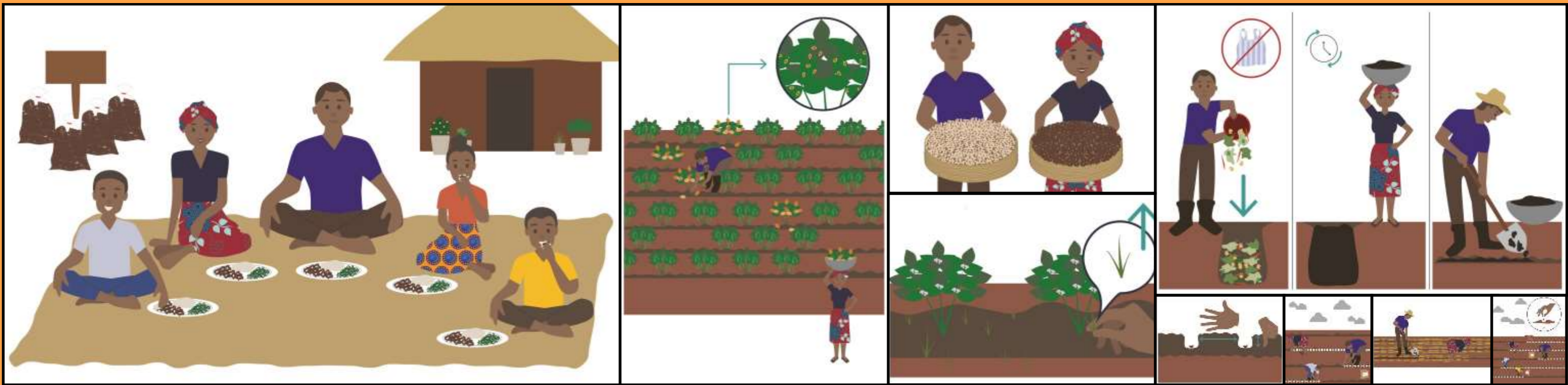




Production of Mbereshi Beans

A Manual for Trainers (Why, Where, What, When & How)



WHY WE GROW MBERESHI BEANS



Beans



Are nutritious and healthy



Are suitable for crop rotation



Help to improve soil fertility



Add cash to the household

Why we grow Mbereshi Beans



Task for the trainer:

1) Discuss the headlines

(Mbereshi Beans feed us, they feed our animals and they feed our soil too)

2) Discuss the picture

⊕ Family together

(take time for meals, have regular mealtimes)

⊕ Healthy food

(Eat diverse and include different food groups into your diet)

⊕ Its possible to sell Beans

(First priority is to eat beans as a source of protein but if you produce enough, you can sell the rest and earn some cash)

3) Ask question



Benefits of Mbereshi Beans



- Is nutritious: It is high in Protein, Iron and Zinc
- Leaves are also given to livestock as feed
- Can be rotated with other crops to support living soil.
- Can be planted as an intercrop
- Can be planted as a cover crop
- Assist to add nitrogen into the soil so helping to improve soil fertility.
- Can be sold adding cash to our household.
- Matures faster [80-85 days]
- Requires minimum inputs
- Can be grown twice in the same farming season
- Is very suitable for the climate found in Luapula Province [Region III]
- Ask the farmers about their experiences with Mbereshi Beans

SITE SELECTION FOR MBERESHI BEANS

1



Well drained soil

2



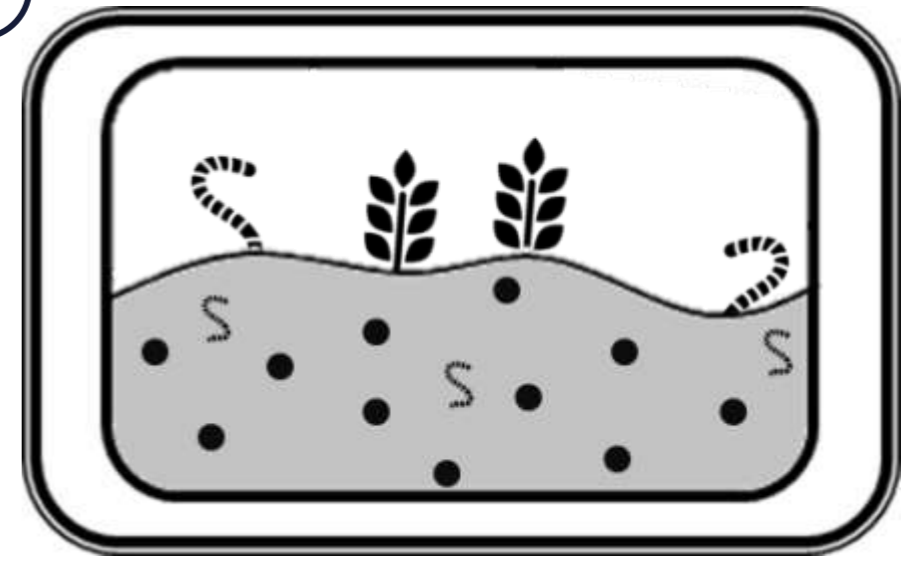
Water holding

3



**PH range of
4.5 to 5**

4



Living Soil

Site selection for Mbereshi Beans Production



Task for the trainer:

- 1) **Discuss the headline**
- 2) **Discuss the Pictures**

A good site for beans:

1. Should have well drained soil
2. Good water holding capacity
3. Has the PH range of 4.5 to 5
4. Must be living

- 3) **Show different soils around you**

Ask the farmers about the kind of soil found in their locality

- 4) **Ask question**

LIVING SOIL



Organic Material



Micro-organism



Minerals



Living Organism

Benefits of Living Soil



Increases harvest



Better protection against dry spells



Less or no chemical fertiliser inputs = saves money



Less pests and diseases

Living soil



Task for the trainer:

- 1) **Discuss the term “Living Soil”**
- 2) **Discuss the Picture**
 - ⊕ **Organic Material**
(Its good for the structure, holds water and nutrients, supports micro-organism)
 - ⊕ **Micro-organism**
(Microbes recycle nutrients, create humus, produce a variety of substances to promote plant growth)
 - ⊕ **Minerals**
(Act as bio fertilizer and supports plant growth)
 - ⊕ **Living Organism**
(Break down plant and animal tissues, releasing stored nutrients and converting them into forms usable by plants)
- 3) **Show different soils around you**
- 4) **Ask question**



* **Living Soil**

- ⊕ **Increases the harvest because it maintains the basic nutrients for plants. Plants need this to grow.**
- ⊕ **Protects the plants in case of dry spells because plant leftover (organic materials) holds water for a long period.**
- ⊕ **Requires less or no chemical fertilizer because small living organism break down plant leftovers and produce what our crops need to grow well.**
- ⊕ **Has less pests and diseases because small organisms protect our soil from harmful chemicals and suppress plant diseases.**

