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02

Sustainable and Regenerative Agriculture: Soil, Water, and Biodiversity Management for Small-Scale Farms



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Module Information

Module number: 02

Module title: Sustainable and Regenerative Agriculture: Soil, Water, and Biodiversity Management for Small-Scale Farms

Estimated completion time for learners: 30–45 minutes

Learning Objective

Learners are able to know the core principles of sustainable and regenerative farming and are capable of applying basic practices in soil health, water conservation, biodiversity preservation, and circular resource use in local contexts.

Agenda

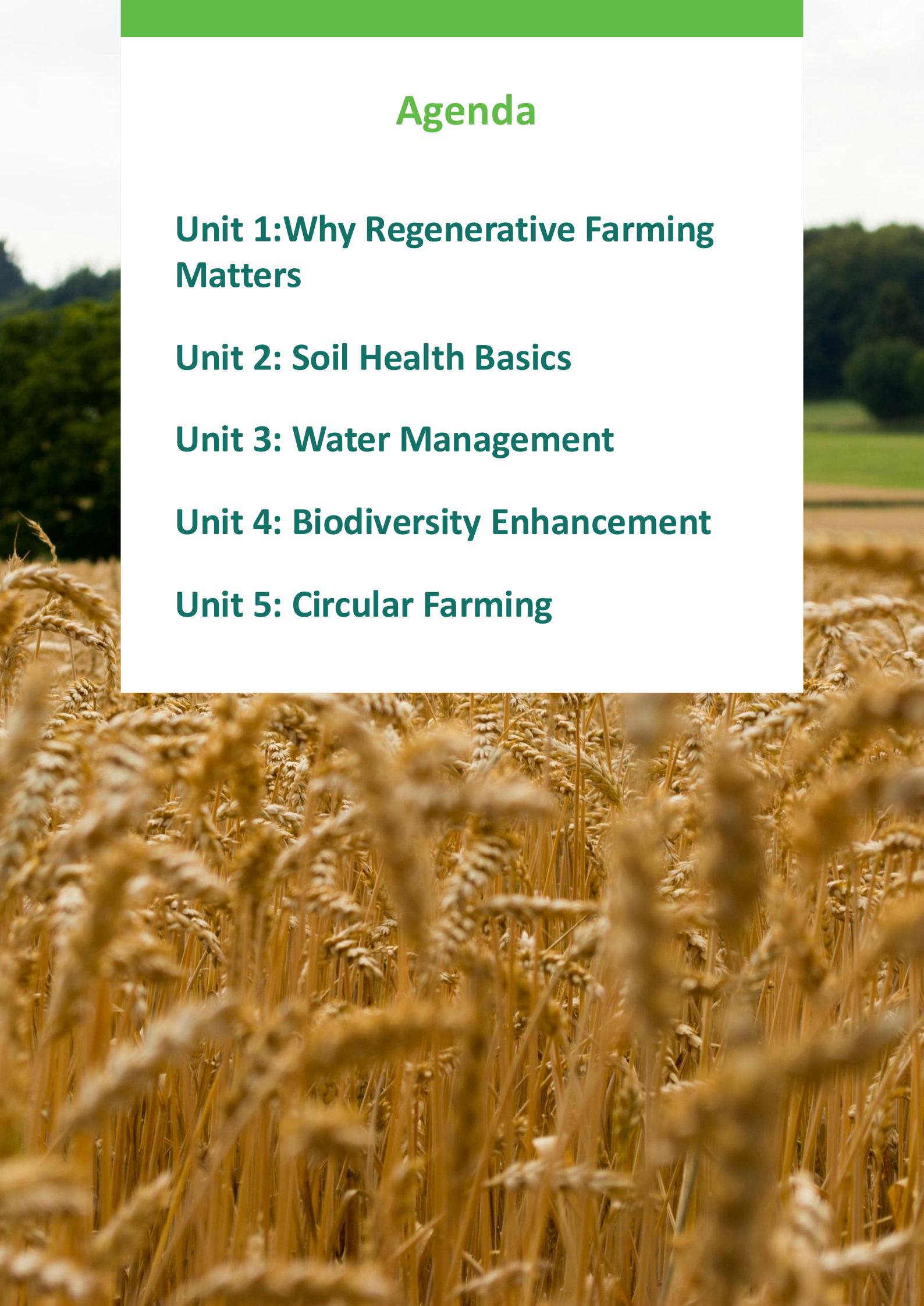
Unit 1:Why Regenerative Farming Matters

Unit 2: Soil Health Basics

Unit 3: Water Management

Unit 4: Biodiversity Enhancement

Unit 5: Circular Farming



Unit 1 –Why Regenerative Farming Matters

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In this unit, learners start with a “why it matters” mindset, preparing them to adopt eco-practices in the next units.

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Unit 1 –Why Regenerative Farming Matters

What is Regenerative Farming?

Regenerative farming focuses on protecting nature, improving soil health, and reducing pollution. It aligns with EU goals such as the Green Deal and Farm-to-Fork Strategy, which promote safe, healthy and sustainable food production.



Learners can identify regenerative farming as a system that:

- Protects soil, water and biodiversity
- Reduces chemical use
- Supports long-term farm resilience

Why healthy soil matters?

Healthy soil contains organic matter and living organisms. This helps soil store more water and hold more carbon, which supports climate-smart farming.

Learners can explain that healthy soil:

- Holds water better during dry periods
- Stores carbon and helps reduce climate change
- Supports stronger, more productive crops

Unit 1 – Self-Reflection

Think about your own farm or a farm you know. Identify one challenge related to soil, water, or biodiversity. Then explain how a regenerative practice (e.g., cover crops, reduced tillage, plant diversity) could help improve that situation over time.

