



Principles of Vegetable Production



By Dr Guy Stubbs



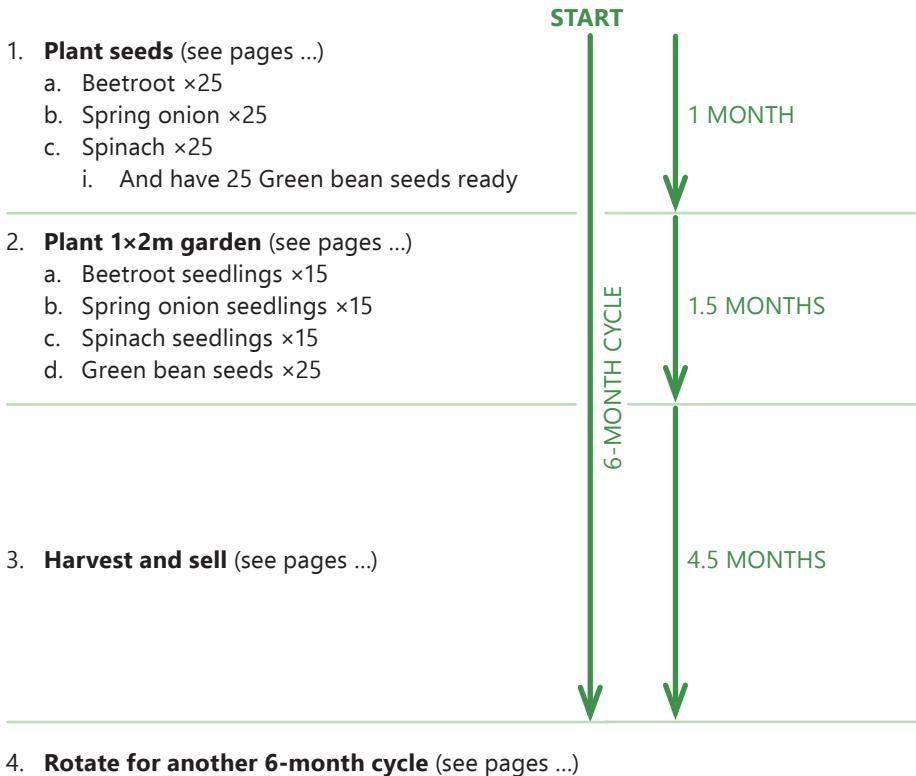
Introduction

This manual is designed for facilitators to teach vegetable-growing principles using a simple 1×2 metre garden. The lessons focus on practical, hands-on methods that rural villagers can use to grow healthy vegetables efficiently. Key principles include loosening the soil without turning it, measuring and spacing plants accurately, applying water and nutrients directly to each plant, and mulching to retain moisture, control weeds, improve soil fertility, and prevent erosion.

Rotation planting – alternating leaf, fruit, and root vegetables, including nitrogen-fixing crops like beans and peas – supports soil health and helps manage pests naturally. Facilitators can use this garden to show group members how careful, consistent care leads to better harvests and stronger, more resilient gardens.

Once these principles are understood it is easy to scale up the size of the gardens.

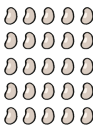
Production Plan – 1×2m Vegetable Plot



Business Plan for Selling Vegetables from 1×2m Garden

Buy seeds and seedlings	
25 bean seeds	5.00
15 spinach seedlings	5.00
15 beetroot seedlings	5.00
15 spring onion seedlings	5.00
Total	20.00

green beans



spinach



beetroot



spring onion



= 20.00

Plant them, nurture them and then harvest



4 bunches
of green beans



16 bunches
of spinach



2 bunches
of beetroot



2 bunches
of spring onions

Sell your harvest		
4 bunches of green beans	20 ⁰⁰ each	80 ⁰⁰
16 bunches of spinach	15 ⁰⁰ each	240 ⁰⁰
2 bunches of beetroot	20 ⁰⁰ each	40 ⁰⁰
2 bunches of spring onion	20 ⁰⁰ each	40 ⁰⁰



4 bunches of green beans 16 bunches of spinach 2 bunches of beetroot 2 bunches of spring onions

= 400⁰⁰



Cost of seeds and seedlings	-20 ⁰⁰
Income from selling vegetables	400 ⁰⁰
PROFIT	380⁰⁰

Seedlings – Simple Ways to Plant Seedlings

Why This Matters – Starting seedlings the right way helps your family grow healthy food, save money, and improve your soil.

This guide shows three easy methods to plant seeds using simple materials found around your home or village.

1. Using 2-Litre Plastic Bottles

Instructions:

1. Cut the plastic bottle in half (horizontally). Keep the bottom half for planting.
2. Use a nail or sharp knife to poke 3–5 holes in the base for drainage.
3. Fill the bottle with the recommended soil mix, leaving 2–3cm from the top.
4. Make holes to plant seeds at the correct depth. Leave enough space, depending on the size of the plants.
5. Plant 2–5 seeds and gently cover them with soil.
6. Water lightly to keep the soil moist.
7. Place the pot in a shady area (not in direct sun all day).
8. When the seedlings are 10–15cm tall or have 4–6 leaves, use a tablespoon or similar tool to scoop them out with soil and roots intact.

Tip: Using two spoons helps keep more soil around the roots and protects them from sun and air.

You Will Need:

- Empty 2-litre plastic bottles
- A knife or nail to poke holes
- Soil mix (see “Soil Mix Tip for All Methods”)
- Seeds
- Water

Cut the bottle in half.

Make holes in the bottom.

Make holes in the soil.

Plant seeds.

Tip: Record the correct depth and spacing for future planting.

Cover the seeds with soil.

Water lightly.

2. Using Rolled-Up Leaves (Natural Seed Tubes)

Instructions:

1. Roll a leaf into a tube approximately 5–8cm wide.
2. Secure the rolled leaf using twine, strips of bark, or strong grass to maintain its tubular shape.
3. Fill the tube with the recommended soil mix and press it down gently.
4. Plant seeds at the appropriate depth.

Tip: Record the depth for the future.

5. Stand the tubes upright in a tray or shallow hole to keep them stable.
6. Water lightly to keep the soil moist.
7. When the seedlings are 10–15cm tall or have 4–6 leaves, carefully unwrap the leaf, keeping the roots and soil intact, and plant the seedling into the ground.