HOW WE SUPPORT OUR LIVING SOIL



Why we cover our soil



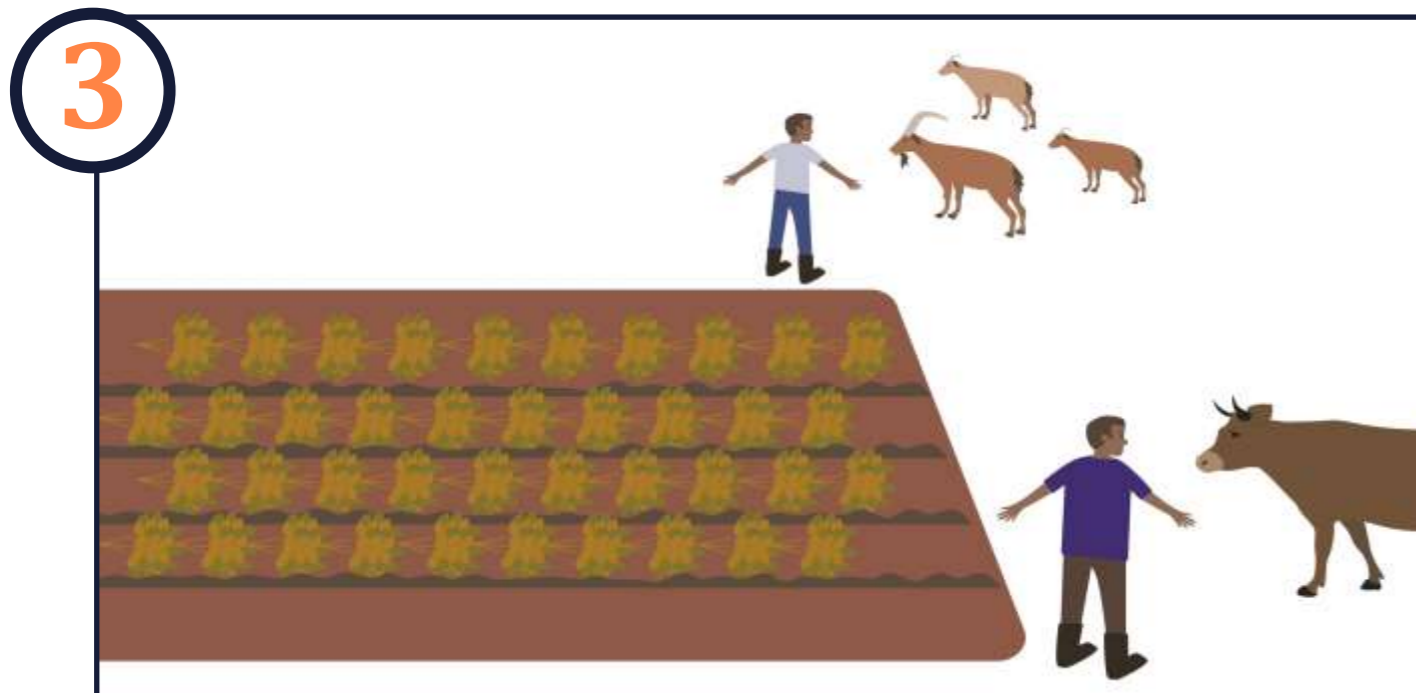
Reduces high temperatures and soil moisture loss



Allows the rain water to enter the soil easily



Reduces weeds



How we support our living soil



Task for the trainer:

1) Discuss the Pictures

1. Dead plant matter and compost

(Leave dead plant matter in the field and applying compost manure)

2. Cover the Soil*

(Cover the riplines/basins with crop residues or other organic material like cut grasses or leaves from nearby trees. This reduces the soil erosion and improves moisture retention on the field)

3. Keep Animals away

(Keep animals away and do not let them graze on our plot. Animals eat the organic material on our field. This makes the plot less productive)

2) Show different ways to cover the soil

3) Ask question

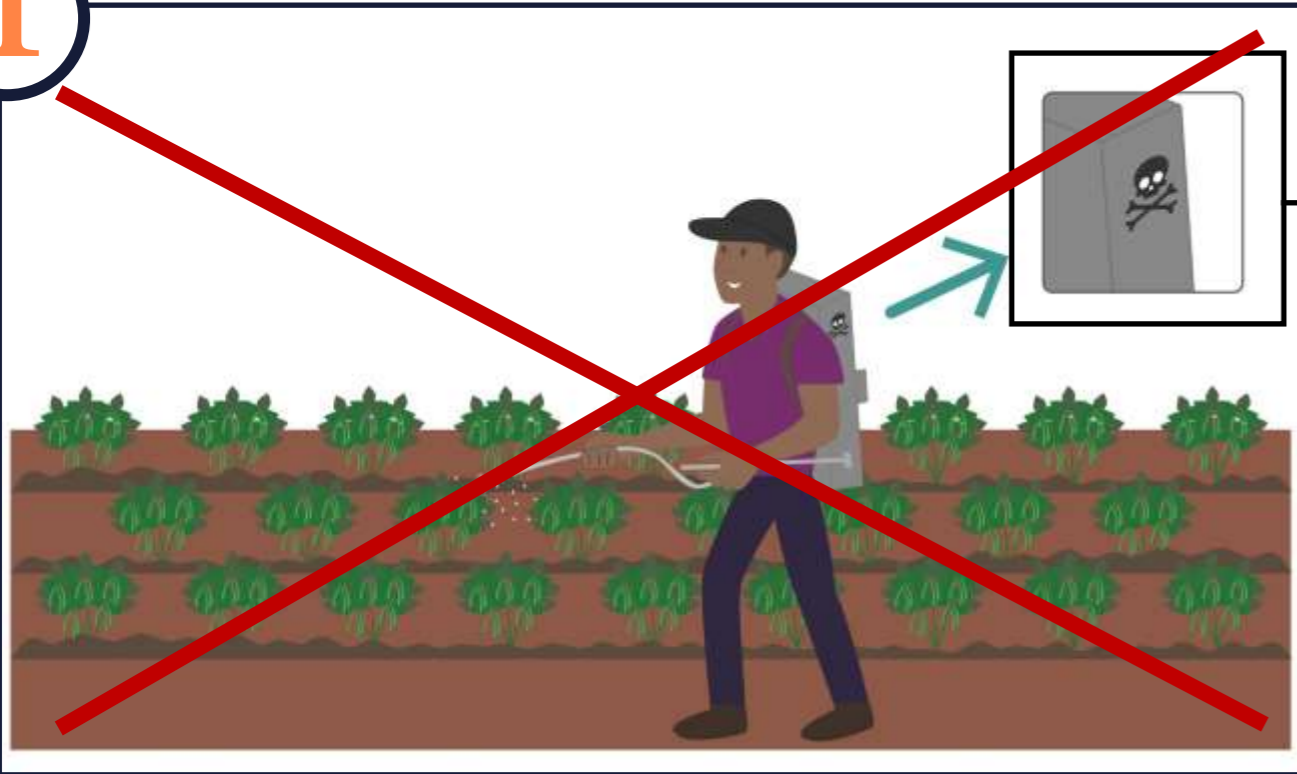


* Why we cover the Soil

- ⊕ **It reduces high temperatures** to support populations of **microorganisms** (This are small living organisms one cannot see with the eye). They cannot survive when it is too hot.
- ⊕ **Allows the rain water to enter the soil slowly** without damaging the surface thereby **supporting plant growth**.
- ⊕ **It reduces weeds. Weeds compete with crops** for what they need to grow. The dead plant matter will transform into natural fertilizer.

THINGS WE SHOULD AVOID TO PROTECT OUR LIVING SOIL

1



Why we reduce chemical fertilizer !



