



## Module 3: Soil Science and Soil Health

### Think-Pair-Share Activity B: Make a Compost Cake

#### Lesson B

**Grouping: Pairs or small groups (3–4)**

**Time: 25–30 minutes**

#### Materials:

- One worksheet per student (or pair)
- Colored pencils/markers (brown, green, gray/black, blue)
- Whiteboard or chart paper for class synthesis

#### Objective:

Students will learn how organic inputs (“browns,” “greens,” soil/compost, and water) interact in decomposition and connect them to the Build–Maintain–Consume framework for soil carbon. They will evaluate whether composting leads to carbon storage or sequestration, and apply systems thinking to design compost strategies for different goals.

#### Instructions:

1. Color and label the compost cake diagram.
2. Add arrows to show carbon and nutrient flows.
3. Discuss prompts with your group and answer questions.
4. Work together to redesign your compost cake for a specific goal.
5. Share your design and reasoning with the class.

#### Your Task:

Your task is to model how decomposition works in a compost cake and connect it to soil carbon cycling. Then, evaluate trade-offs and propose compost strategies that balance Build, Maintain, and Consume.

#### Step 1: Color & Label the Compost Cake (Individual Work)

Circle and color each layer:

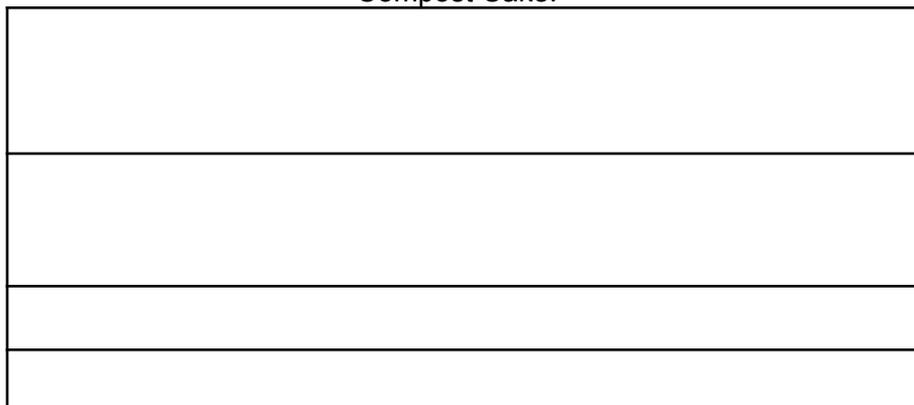
- Browns = carbon-rich (Build)
- Greens = nitrogen-rich (Build → Consume)
- Soil/old compost = microbes + minerals (Maintain)
- Water = microbial activity (Consume)

Add arrows to show:

- CO<sub>2</sub> released (Consume)
- Organic matter → humus/SOM (Maintain)
- Nutrients recycled to plants (Build)

(Draw arrows on the diagram provided)

Compost Cake:



**Step 2: Discussion Prompts (Group Work)**

1. Is this compost pile adding storage or sequestration? Why?
  
  
  
  
  
  
  
  
  
  
2. Which part of the triad (Build, Maintain, Consume) does each layer emphasize?
  
  
  
  
  
  
  
  
  
  
3. What happens if the pile is too wet/dry, or has too much green vs. brown?

**Step 3: Redesign the Compost Cake (Group Challenge)**

Choose one goal and adjust your “cake.” Label changes on your diagram in Step 1.

- Goal A: Maximum long-term carbon storage (sequestration)
- Goal B: Fast nutrient release for crops

Notes on Our Design:

**Reflection**

1. What was the hardest part about balancing Build, Maintain, and Consume?
  
  
  
  
  
  
  
  
  
  
2. Which compost strategy would work best at our school or community garden? Why?

3. How does this activity connect to bigger sustainability goals (e.g., climate action, food systems)?

**Skills You'll Use:**

- Systems thinking (nutrient cycling + soil carbon)
- Problem-solving (trade-offs in compost management)
- Visual modeling (diagramming flows)
- Collaboration & synthesis (moving from individual diagrams to group redesigns)

**Example:**

Our compost cake shows how browns and greens work together to fuel microbes, with soil adding inoculants and water helping maintain microbial activity. When we mapped arrows, we saw that some carbon leaves as CO<sub>2</sub> (Consume), but some stabilizes as humus (Maintain), and nutrients cycle back to plants (Build). We decided our cake represents storage more than sequestration, since purchased compost mainly relocates carbon. To redesign for maximum sequestration, we would emphasize thicker browns and cover-crop residues to keep inputs coming, while reducing excess greens that drive fast respiration. This connects to climate action because managing decomposition carefully can tip the balance toward long-term carbon storage in soils.