1. Learner action (1–2 minutes):

_____

_____

Unit 1 –Test Your Knowledge

1. What is the main goal of sustainable agriculture in the EU Green Deal?

a) To increase chemical use
b) To produce more plastic packaging
c) To protect nature and reduce pollution
d) To grow only one type of crop

2. Why is healthy soil important during dry periods?

a) It grows faster plants
b) It stores more water
c) It reduces sunlight
d) It stops insects completely

3. Why do biodiverse fields need fewer chemicals?

a) Because they attract tourists
b) Because they control pests naturally
c) Because they grow only trees
d) Because they use more machines

4. What makes regenerative farming different?

a) It focuses only on short-term profit
b) It removes all natural plants
c) It improves the land every year
d) It uses more irrigation

Unit 2 – Soil Health Basics

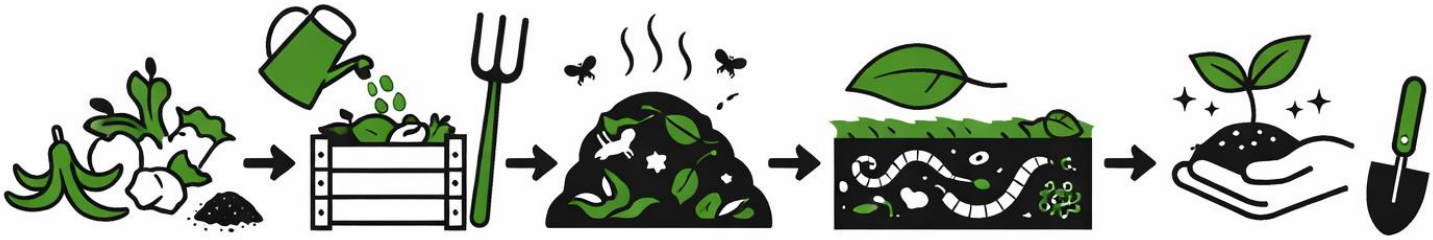


- Composting
- Mulching
- Green manure & cover crops
- No-till farming

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Unit 2 – Soil Health Basics

Composting: What it is and why it matters



Composting is a natural way to recycle organic waste.
Farmers can identify useful materials such as:

- Food leftovers
- Vegetable peels
- Dry leaves and crop residues
- Animal manure

These materials break down with air, water and small organisms like bacteria and worms. Over time, they become humus — dark, soft, nutrient-rich material.

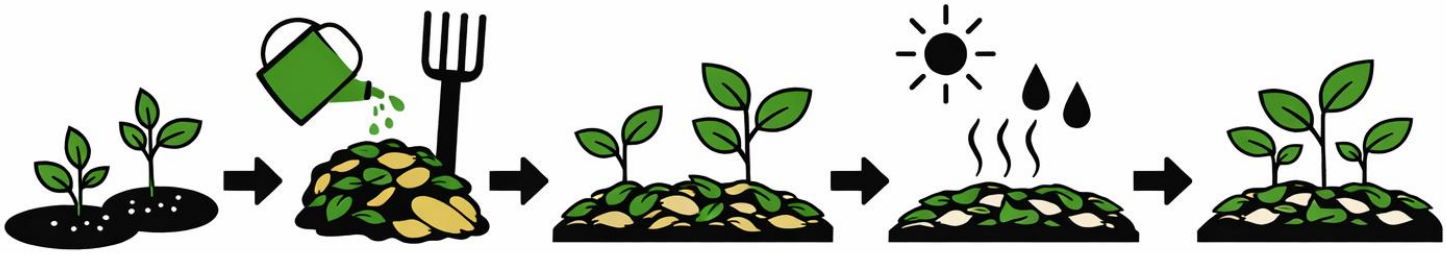
Benefits of compost:

- Improves soil structure
- Strengthens root growth
- Helps soil keep more water
- Reduces the need for chemical fertiliser

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Unit 2 – Soil Health Basics

Mulching: Protecting the soil surface



Mulching means covering the soil with natural materials such as straw, dry leaves, grass or wood chips. This layer works like a protective blanket.

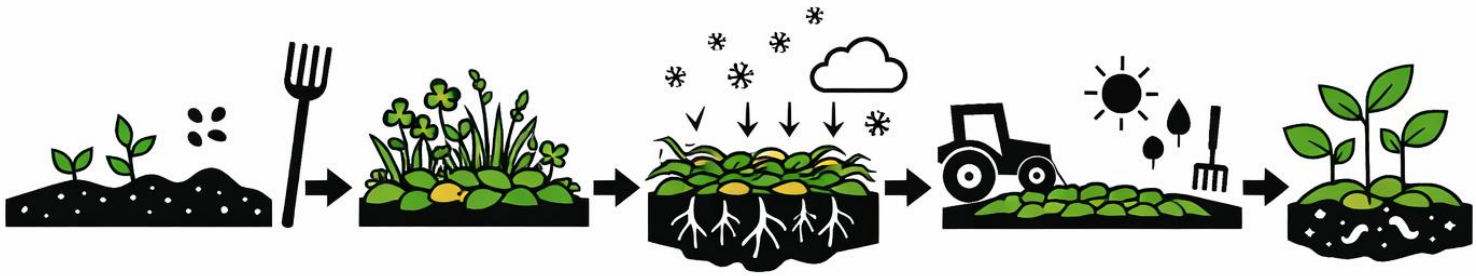
Benefits of mulch:

- Keeps water in the soil
- Prevents fast drying from strong sun
- Keeps soil cooler in summer and warmer in winter
- Blocks weeds by reducing sunlight
- Protects soil from erosion caused by rain and wind

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Unit 2 – Soil Health Basics

Green Manure and Cover Crops



Green manure and cover crops are plants grown to improve soil, not for sale or food.Examples include clover, vetch and other legumes.