Less power of our Soil

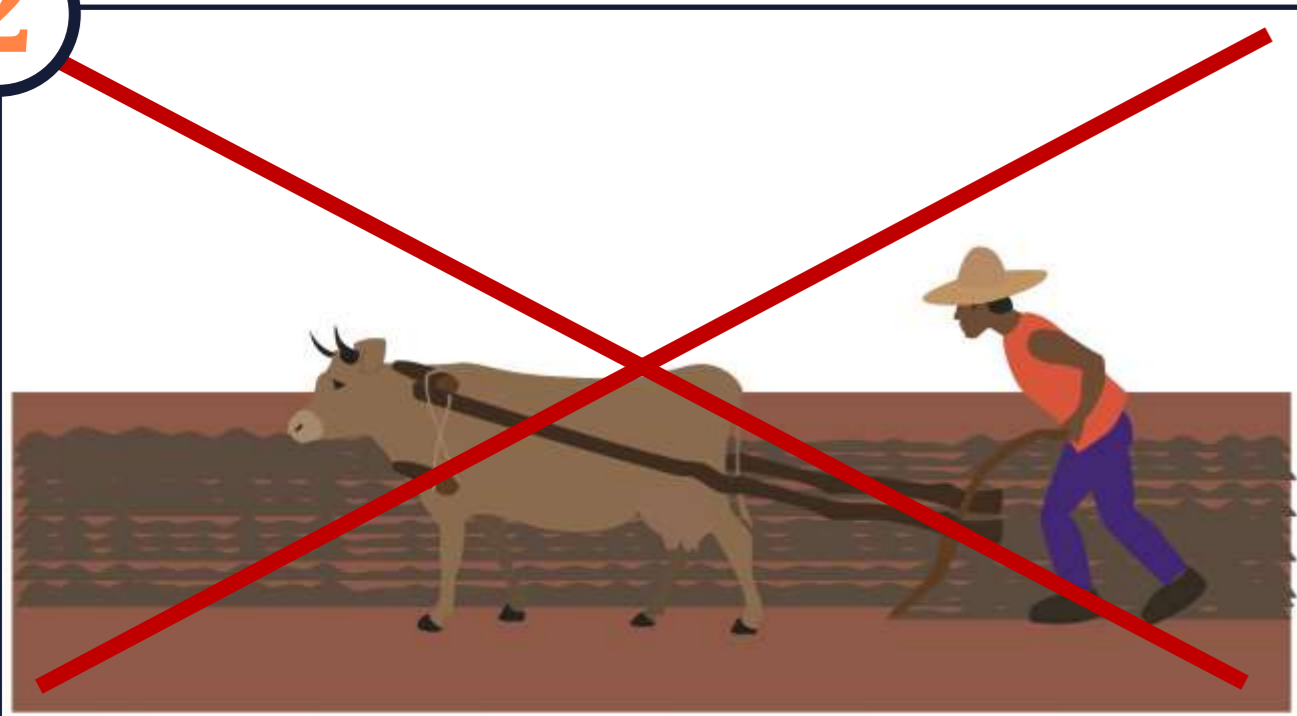


Less money input needed



Less living organism die

2



3



THINGS WE SHOULD AVOID TO PROTECT OUR LIVING SOIL



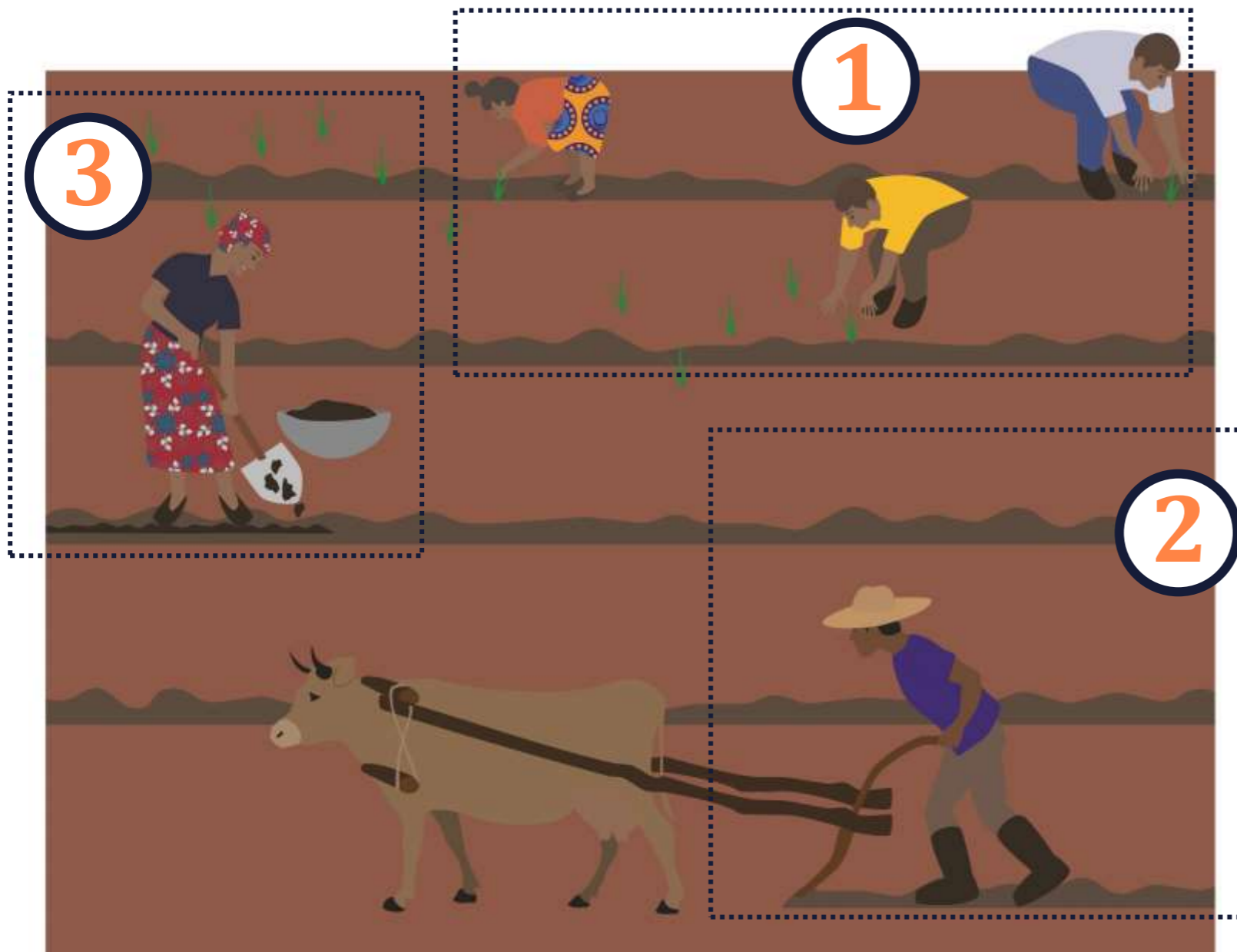
Task for the trainer:

- 1) **Make it clear, that the crossed out section means “we do not do it”**
- 2) **Discuss the Pictures**
 1. **Reduce the use of chemical Fertiliser***
(Do not use much chemicals, including fertiliser on your field. But apply organic matter such as compost and manure)
 2. **Avoid maximum tillage of the land**
(Avoid ploughing the land, which exposes the soil to too much heat, wind that can carry soil nutrients away, and can kill the living organisms in the soils - we encourage permanent ridges)
 3. **Avoid burning crop residues**
(Do not burn crop residues because they protect the soil against wind, heat and erosion. Also the burning kills small beneficial organisms.)
- 3) **Ask question**