You Will Need:

- Large, strong leaves (banana, pumpkin, or maize)
- Twine, strips of bark, or strong grass
- Soil mix (see *"Soil Mix Tip for All Methods"*)
- Seeds
- Water



Support the tubes to keep them upright.

Note:

Avoid planting the seedling while still wrapped in the leaf. Fresh leaves added directly to soil can disrupt the carbon-to-nitrogen ratio, potentially causing **nitrogen drought**, which can harm crop growth.



3. Planting in Raised Beds with Mulch

Instructions:

1. Loosen the garden soil and mix in the recommended soil mix to enrich it.



You Will Need:

- A cleared garden space
- Soil mix (see "Soil Mix Tip for All Methods")
- Mulch (e.g. straw or coarse dry grass)
- Seeds
- Water

2. Mark rows or spaces according to the plant type.
3. Plant seeds at the correct depth.

Tip: Record the correct depth and spacing for future planting.



4. Add a thick layer (5–10cm) of mulch to cover the garden bed.
5. Water lightly to keep the soil moist.
6. After 3 weeks, remove the mulch to give seedlings more space and light.
7. When seedlings reach 10–15cm or have 4–6 leaves, carefully lift them using a spoon to transplant. Using two spoons can help keep soil around the roots and protect them from exposure.

Cover with straw mulch to protect the seedlings for the first 3 weeks.



Tips for Seedlings

1. Soil Mix Tip for All Methods

A good soil mix helps plants grow strong. Here's a simple method:

- Use 2 parts compost (look at pages ...) or natural compost – or soil collected from under trees (especially under Acacia or similar nitrogen-rich trees).
- Mix with 1 part river sand or other material that improves drainage and airflow.



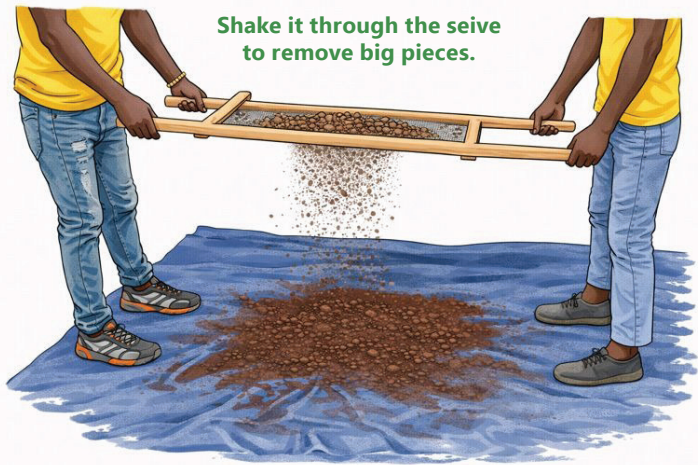
Collect compost on a bag. Use the bag to move the compost to your sieve.



This mixture:

- Holds moisture so roots don't dry out.
- Provides nutrients for strong growth.
- Prevents waterlogging and root rot.

Shake it through the sieve to remove big pieces.

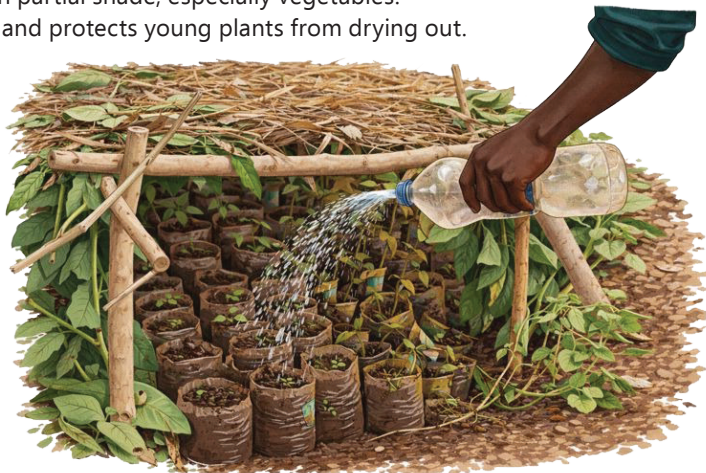


2. Shade Tip for Seedlings

Seedlings often do better in partial shade, especially vegetables. Shade keeps the soil moist and protects young plants from drying out.

How to make shade:

- Use tree branches, coarse grass, or straw placed above or around the seedling area. You can also grow seedlings in dappled shade from a tree or beside a building to block harsh sun during the hottest part of the day.



Use grass and leaves to shade your seedlings.

3. Ongoing Care for Your Seedlings

- Water when needed in the early morning or late afternoon.
- Protect seedlings from animals using simple fences or sticks.
- Remove weak seedlings to give strong ones room to grow.
- Remove weeds that compete for water and nutrients.
- Transplant when seedlings are 10–15cm tall or have 4–6 leaves.

Tips:

1. Using **mulching** reduces the need to water every day.
2. Make a **watering bottle** by using a sewing needle and poking small holes in a 2-litre bottle lid. This creates a gentle spray that won't harm seedlings.



Note: Sewing needle-sized holes works well for seedlings, but for vegetables use a thicker nail.



4. Helpful Community Tips

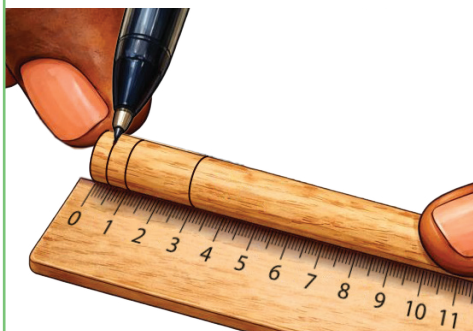
- **Use what you have.** Bottles, leaves, dry grass – all are useful.
- **Share or sell extra seedlings** with your VSLA group or neighbours.
- **Good compost** often comes from under Acacia or Albizia trees (high in nitrogen).
- **Avoid compost** made from eucalyptus or black walnut leaves – they may harm seedling growth.
- **Test compost** by planting a few seeds before using it on many.

5. For Family and Group Use

- Use this manual to teach group members.
- Show others how to start seedlings using simple, cost-free methods.
- Keep a seedling corner in your yard or centre so families can grow vegetables easily.

Tip:

Mark your planting stick so that you can easily make holes to the right depth.



Extra Tip – Mini Greenhouse:

Place the top half of the bottle over the plant like a mini greenhouse for the first 2 weeks to hold in warmth and moisture.