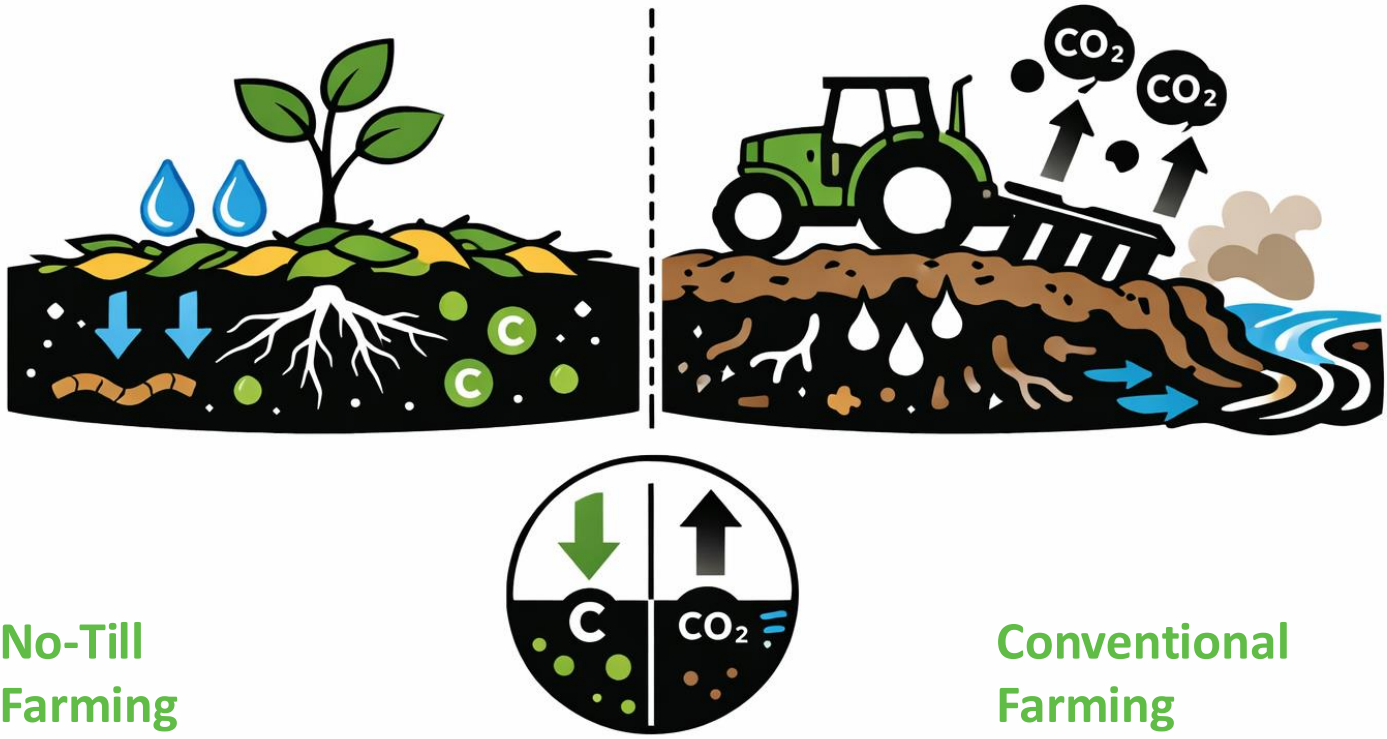
Benefits of these plants:

- Add natural nitrogen to the soil
- Hold soil together with their roots
- Protect against erosion
- Increase organic matter when mixed into the soil
- Make soil more fertile and healthy

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Unit 2 – Soil Health Basics

No-Till Farming



No-Till Farming

Conventional Farming

No-till farming means planting seeds without ploughing or disturbing the soil deeply.

Benefits of no-till:

- Protects natural soil structure
- Keeps microorganisms, insects and earthworms safe
- Reduces soil erosion
- Improves water absorption
- Stores carbon in the soil, supporting climate goals
- Strengthens soil health over time

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Unit 2 – Soil Health Self-Reflection Sheet

No.	Reflection Question	Yes	No
1	Do you currently use compost, manure, or mulching?	☐	☐
2	Do you rotate crops every year/season?	☐	☐
3	Have you noticed signs of erosion (bare soil, gullies)?	☐	☐
4	Soil test or observation done in the last year?	☐	☐
5	Do you use cover crops (such as clover or legumes) during the off-season?	☐	☐
6	Do you check soil moisture before irrigation?	☐	☐
7	Do you leave crop residues on the field after harvest?	☐	☐
8	Have you observed earthworms or other soil organisms in your field?	☐	☐

Additional Notes / Reflections

_____

_____

_____

Unit 2 –Test Your Knowledge

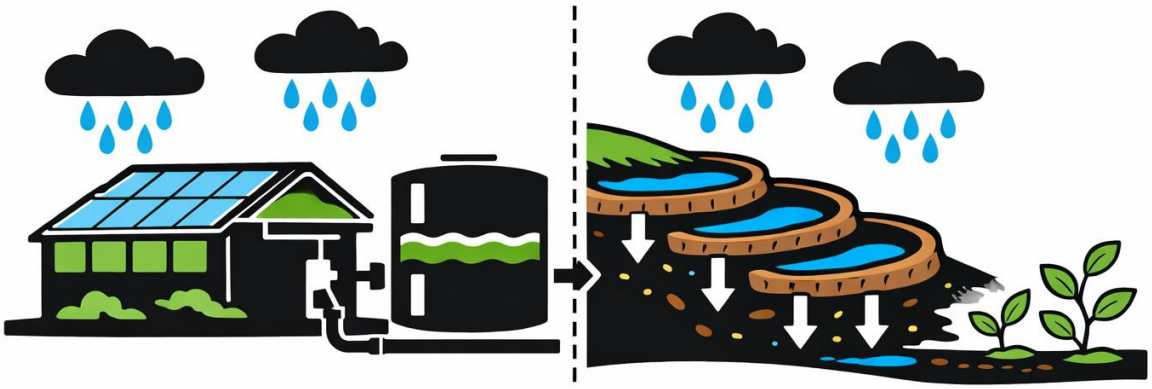
1. What is the main purpose of composting?
a) To increase soil temperature
b) To recycle organic waste into humus
c) To remove microorganisms from soil
d) To dry the soil faster

2. How does mulching help the soil?
a) It increases weed growth
b) It removes nutrients
c) It keeps moisture in the soil
d) It makes soil harder

3. Why are cover crops useful for soil health?
a) They reduce organic matter
b) They add natural nitrogen and protect soil
c) They stop all insects
d) They replace the need for seeds

4. What is a key benefit of no-till farming?
a) It increases soil disturbance
b) It removes earthworms
c) It protects soil structure and reduces erosion
d) It requires more ploughing

Unit 3 – Water Management
Rainwater Harvesting



Rainwater harvesting means collecting and storing rainwater for later use.