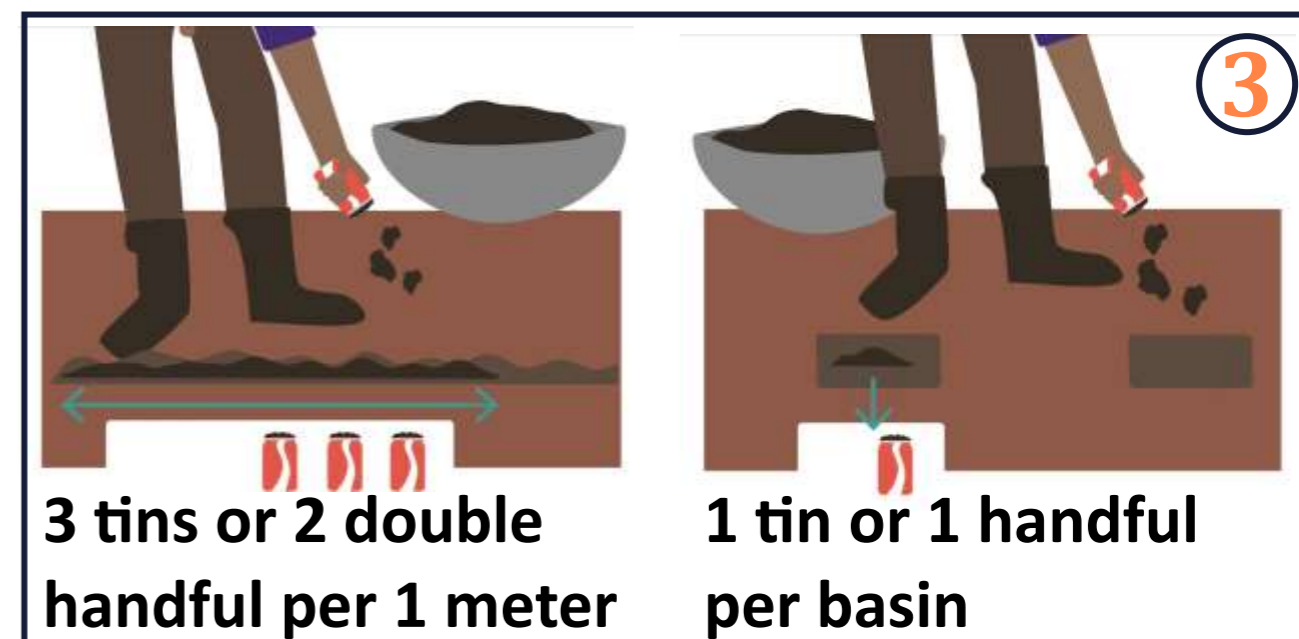
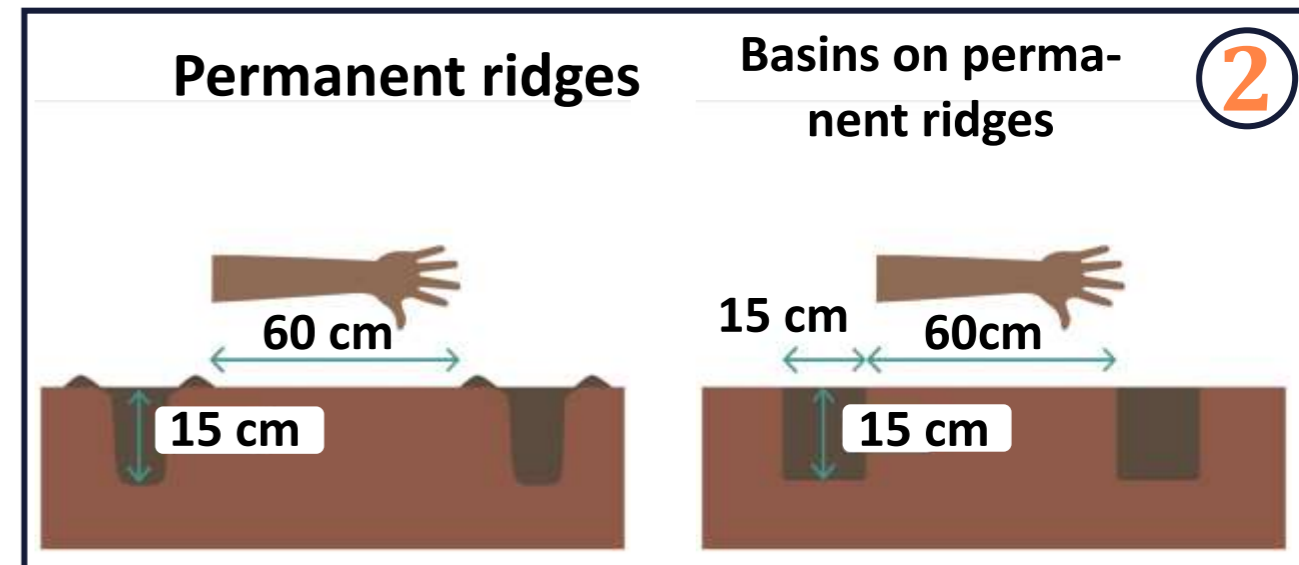
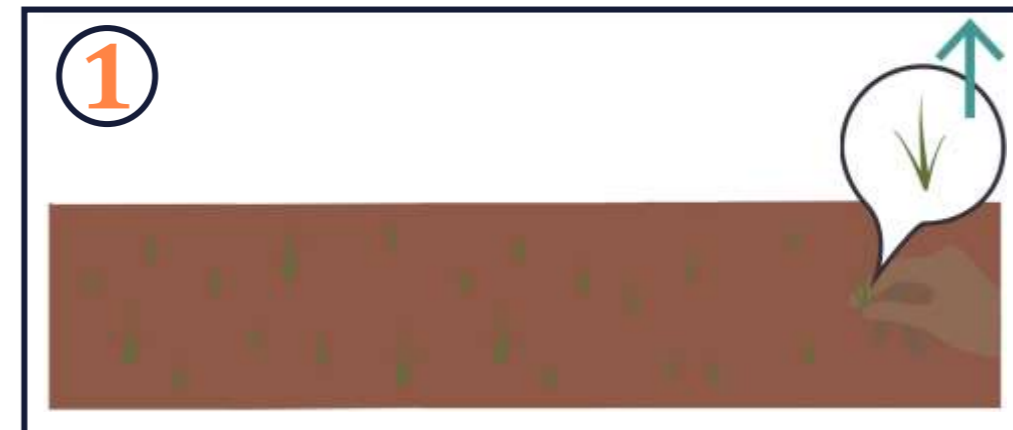
*Why we reduce chemical Fertiliser

- ⊕ If chemical fertilizers are used over a longer period, the soil might need **regular input to support normal plant growth.**
- ⊕ Chemical fertilisers are **expensive**. The **money** we spend on them could be **utilized for something else.**
- ⊕ **Excessive use** of chemical fertiliser can **kill small beneficial organisms** that our soil needs to support crops.

LAND PREPERATION



Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
									☪	☪	☪



LAND PREPARATION



Task for the trainer:

1) Discuss the calendar

(Emphasize, that the fields should be prepared to allow the **harvest to take place after the main rains have past**. The normal growing period of Mbereshi Beans is 80-85 days. Times can vary according to the variety and need to be adjusted to rainy season.)

3) Discuss pictures

1. Clearing of the field

(Keep the fields free of weeds before preparing ridges. Weeds compete with crops for what they need to grow. Weeding can be done **by hand or using tools**)

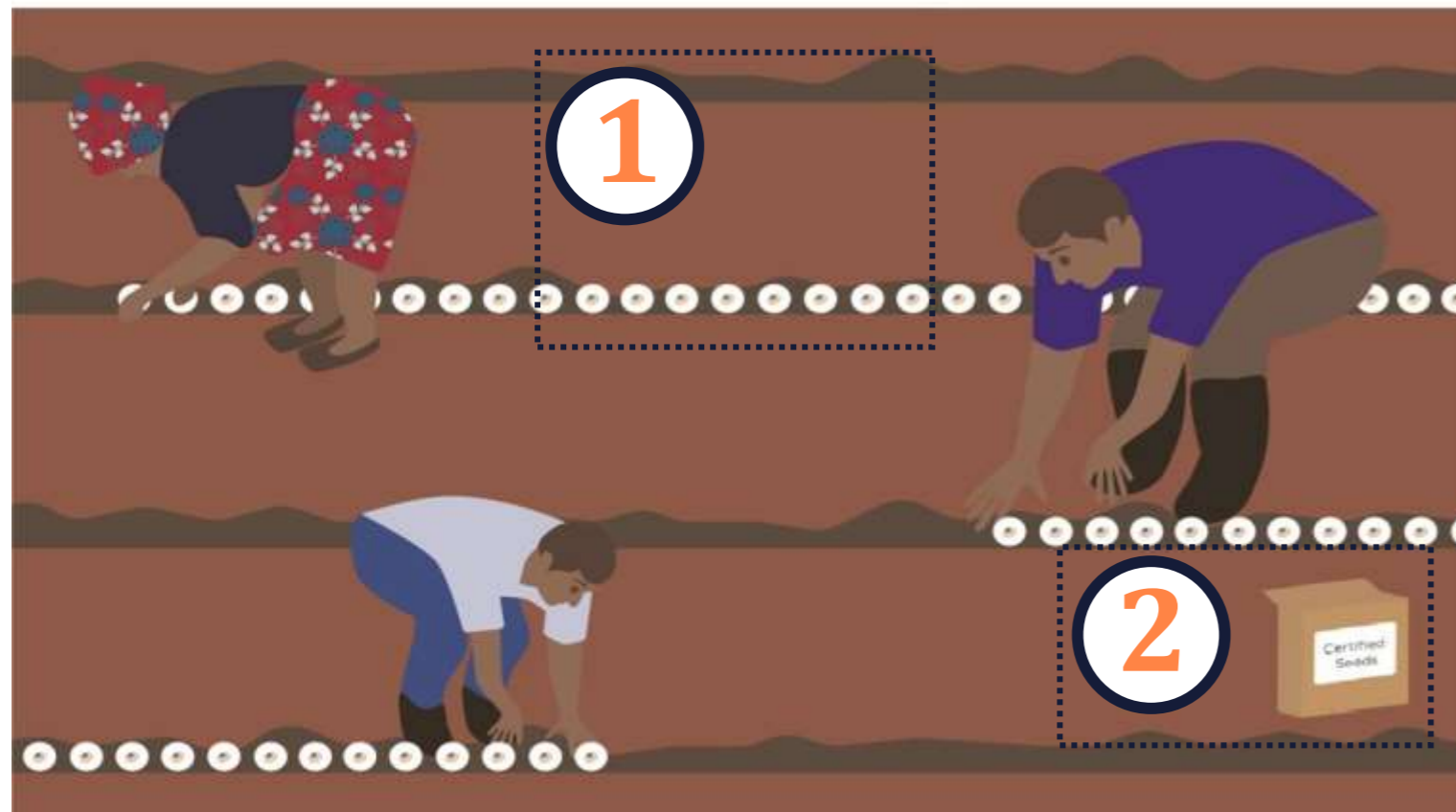
2. Making permanent ridges or basins on ridges


(Make permanent ridges or basins on the ridges. **Rielines and basins are equally suitable for growing Mbereshi Beans**). For the first farming season, permanent ridges that are made between January and February should be allowed to rest for the minimum period of 14 days before planting.