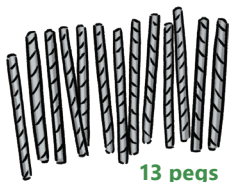


Remember to remove the bottle cap to allow air circulation.



Making a 1×2m garden

Supplies you will need



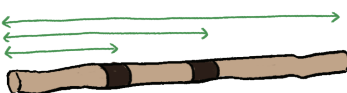
13 pegs



13 pegs – 20cm long.

Use plastic conduit, hard wood, steel or small plastic bottles filled with sand.

37.5cm
20cm
10cm

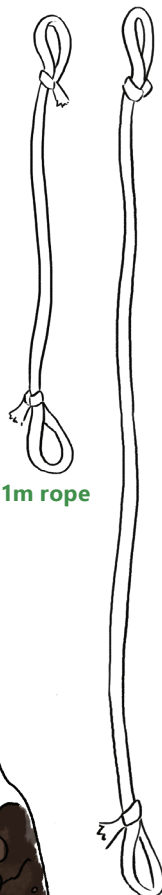


measuring stick



Two measuring ropes

One 1m long and one 2m long, with loops tied on both ends.



1m rope

2m rope



Measuring stick

37.5cm long.



matchbox



book or
newspaper



planting
stick



Matchbox



Planting stick – rounded on one end.



A large book or piece of newspaper



wood ash



Wood ash – 500ml.



Compost – 6 litres or 1 plastic shopping bag.



compost



Dry grass or leaves – 5 plastic shopping bags.



Seeds and seedlings from your seeding plan to have ready:

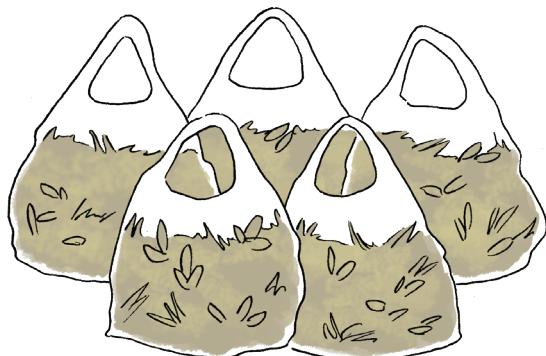
- 25 green bean seeds
- 15 spinach seedlings
- 15 beetroot seedlings
- 15 spring onion seedlings
(Note: 5 plants per seedling for spring onion)



25 seeds



15 seedlings of each
(with 5 plants per seedling)



dry grass or leaves

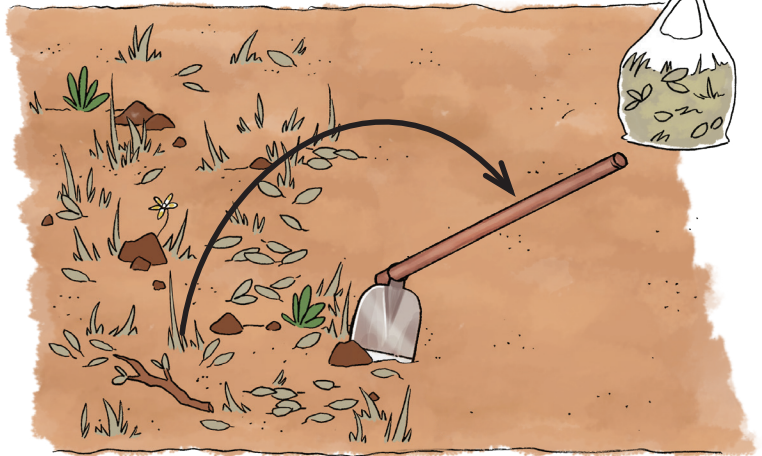
Preparing your garden (Plan)

1. Clear the ground

We start our gardens by clearing the ground so that there are no stones, grass, or weeds to stop the vegetable seedlings from growing big and healthy.

Keep any dry leaves or grass that you clear in your plastic shopping packets so that it can be used for a mulch "blanket".

Dry leaves can be used for mulch.



Patch with weeds, stones, and debris.

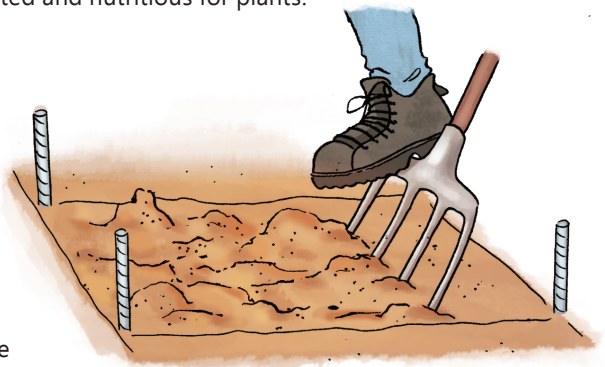
Cleaned patch.

2. Loosen in a roughly 1.5×2.5m space (Important: do not plough or turn the soil)

Now, you must loosen the soil by pushing a garden fork into the ground. Do not turn the soil because turning can upset the environment for micro-organisms, worms and other insects, that help keep the soil aerated and nutritious for plants.

You can loosen the soil by:

1. Water the area well.
2. Take your garden fork and push it 30cm into the ground.
3. Pull the fork back slightly so that the soil loosens.
4. Repeat these actions until all the soil in your garden is loose.



Loosened but not turned.

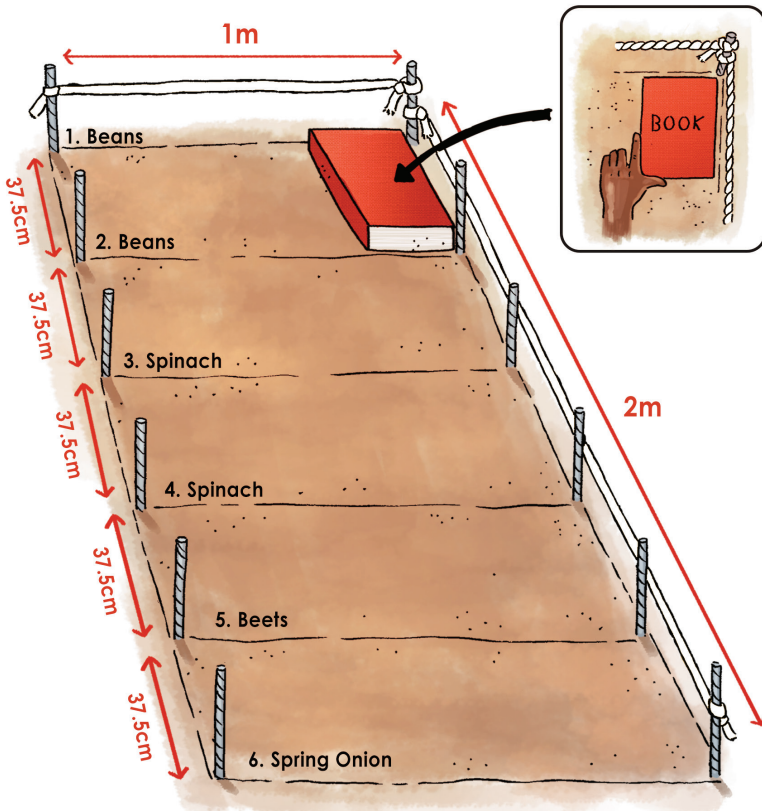
3. Measuring your plot accurately

(Make/take measurements to know where to plant)