Farmers can use:

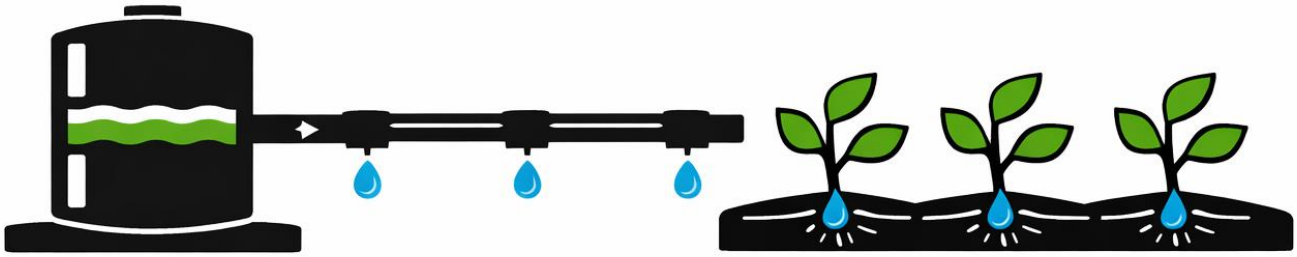
- Water tanks to collect water from roofs or greenhouses
- Contour bunds (small soil barriers) on slopes to slow water and help it enter the soil

Benefits of rainwater harvesting:

- Reduces groundwater use
- Supports farms during dry seasons
- Prevents soil erosion by slowing water flow

Unit 3 – Water Management

Drip irrigation



Drip irrigation gives water directly to plant roots through small pipes and holes.

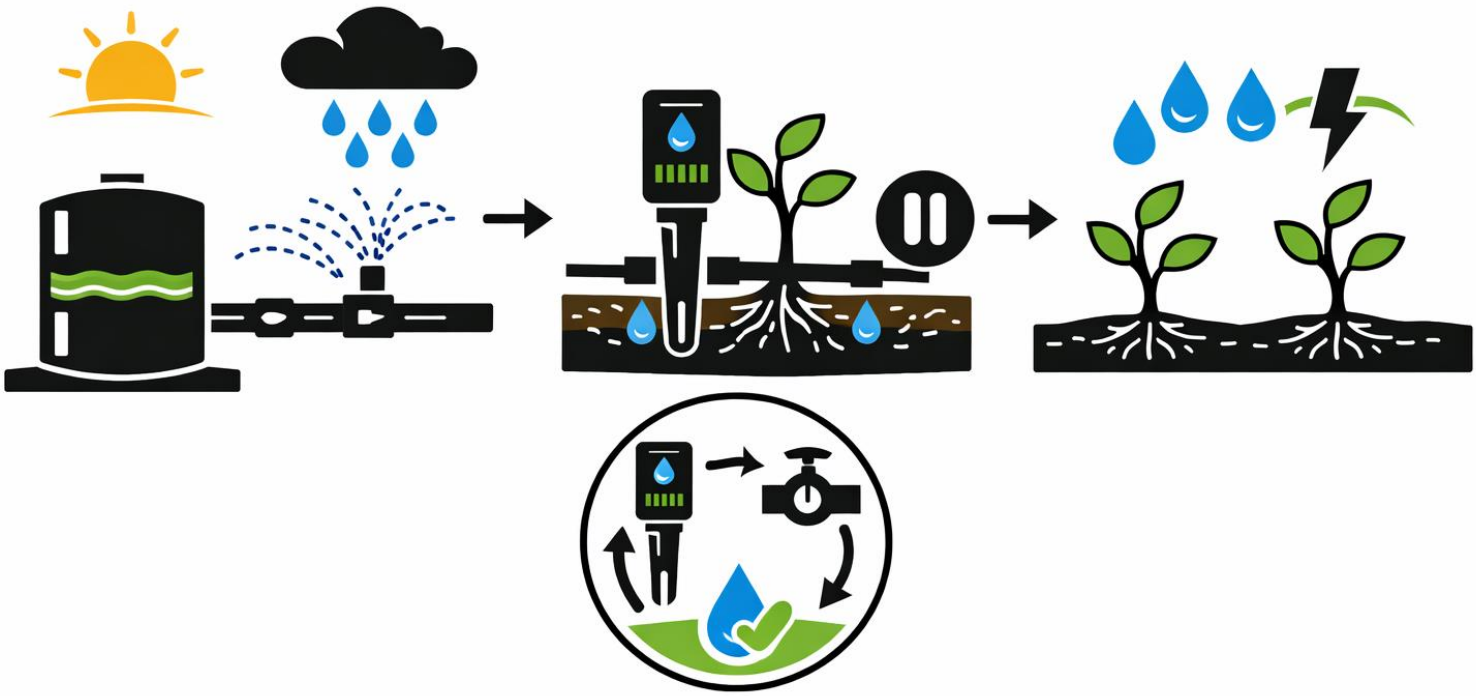
Water comes out slowly, drop by drop.

Benefits of drip irrigation:

- Reduces water waste
- Prevents evaporation
- Avoids watering empty areas
- Saves water and costs

Unit 3 – Water Management

Water-saving scheduling



Water-saving scheduling means irrigating only when needed.

Farmers can:

- Water early morning or evening to reduce evaporation
- Plan irrigation based on plant needs
- Some farmers use soil moisture sensors to measure how much water is in the soil.