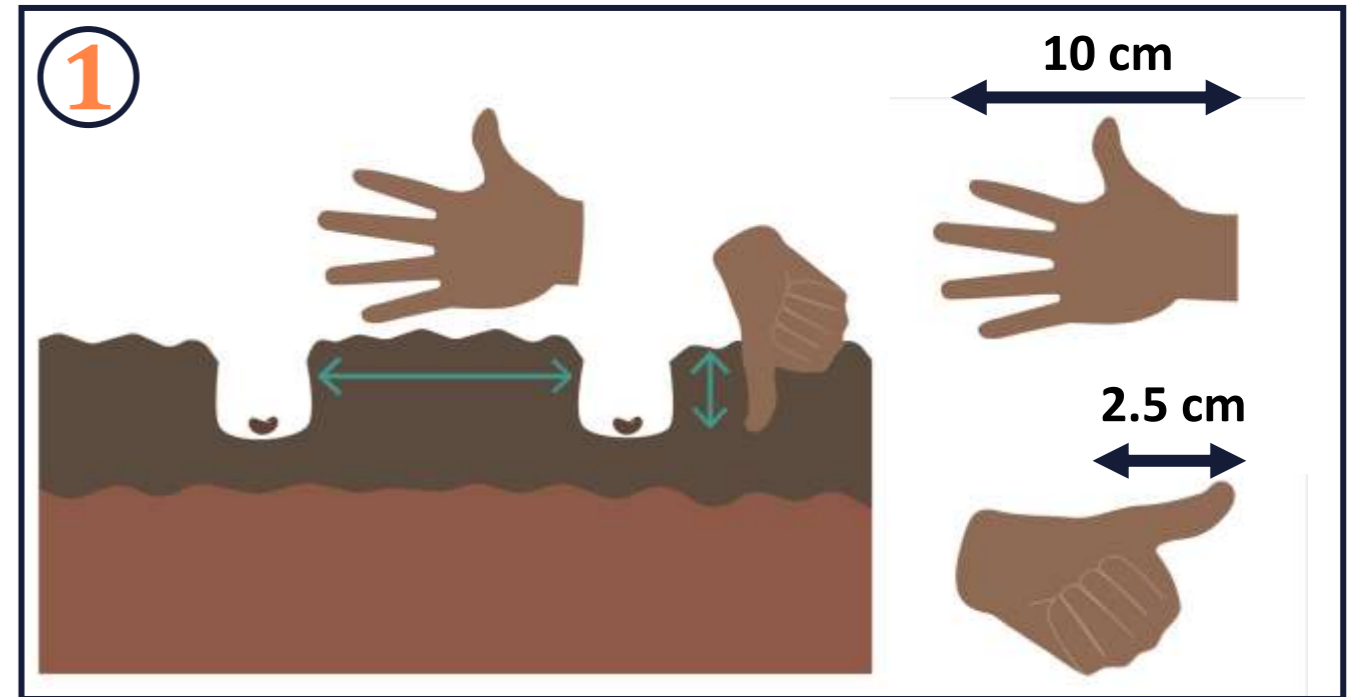
3. Applying compost and dry manure

(Apply compost or **dry** manure to the rielines or basins. Use **one double handful per basin [one full soda tin]** or **three double handful in rielines [3 tins] per meter**)

PLANTING



Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
											



PLANTING



Task for the trainer:

1) Discuss calendar

(Mbereshi Beans should not be grown in excessive water conditions or water logged areas because it increase the danger of diseases. Mbershi Beans has a slight tolerance to water logging. Mbereshi **Beans** can be planted during **effective rains** of the season. Times can vary and need to be adjusted to the rainy season)

2) Discuss pictures

(Select good seeds without holes or wrinkles for planting)

1. Spacing

(The seeds are spaced 10cm apart and planted 3-5cm deep with one seed per station - one seed only if you use certified seeds. One hand is approximately 10cm.)

2. Seeds

(Use certified seeds and plant one seed per station. **Use 15kg of seeds** per lima.

3) Demonstration

(Have every farmer prepare three planting holes. Discuss their choice regarding distance and deepness)