Use your ropes, measuring stick and a book to make even rows for your vegetables. Pegs can be used to mark where one row starts and ends.

To make a 1×2m garden, you can measure as follows:

1. Use the 1-meter rope to measure the width of the garden.
2. Use the 2-meter rope to measure the length of the garden.
3. Place pegs at the end of each rope to mark the area of your garden.
4. Use a book or folded newspaper to make a square. Start by placing the book in one corner of the garden, making sure that the longest side of the book is next to the longest side of the garden.
5. Place a peg at the bottom of the book.
6. Repeat steps 5 and 6 until you have 5 rows in your garden.
You should have 12 pegs in the ground.

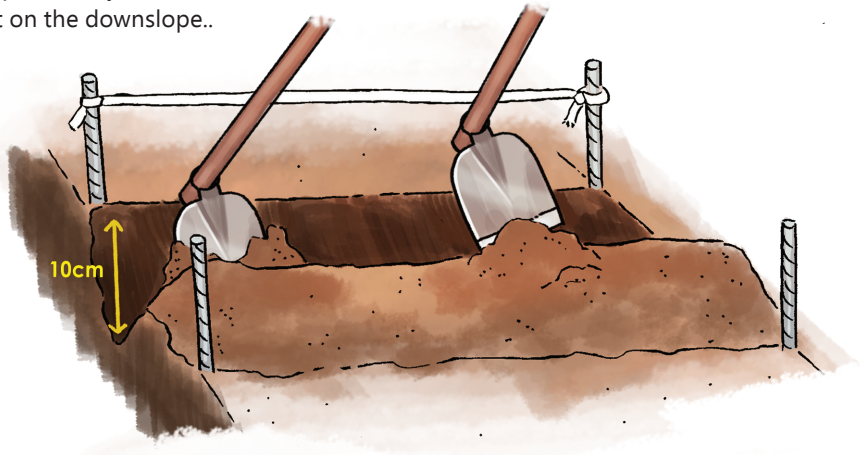


4. Dig furrows

To prepare the soil for planting you need to dig furrows along the rows you marked.

To dig furrows, you must:

1. Use your hoe to dig a groove/furrow for each of the 6 rows.
2. Dig them about 10cm deep at an angle to form a triangle shape in the ground.
3. Heap the soil you remove from the furrow next to it on the downslope..



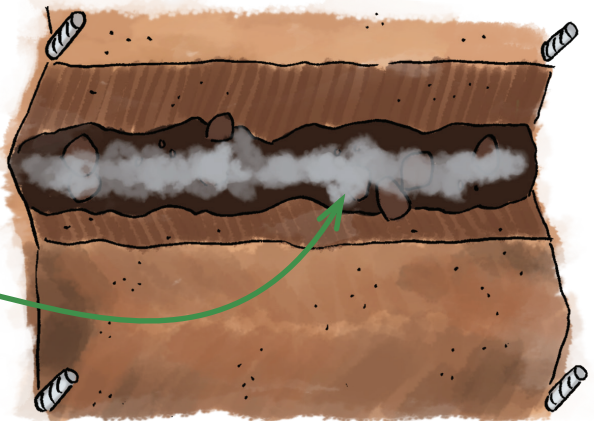
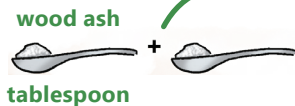
5. Add wood ash and compost/manure to the soil

i. Use wood ash to balance the pH of the soil

Add wood ash to the soil during the first two years to help reduce acidity. When soil is too acidic, important nutrients like phosphorus, calcium, and magnesium become harder for plants to absorb, which can weaken the roots and harm helpful soil organisms.

To add wood ash to your garden, you must:

1. Evenly spread two tablespoons of wood ash in each furrow.



ii. Add nutrients/food to the soil using compost or dry kraal manure

Add compost to feed the soil with nutrients – compost is best, but dry kraal manure also works. We need healthy soil to grow healthy plants. Minerals we get from compost and dry manure help to enrich the soil so that it is very healthy.

Keep in mind that beans and peas help add nitrogen to the soil, which makes it healthier for other plants.

To add compost/manure to your garden, you must:

1. Add one litre of compost/dry manure (two porridge bowls) in each furrow.

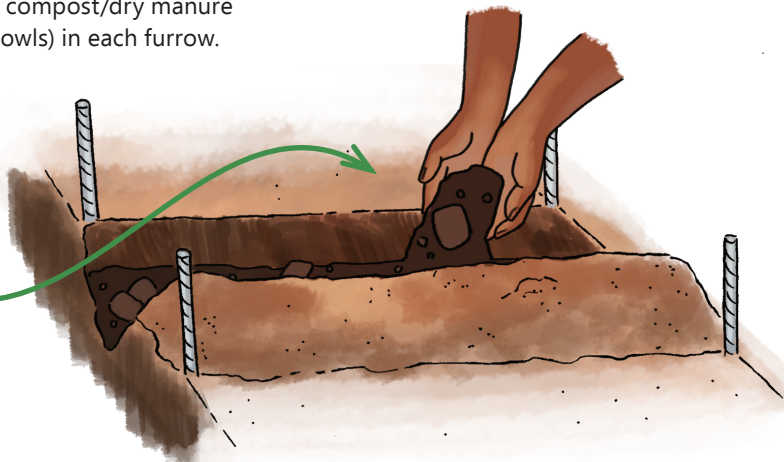
compost/
dry manure



+



porridge
bowl



2. Cover the wood ash and compost/manure and with soil and fill the furrow.
3. Pat the soil so that it is all flat and level.