Benefits of sensors:

- Prevent unnecessary irrigation
- Protect plant roots
- Reduce energy and water use

Unit 3 – REFLECTION ACTIVITY
Water Management

Think about your farm or a farm you know. Identify one water-related challenge (e.g., dry soil, high water use, uneven irrigation). Then explain which water-saving method (rainwater harvesting, drip irrigation, or water-saving scheduling) could improve the situation.

Learner action (1-2 minutes):

Write one sentence describing the challenge.

_____

_____

Write one sentence describing how a water-saving method could help.

_____

_____

Unit 3 –Test Your Knowledge

1. What is the main purpose of rainwater harvesting?
a) To increase soil temperature
b) To collect and store rainwater for later use
c) To remove nutrients from soil
d) To speed up evaporation

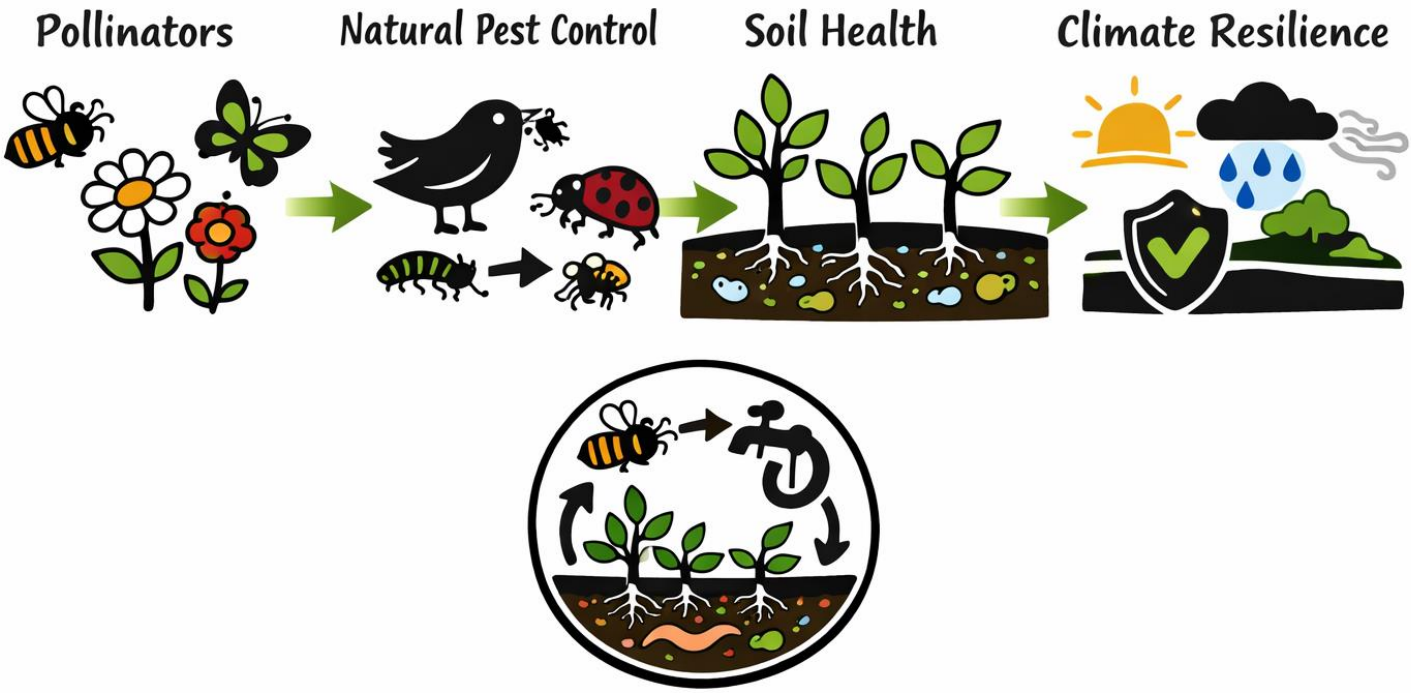
2. How do contour bunds help on sloped land?
a) They make water flow faster
b) They slow water and help it enter the soil
c) They remove organic matter
d) They dry the soil

3. What is a key benefit of drip irrigation?
a) It waters empty areas
b) It gives water directly to plant roots
c) It increases evaporation
d) It requires more water

4. Why do farmers water early in the morning or late in the evening?
a) To reduce evaporation
b) To warm the soil
c) To increase weed growth
d) To remove soil moisture

5. What do soil moisture sensors help farmers decide?
a) When the soil needs fertiliser
b) Whether the soil already has enough water
c) How to increase soil temperature
d) When to harvest