4) Ask question



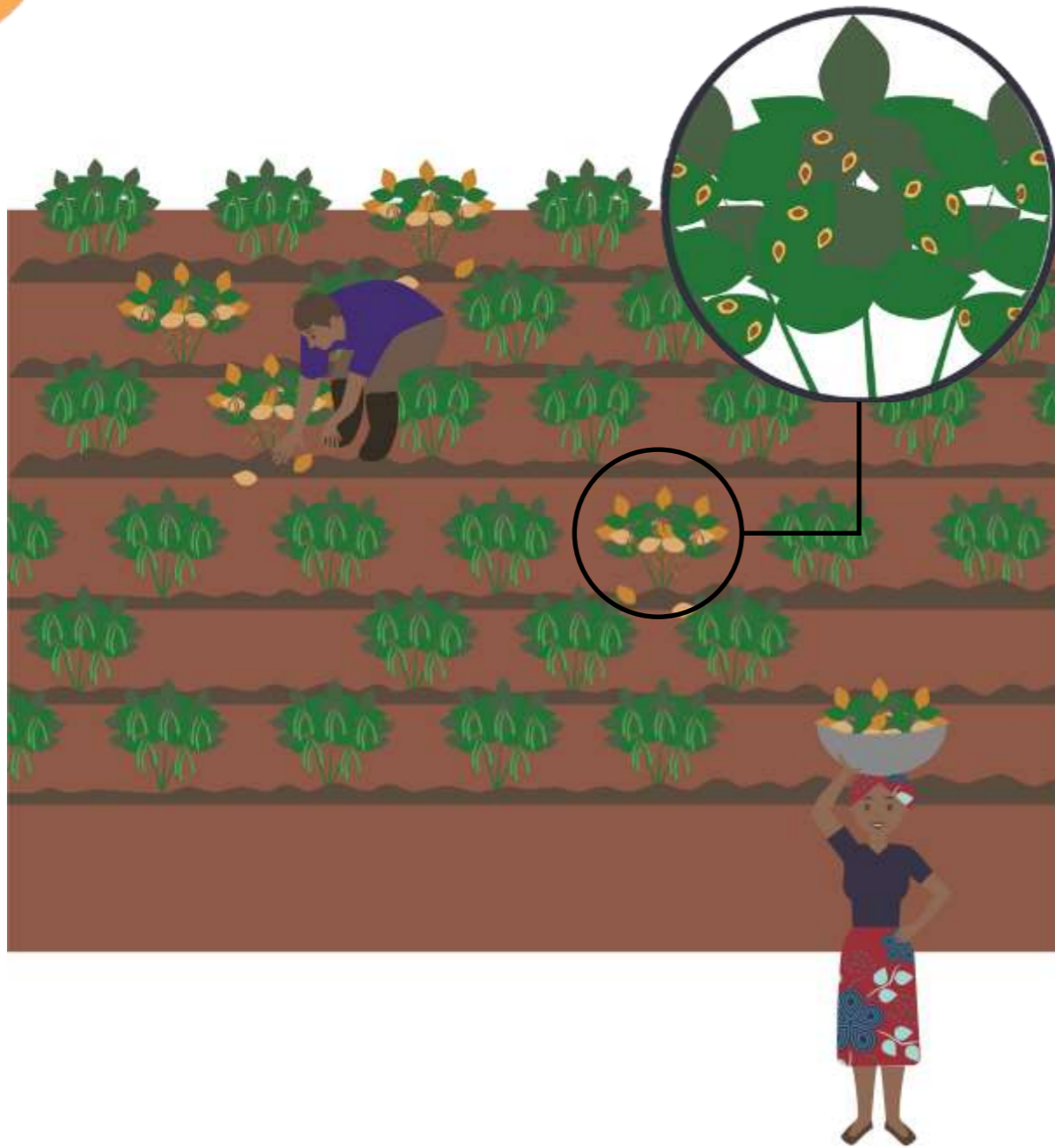
Introduce Intercropping

Intercropping

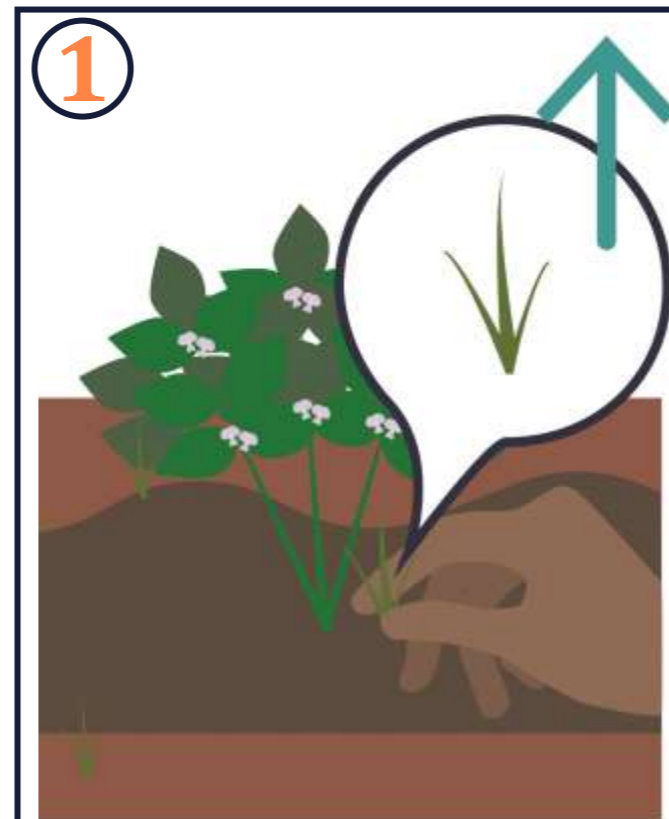


- ⊕ **As a cover crop Beans can be intercropped with maize, sorghum or millet.**
- ⊕ **Intercropping beans enhances soil quality, keeps moisture for your maize, sorghum or millet.**
- ⊕ **If intercropped, beans should be planted at about 4-6 weeks after planting maize, sorghum or millet with 20 cm between rows.**
- ⊕ **We do not intercrop with maize if we plant beans for seeds.**

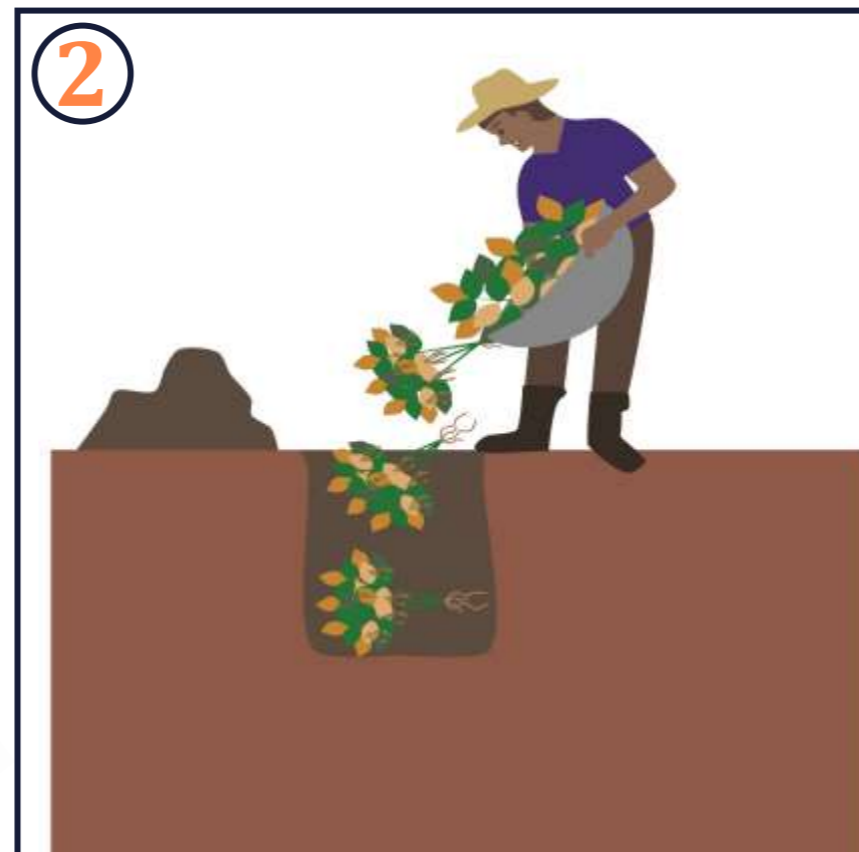
BEANS: PESTS, DISEASES AND WEED MANAGEMENT



Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

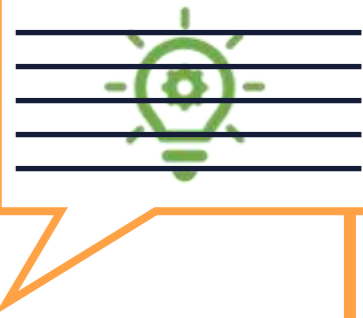


After Planting	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
1st Weeding						
2nd Weeding						



After Planting	Check
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	

PESTS, DISEASE AND WEED MANAGEMENT



Task for the trainer:

1) Discuss the calendar

(During the **whole time** while the plants grow, you need to observe the fields to ensure the crops are healthy. Remove diseased plants as soon as possible)

2) Discuss the pictures

(Diseased plants can be identified by various signs – mostly on the **leaves or stems**)

1. Weeding

(Weeding should be done regularly. To avoid dropping of flower buds you should do **hand weeding** during **flowering stages** rather than using a tool. Weed control reduces competition for nutrients, water and sunlight)

2. Diseased and infested plants

(Shortly after the germination, during flowering stage, after the first pods show and during dry spells, beans is most affected by pests. Diseased plants need to be removed with their roots **immediately**. They should be buried **away from the fields**. If kept close to the fields or garden they might **infect healthy plants** even when buried.)

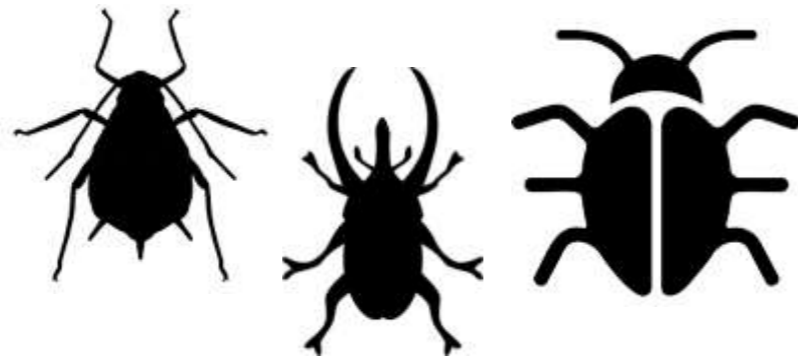
3) Ask question

IDENTIFICATION AND MANAGEMNT OF PESTS AND DISEASES

Common Pests

Mbereshi Beans is very attractive to insects. The main pests during the growing season are:

1. Aphids
2. Pod sucking bugs
3. Blister beetle
4. Bean stalk borer
[Stem maggot]



Note: Regular scouting of the field is important for identification of Pests and diseases.

Practice crop rotation, companion planting, mixed cropping and regular weeding to avoid pests. Natural substances can be used in addition:

- ⊕ Tephrosia
- ⊕ Chilli powder
- ⊕ Tobacco snuff
- ⊕ Moringa tea/powder
- ⊕ Garlic powder
- ⊕ Neem/Eucalyptus tea

Signs of diseased plants



Angular leaf spot: Small greyish-brown spots at the leaf veins. In severe cases, the leaves turn yellow and drop prematurely.



Rust: Reddish-brown spots in the upper and lower leaf surface, stems and pods.



Common bacterial blight: Water-soaked lesions on leaves. The lesions enlarge and merge.