Plant your garden

6. Water the soil before planting (Not less, not more)

Do not flood your garden because too much water can drown seeds and the roots of seedlings. Too little water won't quench the thirst of the plants.

Water the soil just enough so that the water runs into the soil and moistens it to at least 6cm deep.

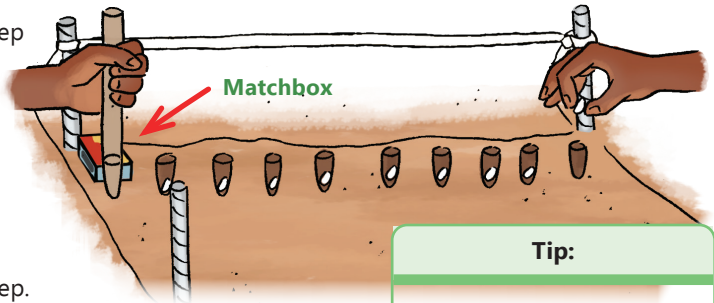
6cm



You can make your own waterer from waste.

Plant Bean Seeds

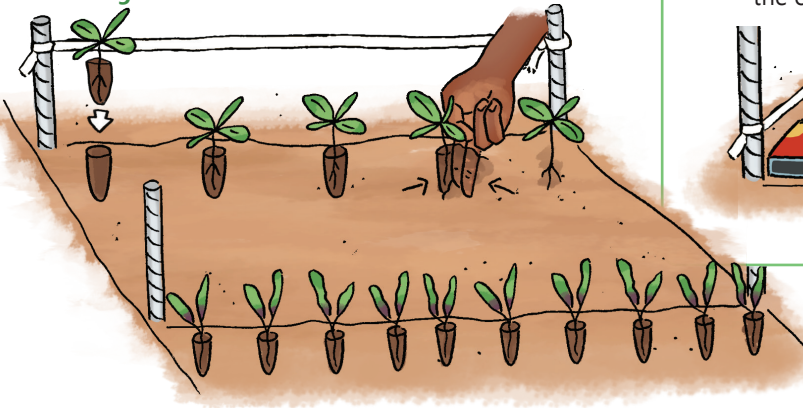
- Push in holes 3cm deep and 10cm apart.
- Plant 10 seeds per row and cover lightly with soil.



Plant Seedlings

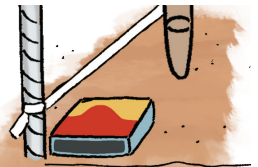
- Push in holes 6cm deep.
- Plant 5 spinach per row, 20cm apart.
- Plant 10 beetroot/spring onion per row, 10cm apart.

Gently push the soil around the seedling making sure there is no air below the roots.



Tip:

Use a matchbox to measure the distance from your measuring rope to plant your seedlings and bean seeds directly over the compost.



7. Put the mulch around the holes for the seeds and seedlings

This helps stop water evaporation (water loss) and helps stop weeds from growing.

Use old, dried leaves and grass to make a "blanket" that is about 5cm thick. Do not cover the plants with the mulch but place it around the plants.

This helps stop water evaporation (water loss) and helps stop weeds from growing.



Leave the plants open until each plant has 5 leaves, then tuck the mulch around them.

Care for your garden

8. Weed the plot

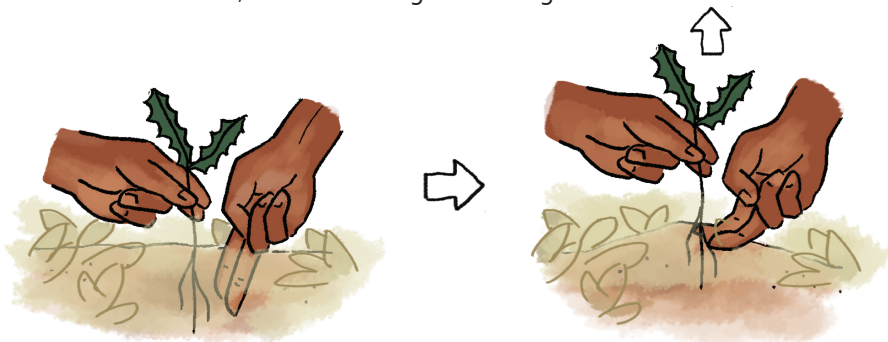
This will make sure that the weeds do not compete with the crops for nutrients/food.

Weeds have no purpose in a vegetable garden and can do more harm than good.

Make sure you pull the roots of the weeds out, too. If you leave a root behind, the weeds can grow back again.

Note:

Keep on topping up your mulch so that weeds cannot grow.



Make sure you get the roots out.

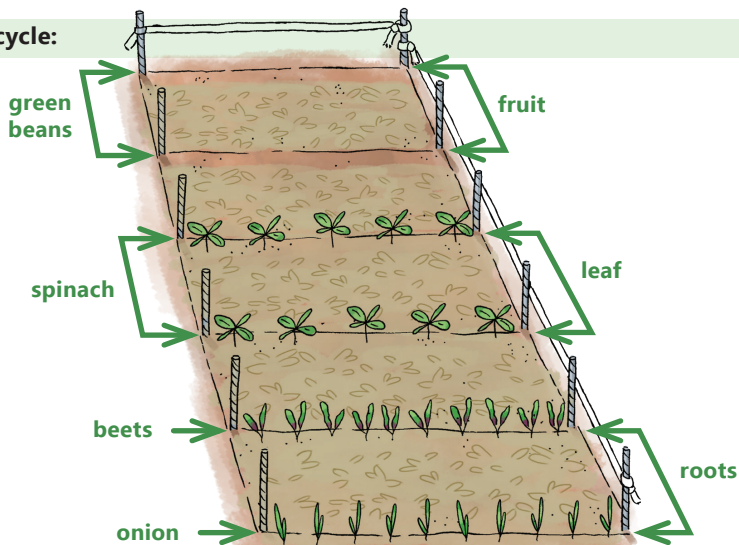
9. Practice crop rotation

(For example, for the crops to benefit from Nitrogen left in the soil by beans/peas.)