Unit 4: Biodiversity Enhancement



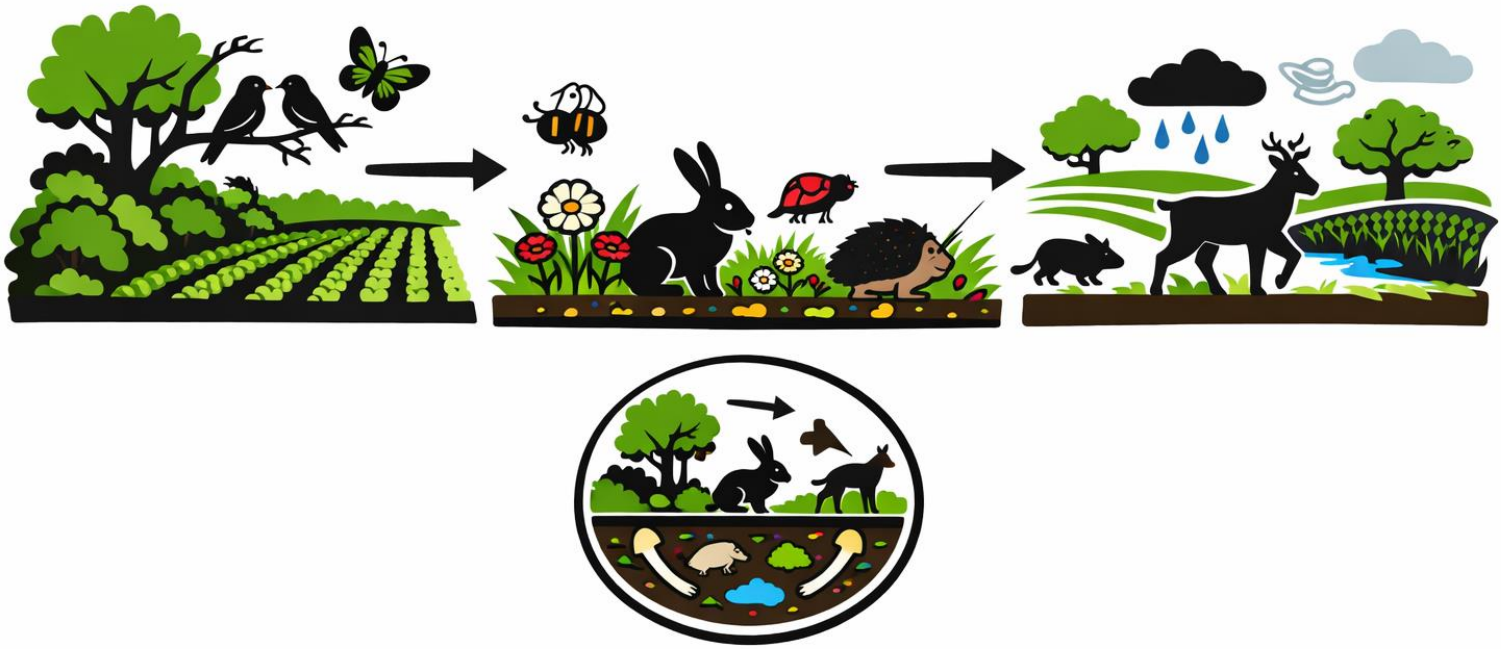
Biodiversity means having many different types of plants, animals, insects, and microorganisms in one area. In farming, biodiversity enhancement means increasing the variety of life on the farm.
When a farm has only one type of crop, it is called monoculture. This can make the soil weak and increase pests. But when farmers grow different crops and protect natural areas, the farm becomes healthier.

Why Is Biodiversity Important?
Biodiversity helps farmers in many ways:
- It attracts bees and other pollinators that help plants produce fruits and seeds.
- It supports natural predators like birds and ladybugs that eat harmful insects.
- It improves soil health because different plants support different soil organisms.
- It makes farms stronger against climate change and extreme weather.

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Unit 4: Biodiversity Enhancement

•Hedgerows & Field margins



Hedgerows are lines of bushes or trees along field edges.

Field margins are small natural areas at the borders of farms.

Benefits of hedgerows and field margins:

- Provide shelter and food for birds, insects, and small animals
- Act as wildlife corridors, helping animals move safely
- Reduce wind and prevent soil erosion
- Create a more balanced farm ecosystem

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Unit 4: Biodiversity Enhancement

Pollinator Habitats with Native Flowering Plants





Pollinator habitats are areas with flowers that attract bees, butterflies, and other pollinating insects. Farmers plant native flowering plants because they grow well in local conditions.

Pollinators help crops produce fruits and seeds. Without pollinators, many plants cannot grow properly.

Benefits of flower strips:

- Native plants grow well in local conditions
- Pollinators increase fruit and seed production
- Flower strips support biodiversity and improve yields naturally

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Unit 4 – REFLECTION ACTIVITY
Biodiversity Enhancement

Think about your farm or a farm you know. Identify one area where biodiversity is low (for example: few flowering plants, no hedgerows, one crop only). Then explain which biodiversity practice (hedgerows, field margins, flower strips, crop diversity) could improve the situation.

Learner action (1-2 minutes):

One sentence: What is the biodiversity challenge?

_____

_____

One sentence: Which practice could improve it and how?

_____

_____

Unit 4 –Test Your Knowledge

1.What does biodiversity enhancement mean on a farm?
a) Reducing the number of plant species
b) Increasing the variety of plants, animals, and insects
c) Planting only one crop
d) Removing natural areas

2. Why are hedgerows and field margins important?
a) They increase soil erosion
b) They provide shelter and food for beneficial species
c) They reduce pollinator numbers
d) They slow plant growth

3. How do flower strips help farming?
a) They attract pollinators that increase yields
b) They reduce soil organic matter
c) They increase pesticide use
d) They reduce beneficial insects

4. Why is monoculture risky?
a) It strengthens soil
b) It reduces pest problems
c) It can weaken soil and increase pest pressure
d) It increases biodiversity

5. How does biodiversity support climate resilience?
a) It makes farms more vulnerable
b) It reduces plant species
c) It strengthens resilience to extreme weather
d) It removes natural predators

Unit 5 Circular Farming

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Circular farming is a system where waste is reused instead of thrown away. Materials like crop residues, manure, and water are recycled and used again on the farm.