Stem rot: Often observed in waterlogged areas. The disease infects the stem. **Anthracnose:** Sunken lesions on the pods

IDENTIFICATION AND MANAGEMENT OF PESTS AND DISEASES



Task for the trainer:

1) Discuss common pests

(Ask about the different pests and experiences the farmers have. Explain that farmers should **always** keep an eye on their plants. Pests can come at any time but for beans, the **most dangerous** times are **after planting, shortly before flowering and during dry spells**. Explain that **controlling pests** by one or two applications of **substances** is often necessary - most of the natural substances are applied by mixing them with water. Discuss the ratio with your Camp Officer.)

2) Ask the farmers about their experiences with organic pest control

3) Discuss common diseases

Diseased plants can be identified by various signs – mostly on the **leaves or stems**. Discuss **each picture** and highlight the **differences between the diseases**)

Diseased plants

(Diseased plants need to be removed with their roots immediately. They should be buried away from the fields. If kept close to the fields or garden they might infect healthy plants even when buried)

NOTE: Establish the botanical garden as a source of herbal medicines to use for pests and disease management

4) Ask question

HARVESTING & POST HARVEST HANDLING



Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	☘	☘	☘	☘							

2

!
Screen out

Branches

Sick legumes

Husks

Leaves



HARVESTING AND POST HARVEST HANDLING



Task for the trainer:

1) Discuss the calendar

(The harvest should be done when the pods are **fully mature** - when pods turn brown and the leaves start dropping off. With Beans a **second or third harvest is possible** to ensure we get the beans when they are fully ripe and dry. **Do not uproot** the plants, because the little balls around the roots [nodules] contain elements that farmers usually apply to the soil through chemical fertilizer [Urea]. Leaving bean roots in the soil saves money on fertilizer for the next crop.) Delayed harvesting encourages weevil infestation and shattering in the field.

2) Discuss the pictures

Screening

(To sort out good and clean beans by grading, **use your hands or a mesh**. Screen out any foreign matter like little branches, leaves, sick beans or husks)

Winnowing

(Clean the beans and **separate them from chuffs** through winnowing)

3) Ask question

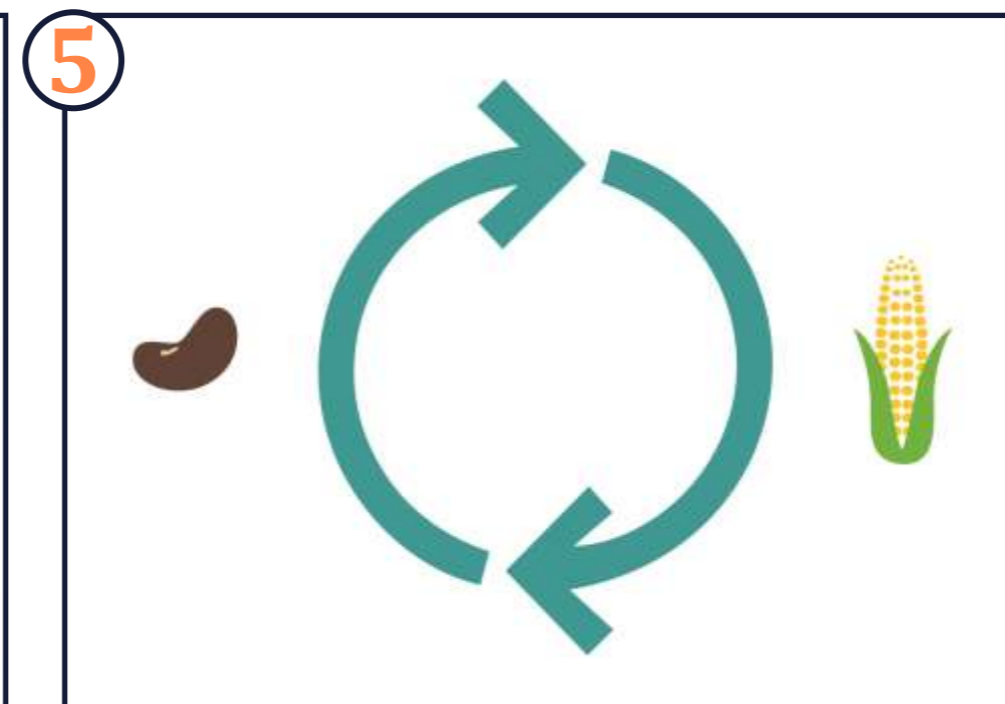
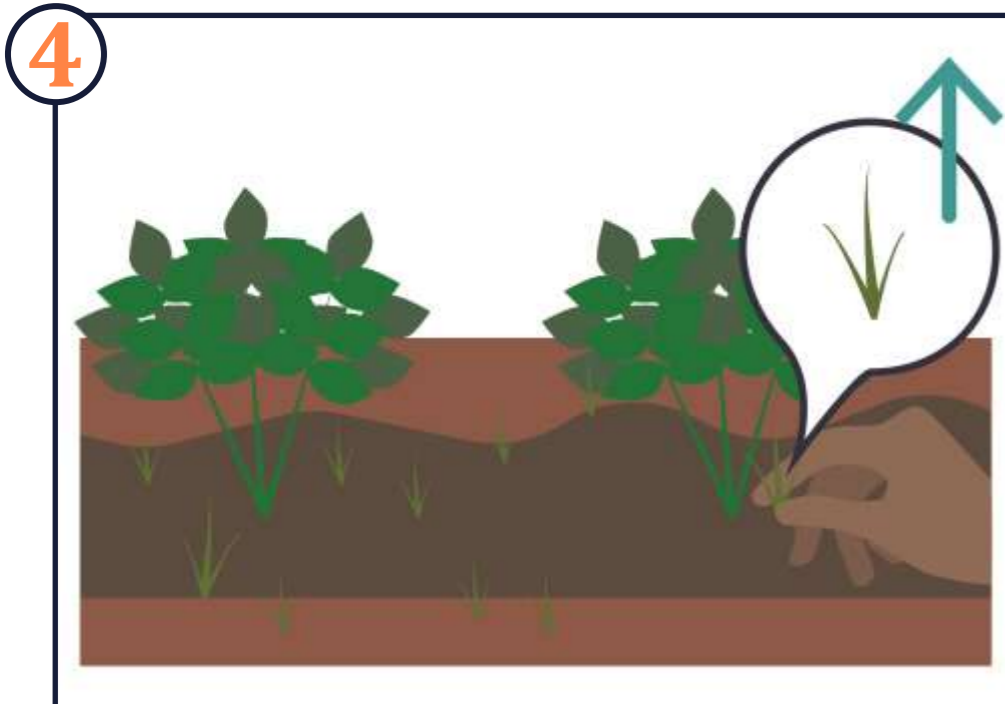
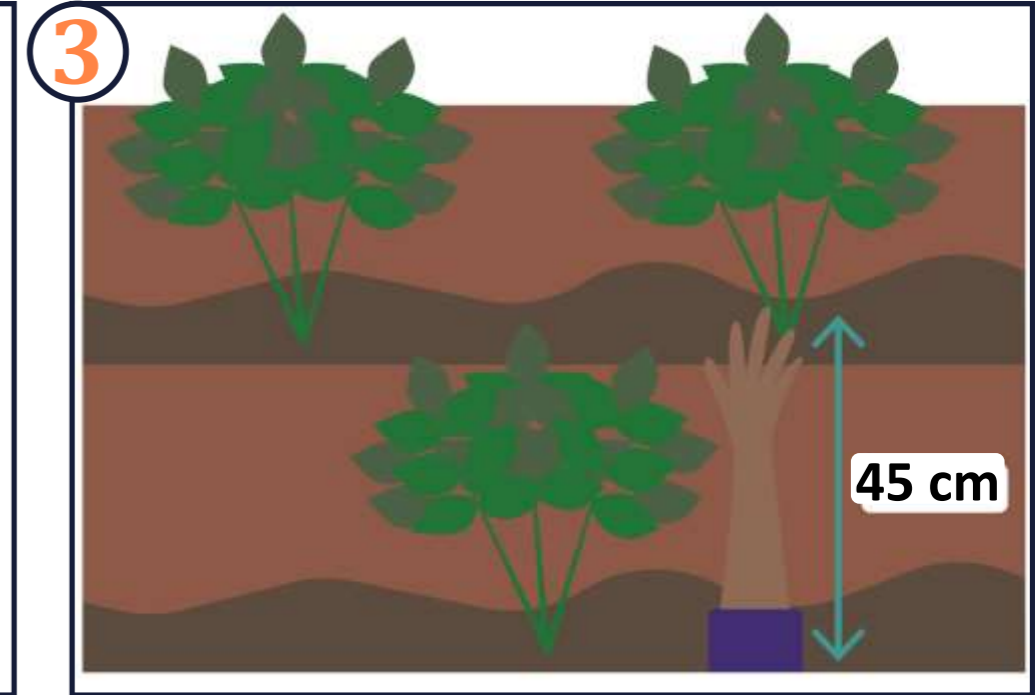
TIPS FOR HIGH YIELDS



2

Jul	Aug	Sep	Oct	Nov	Dec
					Q
Jan	Feb	Mar	Apr	May	Jun
Q					

A calendar grid showing months from July to June. A 'Q' (representing a seed) is placed in the December cell and the January cell.



