Module 2: Waste-to-Resource Strategies in Agri-Food Systems
Think-Pair-Share Activity C: Mini Waste-to-Resource Pilot

Lesson C
Grouping: Pairs or small groups (3–4)
Time: 25-30 minutes

Materials:
- Activity worksheet
- Board or chart paper for class synthesis
- Pens/markers

Objective:
Connect a specific campus waste hotspot to potential solutions. Use feasibility and projected CO_2-eq savings to design a proposed pilot waste-to-resource system with clear trade-offs. Consider how multiple pilots could link together into a circular campus system.

Instructions:
1. Pick a hotspot and waste stream to focus on (e.g., Student Union cafeteria, dorm kitchen, or yard waste pile).
2. Choose the best way to turn your hotspot's waste into a resource and decide who would handle it. (compost, bokashi, biochar, insect larvae, etc.), assigning who would manage it, estimating weekly waste and CO_2 savings using Lesson B's ΔCO_2-eq values, and writing a 2-sentence justification.
3. Complete a Think–Pair–Share by noting benefits and limitations, then comparing with a partner to refine trade-offs, and finally posting or presenting your pilot idea to the class for synthesis.

Equations:
- ΔCO_2-eq = net change in greenhouse gas emissions compared to landfill.
- Weekly Waste (kg) = Mass per bin (kg) $\times$ empties per week
  Given: <u>150 kg</u>
- Valorization methods:
  - Compost: -100 g/kg
  - Bokashi: -200 g/kg
  - Biochar: -450 g/kg
  - Larvae feed: -300 g/kg
- CO2-e = Mass of waste (kg) $\times$ Emission factor (kg CO2-e/kg waste)

Your Task:

Step 1: Hotspot & Waste Stream
Identify a location on campus where waste is generated and describe the type of waste (typical food scraps) found there.

Hotspot (Location):

Waste Stream:

Step 2: Chosen Pathway
Select the most appropriate waste-to-resource pathway for your hotspot and decide who would realistically manage it (students, cafeteria staff, custodians, sustainability club, etc.).
Note: Examples of valorization methods include composting, bokashi fermentation, insect larvae, etc.

Valorization Method:

Who Manages It?

Step 3: Waste and CO_2 Savings
Estimate how much waste this hotspot produces per week. Use the ΔCO_2-eq values from Lesson B to calculate the total CO_2 savings your pilot could achieve.

Estimated Waste per Week (kg):

ΔCO_2-eq (g/kg) from Lesson B:

Total CO_2-eq Savings (g/week):
(Formula: Total Savings = Waste × ΔCO_2-eq)

Step 4: Benefits and Limitations
List 1–2 main benefits of your pilot design (e.g., reduced emissions, useful products) and 1–2 limitations (e.g., cost, training, space).

Key Benefits (1-2):

Key Limitations (1-2):

Step 5: Justification
Write two sentences explaining why your chosen pathway is the best option for this hotspot, citing both the type of waste and the projected CO_2 savings.

Reflection

1. Strengths:
   - What is the strongest benefit of your pilot idea?
   - How does it help reduce CO_2 emissions or improve campus sustainability?

2. Challenges:
   - What is the biggest obstacle you might face before launching this pilot?

3. Connections

- How could your pilot link or collaborate with another group's pilot?

Skills You'll Use:

- Systems thinking
- Applying scientific data
- Design reasoning
- Collaboration and justification

Example:

Hotspot & Waste Stream

- Location: Student Union Cafeteria
- Waste Stream: Post-consumer food scraps (meat, veggies, rice)

Chosen Pathway

- Valorization Method: Bokashi fermentation + small digester
- Who Manages It: Cafeteria staff + sustainability interns

Waste & CO_2 Savings

- Estimated Waste per Week: 150 kg
- ΔCO_2-eq: −200 g/kg
- Total CO_2-eq Savings: −30,000 g/week (−30 kg CO_2-eq)

Key Benefits

- Handles meat and dairy
- Produces biogas for the cafeteria stove

Key Limitations

- Needs digester unit and training
- Requires bokashi pre-processing

Justification (2 Sentences):
We chose Bokashi + digester because the cafeteria produces mixed food waste that composting alone cannot easily handle. The system keeps smells down during fermentation, produces biogas for cooking, and saves the equivalent of ~75 car miles in CO_2 emissions each week.