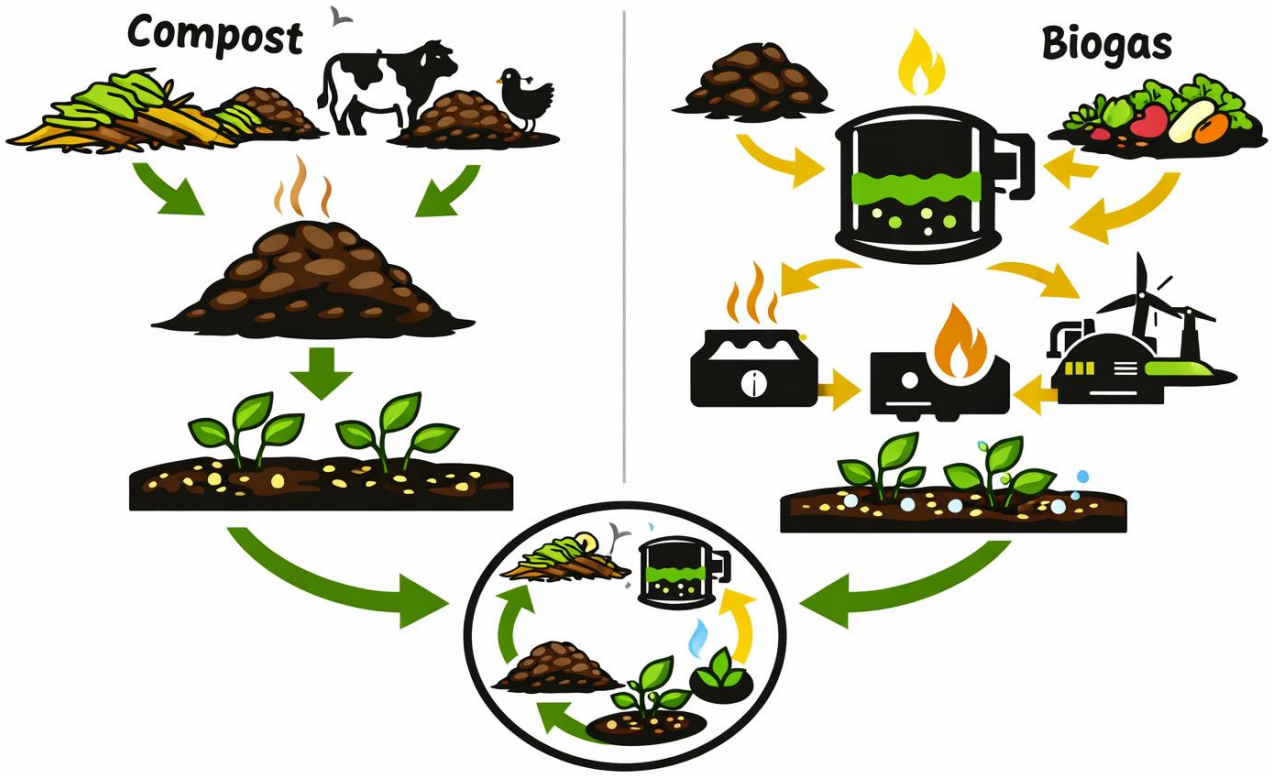
Benefits of circular farming:

- Reduces waste and pollution
- Saves money and resources
- Decreases chemical fertiliser use
- Supports sustainable, independent farms

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Unit 5 Circular Farming

Reuse of Crop Residues and Manure (Biogas or Compost)



After harvest, farmers have straw, leaves, stems, and animal manure. Instead of burning or discarding them, they can turn waste into value.

Composting — waste breaks down into compost that improves soil fertility

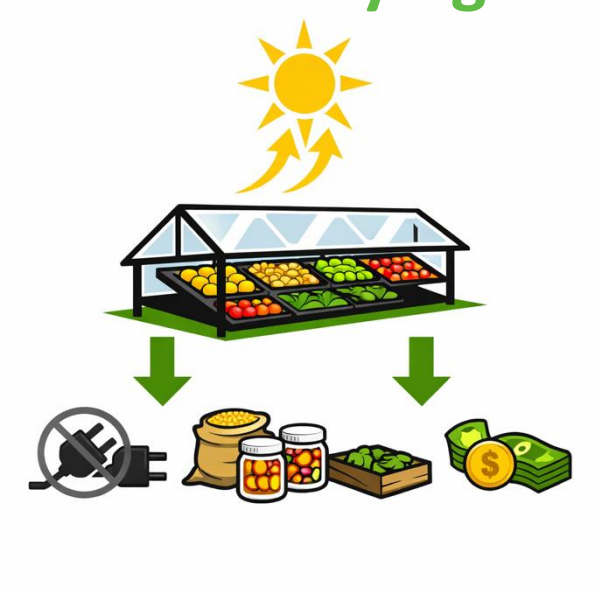
Biogas production — waste in a biodigester creates biogas for energy and fertiliser

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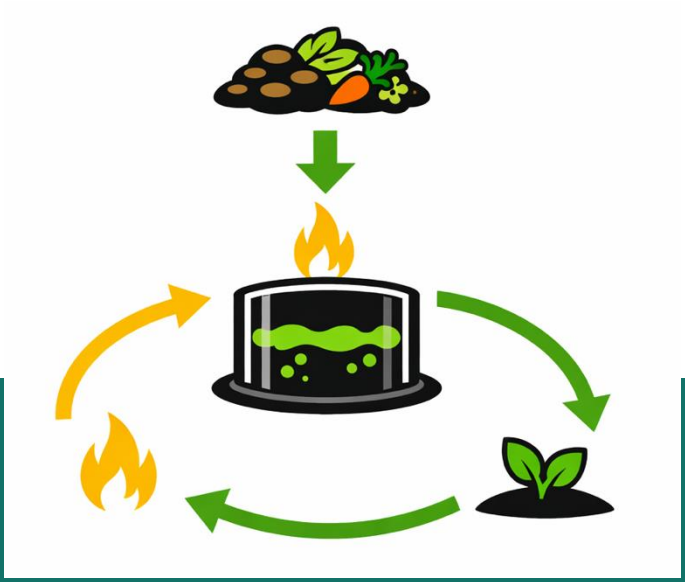
Unit 5 Circular Farming
On-Farm Energy Loops (Solar Drying & Bio-Digesters)