TIPS FOR HIGH YIELDS



Task for the trainer:

1) Discuss the pictures

1. Plant **certified seeds**. Certified seeds are tested by the government for best plant growth and quality.
2. Plant beans in January and February. **Times can vary and need to be adjusted to rainy season.**
3. Plant in rows **60-75cm apart** to leave enough **space for plant grow**. Also leave 10 cm space between the plants.
4. Keep the fields **free of weeds**: They compete with crops for what they need.
5. **Rotate your Mbereshi Beans with other crops**, (e.g. Cereals and Tuber Plants). Beans add some elements to the soil that farmers usually apply through chemical fertilizer (Urea). This will benefit your maize next year.
6. To ensure high yields for the **next year, always keep the best Mbereshi Beans for replanting** after the harvest. **You can replant for max three seasons.**

2) Ask question

STORAGE

1



2



Is Beans as well dried? The Salt Test



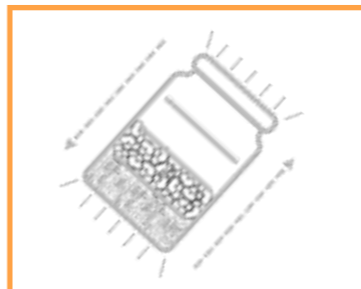
Use a clean dry jar, salt and a sample of the dried seeds.



Fill the salt into the jar.
(up to a quarter)



Add the sample of beans into the jar. (up to half)



Close the jar, shake it and let it settle for about 10 minutes.



Check if no salt is stuck on the sides of the jar.

STORAGE



Task for the trainer:

1) Emphasize long-term benefits

Dried beans seeds can be stored up to 8 months. Beans leaves can also be preserved by adding salt water and keeping the vegetables in a clean and air tight container for future home consumption especially in the dry season when vegetables are scarce.

2) Discuss the Pictures

1. Drying

(After separating the Bean seeds from the chuffs and diseased plants, dry them in the shade and not under direct sunlight - sunlight drying would increase the moisture reabsorption that can lead to molds and insect damage during storage. Regularly clean them and remove dust and other foreign matter. Use the salt test* to check if they are sufficiently dried)

2. Use airtight packaging material

(Store the Beans on a raised platform in clean and dry containers. You can use airtight polythene bags, plastic buckets or bins)

3) Ask question



* The salt test

Beans should be dried before storage. Assess the moisture with the salt test.

- ⊕ To check if the jar is dry, use one table spoon of salt in the empty jar and shake it. The salt should not stick to the jar.
- ⊕ Fill the salt into the jar (up to a quarter).
- ⊕ Add the sample of Beans into the jar (up to half).
- ⊕ Close the jar, shake it and let it settle for about 10 minutes.
- ⊕ Check if the salt is stuck on the sides of the jar. If damp salt is stuck on the sides of the jar, the beans are still too moist.

REPLANTING FROM CERTIFIED SEEDS



The embryo should be visible



No cracks should be visible



No signs of diseases or pest attacks

Store seeds for the next season



Select the best Beans produced from certified seeds for replanting

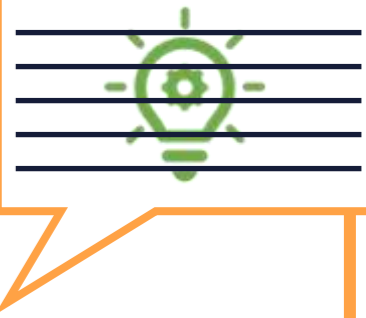


Store in a cool place. High temperature might damage the seeds



Use fully filled airtight containers - regularly check the seeds

Replanting from certified seeds



Task for the trainer:

1) Emphasize problems in relying on seed supplies

2) Emphasize that seeds can be replanted

- Explain that if the Bean seeds from certified seeds are selected and stored carefully, they can be **replanted for three years** before losing too much germination power (**Mention germination test**). To continue getting high yields, it is better to buy new certified seeds after this period

3) Discuss the importance of proper storage techniques.

- Select **dry beans** to avoid the baby plant inside the seed getting rotten
- Use **airtight** containers to suffocate insects that have been overlooked

4) Discuss how to identify the best beans to be kept as seeds for replanting next season

- The **embryo** should be clearly **visible**
- The beans should **not have cracks or holes**
- **No signs of diseases or pest attacks** should be visible

4) Ask question

* Storage

The main factors determining the storage life of seed are the Humidity, moisture content and temperature. Therefore:

- ⊕ Dry the seeds before storing (use salt test to check moisture).
- ⊕ Select the best Beans for long time storage.
- ⊕ Store the beans in airtight container on a raised platform.
- ⊕ Use a cool place for storage.
- ⊕ Regularly check the seeds and sort out any infested or diseased seeds. If you do not sort out these seeds you might lose all stored seeds.

THE GERMINATION TEST FOR RECYCLED SEEDS



- Plant 100 seeds (10x10)
- One seed per hole
- Each hole should be 2cm deep
- The holes should be 2 to 5 cm apart

- Cover the seeding holes with sand or soil
- Water constantly but not too much - keep the seeds moist but not wet
- Ensure birds and other animals do not eat the seeds

- Check after nine days
- Count the seedlings
- Calculate the percentage (80 seeds out of 100 planting holes = 80 percent)

The germination test for recycled seeds



Task for the trainer:

1) Why do we do the germination test?

1. Avoid re-sowing in case the seeds have not germinated (Re-sowing is expensive - Labor and additional seeds)
2. Avoiding yield losses (The germination rate has impact on your yields - 60% germination means only 60% of the planned yield)
3. Use the right amount of seeds for your cultivated area - don't use too much seeds but only the amount you need
4. Allow to adjust planning in case the seeds do not germinate well - if the germination rate is too low you can plant other seeds

2) When do we do the germination test?

The germination test should be conducted at least a month before planting to allow an adjustment of plans in case the test the germination rate is too low

3) Viability test

Put the seeds in a dish containing water and allow them to settle for 5-10 minutes. Remove the seeds that float. Collect, dry and keep the seeds that sink.

4) Ask question



Germination Test



- You can use a protected place in your garden or a container filled with soil and a hole to allow water to drain off. **Plant 100 seeds in 10 rows with 10 seeding holes.** The holes should be 2 cm deep and at least 2 cm apart. Use random seeds from different parts of your stored bags of cowpeas. Cover the seeds with sand or soil and water regularly (moist but not wet). Make sure, animals will not eat the seeds because this would give wrong results. After nine days, check how many seeds germinated. Count the seeds and calculate the percentage (15 germinated seeds = 15%, 60 germinated seeds = 60 percent, 85 germinated seeds = 85%).
- For beans seeds the germination rate should be **higher than 80 percent** but can go down to 70 percent after one or two years. If the result of the germination test is lower, we use more seeds during planting and therefore, we should buy new seeds to compensate for the decreased quality. **(If the germination is lower than 70%, you are advised to buy the certified seeds.)**

Mbereshi Beans Production

A manual for trainers

(Why, Where, What, When & How)



**EAT HEALTHY
EAT DIVERSE
EAT DIFFERENT
FOOD GROUPS**

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Sources

The Better Life Book, COMACO, 2018; Beans Production Guide, ZARI, 2018;
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