Module 2: Waste-to-Resource Strategies in Agri-Food Systems

Think-Pair-Share Activity C: Mini Waste-to-Resource Pilot

Red Notes

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) × empties per week
  Given: 150 kg
- 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) × 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):

Student Union Cafeteria

Waste Stream:

Post-consumer food scraps (meat, veggies, rice)

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:

Bokashi fermentation + small digester

Who Manages It?

Cafeteria staff + sustainability interns

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): __150kg____(given)

ΔCO_2-eq (g/kg) from Lesson B: __-200 g/kg____(from student valorization method)

Total CO_2-eq Savings (g/week): __150 × (−200) = −30,000 g = −30 kg CO_2-eq per 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):

Handles meat & dairy + Produces biogas for cafeteria stove

Key Limitations (1-2):
Requires digester unit and training + Bokashi pre-processing step

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.

We chose Bokashi + digester because the cafeteria produces mixed food waste that composters can't easily handle (meat, dairy, cooked foods). This pathway keeps smells down during fermentation, produces biogas for cooking, and saves about 30 kg CO_2-eq per week, equivalent to ~75 car miles.

Reflection

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

Produces renewable energy on campus.
Reduces CO_2-eq emissions by ~30 kg per week.

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

Equipment costs and staff training required.

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

Biogas digestate could be composted with another group's yard-waste 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.