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Solar Drying



Bio-Digesters



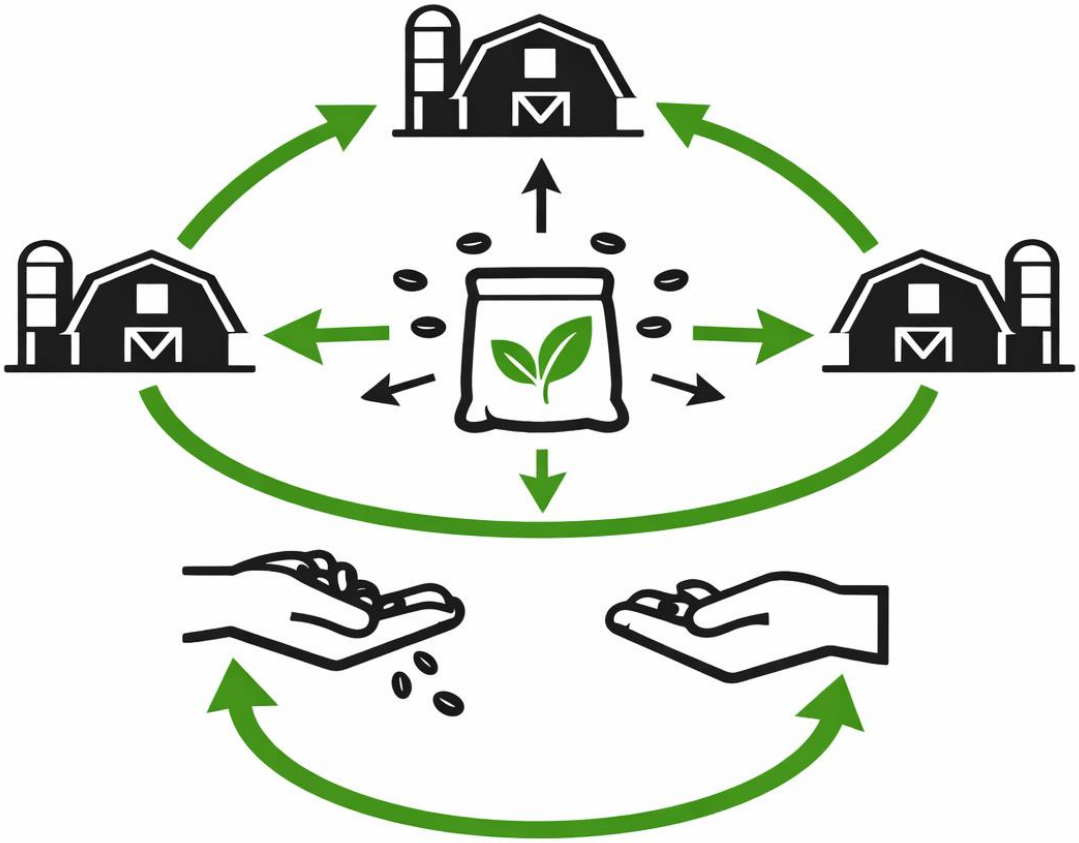
On-farm energy loops mean producing and using energy directly on the farm.

These systems reduce waste and increase farm independence:

- Solar drying — uses sunlight to dry crops and save electricity
- Bio-digesters — turn waste into biogas and fertiliser, creating a closed loop

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Unit 5 Circular Farming
Local Feed and Seed Exchanges



Local exchanges mean sharing or buying seeds and feed nearby instead of from distant suppliers.

Benefits of local exchange:

- Reduce transport and carbon emissions
- Support local farmers
- Protect traditional seed varieties
- Strengthen community and biodiversity

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Unit 5 – REFLECTION ACTIVITY
Circular Farming

Think about your farm or a farm you know. Identify one type of waste (crop residues, manure, or water). Then explain how it could be reused to create a circular process.

Learner action (1-2 minutes):

One sentence: What is the waste material?

_____

_____

One sentence: How could it be reused on the farm?
Learner action (1-2 minutes):

_____

_____

Unit 5 –Test Your Knowledge

1.What is the main idea of circular farming?
a. To throw away all waste
b. To reuse and recycle farm materials
c. To increase chemical use
d. To buy more fertilisers

2. What can crop residues and manure be turned into?
a. Compost or biogas
b. Plastic packaging
c. Chemical fertiliser
d. Animal feed only

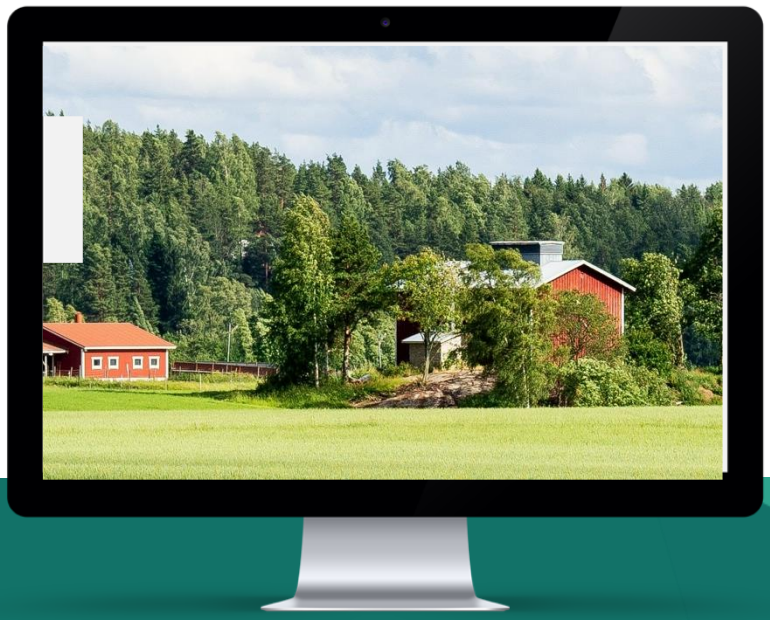
3. What does solar drying help farmers do?
a) Use more electricity
b) Dry crops using sunlight and save energy
c) Increase water use
d) Reduce crop quality

4. What is one benefit of local feed and seed exchanges?
a) They increase transport distance
b) They reduce carbon emissions and support local farmers
c) They require more fuel
d) They weaken biodiversity

5. What does a biodigester produce?
a) Compost only
b) Biogas and fertiliser
c) Chemical waste
d) Water vapour

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