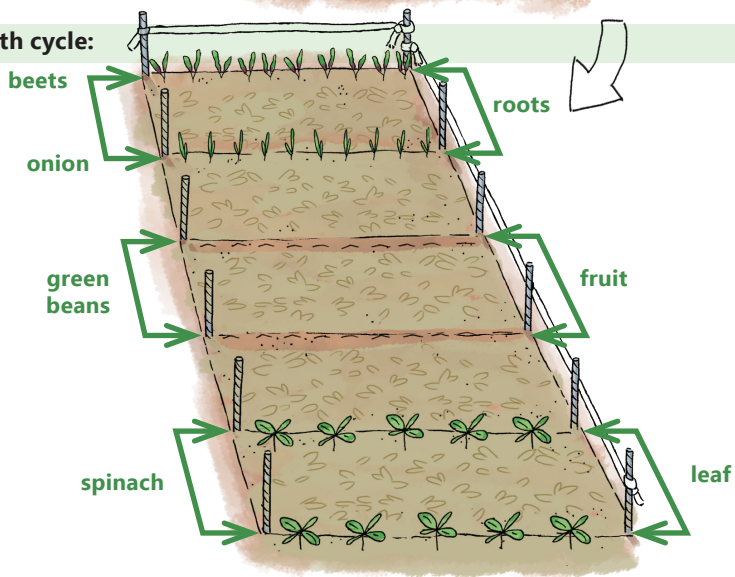
Grow seeds and seedlings in soil that has been used to grow other vegetables. This will help to keep the soil healthy and full of food for the new seedlings.

Also, where onions have been, insects will not go.

i. First 6-month cycle:



ii. Second 6-month cycle:



10. Take care of crops

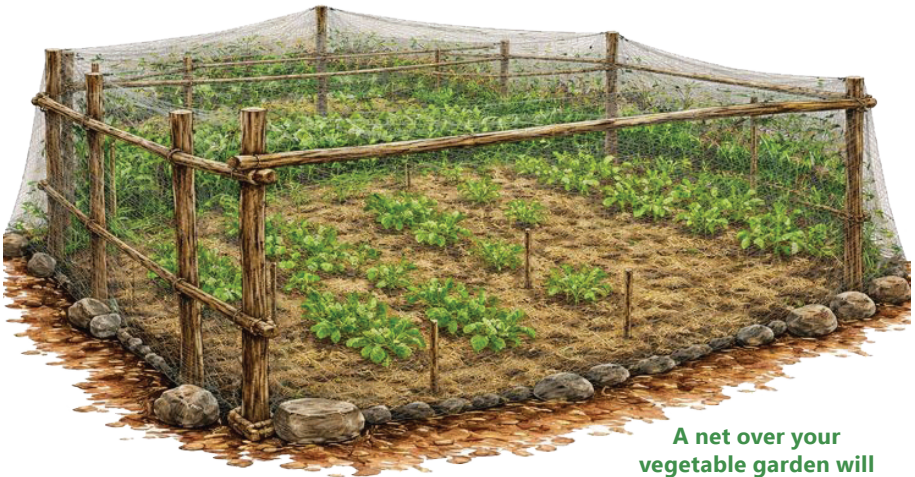
Against things like Frost/Black Frost, pests or animals.

If you want to, you can build a fence around your garden to keep pests and animals out.



Different fence ideas you can use for your vegetable garden.

Some people also place thin cloth or shade cloth over their vegetables to keep them safe from frost in winter. Covering your vegetables will also protect them from hail and chickens.



A net over your vegetable garden will protect it from frost, hail and birds.

Composting

*For Family Groups – Using Local, Natural, and Affordable Materials.
Part of Sustainable Vegetable Growing*

1. What is Compost?

Compost is plant and animal waste that has broken down into dark, crumbly material that looks like rich soil. This happens when small living organisms like bacteria and fungi break it down.

Compost is natural fertiliser that helps plants grow well.

Compost helps to:

- Feed your vegetables and crops
- Improve poor soil
- Hold water in the soil
- Reduce pests and diseases
- Lower the need for chemical fertilisers
- Grow strong and healthy plants

Compost is often called “black gold” because it improves soil health in the long term, enhances water retention, and reduces input costs.



**Compost that is ready
to be used.**

2. Why Make Compost?

- It's **free** when using local waste materials
- **Improves crop harvest**
- **Reduces input costs**
- **Lasts long** in the soil
- **Reduces pests and diseases** over time
- **Safe for people, plants, and the environment**

3. What You Need to Make Compost

You need **3 or 4 types of materials** plus **water**.

Type	Purpose	Amount	Examples
Nitrogen (Wet & Rich)	Heats the pile, starts breakdown	10% (15×50kg bags of manure)	Dry and mature cow, goat or chicken manure; OR legume leaves (beans, groundnuts, peas)
Green Materials (Sugars for microbes)	Helps breakdown	45% (about 8m ³)	Fresh leaves, soft grass, vegetable scraps, green weeds (no seeds)
Woody & Dry Materials (Air & Fungi)	Adds bulk, holds air	45% (about 8m ³)	Maize stalks and cobs, dry leaves, thatch grass, small branches, cardboard, sawdust
Water	Keeps compost moist	~200 litres per pile	Bucket water, not too much rain

4. Three methods of making compost

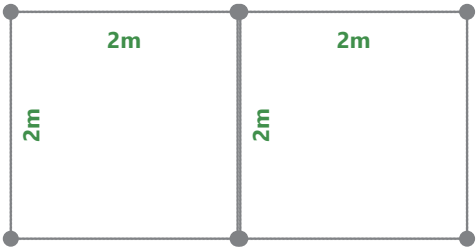
i. Pile Compost (6×2m Poles Forming Two 2×2m Squares, Layered Method)

Steps:

1. Place the 6 poles upright, 2m apart, to form two adjacent 2×2m squares.
2. In the first square, place a layer of green material.
3. Add a layer of dry material.
4. Add a layer of livestock manure.
5. Repeat the layers until the heap is about 2m high.
6. Water lightly to keep the heap moist.
7. Move the material into the second square when turning, and continue turning between the two squares until fully composted.

Materials Needed:

- 6×2m poles
- Green plant material
- Dry plant material
- Livestock manure
- Water



ii. Sunken Compost (Pit Method)

Steps:

1. Dig a shallow pit.
2. Add a layer of green material.
3. Add a layer of dry material.
4. Add a small layer of livestock manure.
5. Cover with a layer of soil.
6. Water lightly.
7. Repeat the layers until the pit is full.
8. Cover the top with soil and allow it to decompose.



Add layers of material to a pit and cover it to compost.

