place to another.

Most farmers use wire mesh to keep chicken out of vegetable gardens.

Line wire fence is used for keeping cattle and goats out of rain-fed crop fields, because it is stronger than wire mesh.

To keep the line wires at even distances from each other "spacer" poles are tied to line wires. These spacer poles should NOT touch the ground so that they are not damaged by termites or moisture rot. This is why they are also called "floating poles".

To keep out cattle use 4 line wires at 33 cm apart and tie the floating poles 50 to 75 cm apart.

To keep out goats and small wildlife tie the floating poles 10 to 20 cm apart. Here it can be enough to use 3 line wires.

To keep out chicken tie the floating poles not more than 5 cm apart.

Never roll out and leave wire lying on the ground along the poles of a fence. The wire rusts and animals and people can be caught when walking over it.

KEY MESSAGES

- If livestock of all community members were herded and their movement controlled, cropfields would only need to be protected from wildlife
- Wire fences can save trees and reduce labour
- For a wire fence to be strong and long lasting it needs to be well built
- Different skills and tools are needed to build a good wire fence
- These skills and tools can be shared among farmers
- To keep out small stock and chicken first build a fence with three line wires. Then use wire mesh or many floating poles to only leave small openings
- Tie the wire mesh or floating poles to the top and bottom line wire
- The thinner spacers or floating poles between poles and wire mesh should NOT touch the ground. This helps prevent termites and moisture from damaging the spacer poles and wire mesh
- Line wires should be fixed to poles in such a way that they are not sliding up or down the poles

KCOA Knowledge Centre for Organic Agriculture and Agroecology in Africa
KHSA Knowledge Hub for Organic Agriculture and Agroecology in Southern Africa

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