Materials Needed:

- Spade
- Green plant material
- Dry plant material
- Livestock manure
- Water
- Soil

iii. Worm Compost (Worms and Worm Juice)

Steps:

1. Place bedding material in the bottom of the container.
2. Add kitchen scraps in small amounts.
3. Add the worms.
4. Keep the contents damp but not soaked.
5. Allow the worms to break down the waste into compost.
6. Collect the compost and the liquid that drains out; dilute the liquid with water and use it as plant feed.

Compost
with worms.



A container with kitchen scraps and earthworms.

Materials Needed:

- Container with drainage holes
- Bedding material (dry grass, shredded paper, or leaves)
- Kitchen scraps
- Compost worms

5. When to Start Making Compost

Start collecting materials **after your crops create canopy cover** (weeding is done). This is the best time because there is **lots of green material available**.

Example: If you plant in November, start making compost in **February**. Finish by **April**. The compost will be ready for the next planting season in **October**.

How to make Pile Compost

1. Collect Materials

- Gather dry, woody, manure, and green materials separately. Use green materials within 3–4 days after cutting.

2. Soak Materials

- Wet each type of material before adding. This helps with moisture levels and fast breakdown.

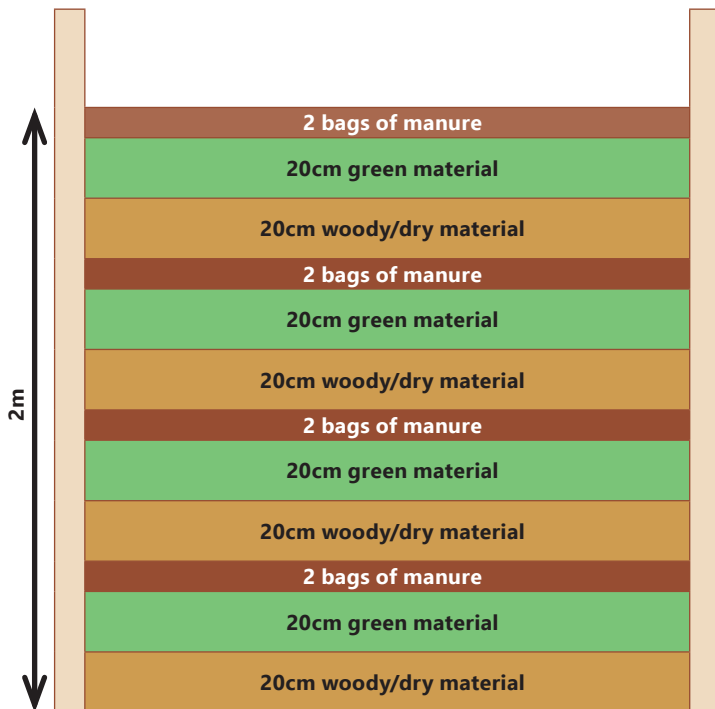
Gather materials:
green plant material.

Gather materials:
bags with
manure.

Soak
materials.

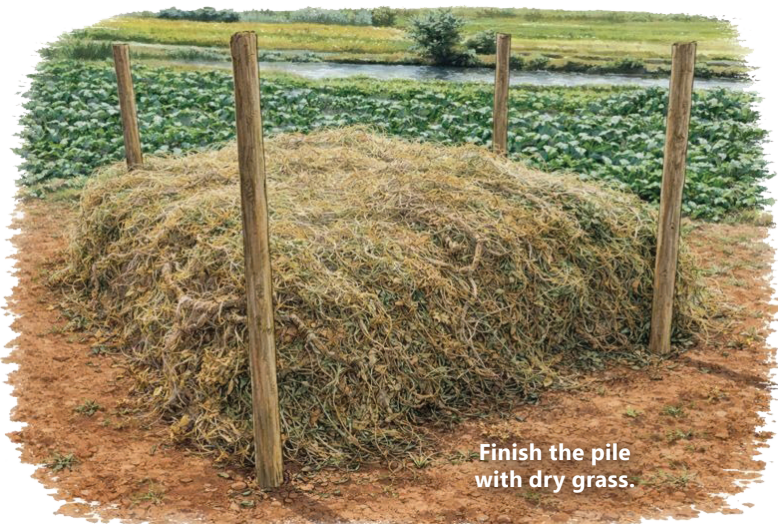
3. Build Layers

- Build the pile in repeating layers like this:
 - 20cm woody/dry material
 - 20cm green material
 - 2 bags of manure
- Repeat until 2m high
- Add water throughout (200L total per pile)



4. Finish the Pile

- Shape the top with a **slight slope** for water runoff
- Cover the pile with **dry grass or old grain bags** to protect from rain



Finish the pile with dry grass.

6. Turning the Compost

Turning is **mixing the pile** to:

- Control temperature
- Add oxygen
- Mix inside and outside materials
- Check moisture

Turning Plan:

- Turn every **3 days** for the **first 3 turns**
- Then every **10 days** for **next 2–3 turns**
- Total of **5–6 turns**
- Then stop turning



Turn the pile by moving it with forks, from the top down, to the empty 2x2m square next to it.

7. How to Know When to Turn

Use a **metal rod** or **stick**:

- Push it into the pile for **5 minutes**
- Hold it:
 - If you **cannot hold it** for 5 seconds – it's **too hot** (>68–70°C)
 - **Turn** the pile to cool it down

8. Checking Moisture

Squeeze a handful of compost:

Result	What it Means
Water drips	Too wet – add dry material
Falls apart	Too dry – add water
Holds shape, no drips	Just right (about 50% moisture)

9. Curing (Resting Phase)

After final turn:

- Let the pile rest for **4 months**
- Do not add or remove anything

Good compost is ready when:

- It is **dark brown or black**
- Has a **sweet, earthy smell**
- Is **crumbly like soil**
- You see **white fungal strands**
- Can be stored for years without losing nutrients

10. Group Work is Best

- Work in groups of 4–5 people
- Each person brings materials
- Help one another build and turn piles
- Saves time and builds teamwork

Tower Garden to Save Water

A tower garden helps rural families living far from water sources by using very little water while producing a steady supply of vegetables close to the home.

1. Building the Tower

1. Set up the frame

- Place the four poles in a square so each side is 1m apart.

2. Prepare the maize sacks

- Cut the maize sacks open so they lie flat.
- Tie the sacks onto the poles to form tower walls.

3. Fill the tower with soil

- Mix the soil according to the soil mix guidelines below.
- Fill the tower with the soil mix.

4. Make planting holes

- Cut holes along the sides, spaced 15–20 cm apart horizontally and vertically for side planting.

Materials Needed:

- 4 sturdy poles, 2m tall (set 1m x 1m apart)
- Rope or wire
- Maize sacks
- Soil ingredients: topsoil, compost, sand
- Vegetable seedlings or seeds
- 1 x 2-litre plastic bottle
- Small stones and coarse sand
- Mulch: teff straw, moss, or dried leaves

2. Soil Mix

A good soil mix should be light, nutrient-rich, and well-draining:

- 50% topsoil (bulk and minerals)
- 40% compost (organic matter and microbes)
- 10% coarse sand (improves drainage and reduces compaction)

Optional: A small amount of ash or bone meal to balance soil pH.



A tower garden.

3. Watering & Greywater Use

- Take a 2-litre plastic bottle.
- Cut off the base.
- Punch a few small holes in the lid and around the lid area.
- Fill the bottle with stones and coarse sand to make a simple filter.
- Place the bottle upright at the top of the tower with the cut base facing upward.
- Pour greywater (kitchen rinse water, not soap-heavy) into the bottle filter.
- Water will drip slowly into the soil, reaching all levels of the tower.
- Water every 2–3 days or when soil feels dry.
Mulch helps reduce how often you need to water.

4. Mulching

- Cover the soil surface with teff straw, moss, or dried leaves.
- Mulching reduces evaporation, keeps soil cool, limits weeds, and adds nutrients as it breaks down.

5. Planting Vegetables

- **Side planting:** Leafy greens (lettuce, spinach, kale), herbs, dwarf tomatoes, peppers, bush beans. Insert seedlings or seeds into the side holes and firm soil around the roots.
- **Top planting:** Root crops (radishes, carrots), strawberries, or larger vegetables like tomatoes or cabbage. Fruit crops (green beans and peas) can be planted on top.

Tip:

Keep leafy crops on the sides and fruiting or root crops on top for best use of space.

6. Nutrient Replenishment

Every 2–3 weeks, feed plants with:

- Compost tea (soak compost in water overnight, or use the tea from your worm compost, and pour around plants)
- Liquid manure (well-diluted before applying)

This keeps the soil fertile and helps the tower garden stay productive for a long time.

Mulching

Mulching means covering the soil around your plants with materials like dry grass, leaves, or crop residues. Mulch protects the soil from the hot sun, keeps moisture in the ground, and slowly adds nutrients as it breaks down.



Women adding mulching to seedlings.

One common concern with mulching is termites. Many people see termites as a problem, but in fact, they can help improve the soil. Termites prefer to eat dead organic matter, not living plants. They use this material to grow fungi underground, which is part of how they farm.



Termites carrying dead material.

If there isn't enough mulch, termites may move on to tender seedlings. The solution is simple: keep adding mulch regularly. As long as there is enough dead organic material, termites will stay busy with that and leave your vegetables alone. At the same time, the soil will become richer, softer, and more fertile.

In this way, termites are not just pests – they are workers in the soil, helping you improve your garden when you manage them correctly with enough mulch.

Natural Pest Control for Community Gardens

1. Cow Milk Solution

Controls: spider mites, caterpillar eggs, blights, mildews, mosaic virus

How to prepare

- Mix **100ml fresh cow milk** with:
- **900ml water** for disease control
- **1–1.6 litres water** for insect and mite control

Use:

Spray every **3 weeks** or when early symptoms appear.

2. Baking Soda Solution

Controls: fungal diseases

How to prepare

- **100g baking soda** in **1 litre water**
- Add **25–50ml dish soap**
- Add **25–50ml vegetable oil**
- Dilute into **16 litres water** (one knapsack)
 - For strong treatment: use **7–9 litres water**

Use:

Spray at first signs of fungal infection.

3. GGOC Extract (Garlic, Ginger, Onion, Chilli)

Controls: whitefly, aphids, mites, caterpillars

How to prepare

- **½ kg garlic**
- **½ kg ginger**
- **½ kg onion**
- **½ kg chilli**
- Grind to a paste and mix with **4–5 litres lukewarm water**
- Let stand **1 day**

Spray doses

- **Young crops:** 250 ml extract + 15 litres water
- **Older crops:** Double the extract + 15 litres water

Shelf life:

2–4 months; best used within 1 month.

4. Spray Timing and Coverage:

- Spray **before 10 am** or **after 5 pm**.
- Cover **both sides of leaves** well.
- Spot spraying is acceptable to save time and materials.

Comparison Chart

*Traditional Farming (Ploughing) vs.
Sustainable Farming (No-Till, Mulch & Crop Rotation)*

CATEGORY	TRADITIONAL FARMING (Ploughing Agriculture)	SUSTAINABLE FARMING (No-Till, Mulch, Rotation)
Soil Health	Breaks up soil structure but leads to compaction (plough pan).	Maintains soil structure; prevents compaction; improves aeration and root depth.
Water Management	Up to 90% rainwater lost as runoff; poor moisture retention.	Only ~6% runoff; mulch reduces evaporation; soil retains water better.
Planting Time	Delays planting; must wait for rain to till soil.	Allows immediate planting with first rain, using already-prepared beds.
Root Development	Shallow roots due to compaction and poor aeration.	Deep, widespread roots with better access to water and nutrients.
Soil Microbial Life	Disturbed by tilling; fewer beneficial organisms.	Protected by mulch and no-till; microbes thrive and recycle nutrients.
Weed Control	Requires herbicides or frequent weeding.	Mulch suppresses weeds naturally, reducing labour and chemicals.
Pest & Disease Control	Continuous cropping increases pest and disease buildup.	Crop rotation breaks pest/disease cycles naturally.
Fertilizer Use	High need due to nutrient loss from runoff and tilling.	Natural nutrient recycling via mulch and legumes in rotation lowers fertilizer needs.
Labor & Fuel Costs	High labour and costs use for ploughing.	Saves labour and costs – no need to plough each season.
Yield Consistency	Inconsistent yields, vulnerable to drought.	Improved drought resilience and more reliable yields over time.
Long-Term Yields	May decline due to soil degradation.	Yields increase significantly with time as soil improves (up to 20x over years).
Economic Stability	High input costs, vulnerable to weather shocks.	Lower input costs, higher long-term returns; more resilient to dry spells.
Environmental Impact	Soil erosion, water loss, and low biodiversity.	Conserves soil and water, enhances biodiversity, and builds sustainable ecosystems.



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