



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

Hands-On Activity B: DIY Bokashi Bucket Setup

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Instructions Worksheet for HOA Module 2 Lesson B - HOA B

Grouping: Pairs or small groups (3–4)

Time: 35-45 minutes (initial setup) + ~5-10 minutes every 2-3 days for monitoring

Precautions and Safety:

- **Food Handling:** Wear nitrile gloves when handling food scraps; wash hands after the activity.
- **Hygiene:** Do not use spoiled or rotten food (this prevents unwanted microbes from taking over).
- **Bucket Safety:** Keep lids sealed tightly to maintain anaerobic conditions (no oxygen).
- **Scale Use:** Place buckets securely on the scale before weighing to prevent tipping.
- **General Safety:** Keep the workspace clean and dry to prevent slipping or accidents.

Materials:

- Commercial 5-gallon Bokashi bucket system ([Amazon link](#))
- **If the commercial kit is not available, then:**
 - Two 5-gallon plastic buckets (same size) with **airtight** lids:
 - *Top bucket:* Drill several small drainage holes in the bottom.
 - *Bottom bucket:* Keep intact (this will collect the liquid “leachate”).
 - One brick or sturdy spacer (e.g., an inverted container or wood block) to create a gap for drainage.
 - Two cloth circles (cotton or burlap) cut to fit the bucket bottoms.
- ~1 kg cafeteria food scraps (chopped into pieces ≤ 2–3 cm; **no rotten items**).
- Bokashi bran (inoculated with beneficial microbes), ~2–3 cups (more is fine).
- Small garden scoops for mixing the food scraps and Bokashi bran
- Large trash bags (to place under the buckets to catch spills)
- Nitrile gloves for all participants.
- Notebook or printed data sheet (for recording smell, appearance, leachate volume, pH data).
- pH test strips or a digital pH meter.

Objective:

Work as a team to assemble a two-bucket **Bokashi** fermentation system to transform cafeteria food scraps into a valuable soil amendment. You will collect and test the liquid by-product (“leachate”) after fermentation and connect your observations to key concepts: microbial fermentation processes, reducing food waste, and improving soil health. This hands-on project demonstrates a **circular economy** approach—closing the nutrient loop by turning “waste” into a resource (linking back to Module 1’s circular systems and paving the way for Module 3’s focus on soil and composting).

Instructions (Watch the labtofarm video on the Bokashi process [HERE](#)):

- **Before You Start:** Remember that Bokashi is an **anaerobic process** (without oxygen). Always start with **fresh food scraps** rather than old, rotten, or moldy waste. Spoiled food can contain large populations of harmful or competing bacteria that may overpower the beneficial Bokashi microbes, making the process less effective—or even smelly and unsafe.
- If the food waste you’re using is **very old or partially decomposed**, you may need to **add extra Bokashi** bran to increase the number of “good” microbes and help restore balance. In other words, the fresher the waste, the better the fermentation! Starting with clean, recently collected scraps gives your beneficial microbes the best chance to dominate and produce a healthy, low-odor fermentation.



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Step 1, Preparation (Day Before Activity)

1. Collect a few pounds of mixed cafeteria food scraps for each team. Cut or chop the scraps into smaller pieces (around ≤ 0.5 -2 inches), smaller pieces ferment faster because microbes can break them down more easily.
2. Gather enough Bokashi bran for each team (roughly 3–4 cups of bran per bucket).
3. Label each top bucket with your team name and a note like “Bokashi, Do Not Open Until Monitoring.” This ensures everyone knows it’s a sealed fermentation experiment.

Step 2, Assemble the Two-Bucket System (do this if you do not have the commercial kit)

1. Place the intact bottom bucket on the floor; this will collect the liquid that drains out (leachate).
2. Put the brick (or spacer) inside the bottom bucket. This creates a platform.
3. Nest the drilled top bucket inside the bottom bucket, resting it on the brick. The drilled bucket should sit a few inches above the bottom of the lower bucket to leave space for liquids to collect.
4. Line the inside bottom of the top bucket with one of the cloth circles. (This cloth helps keep small bits from clogging the holes and aids in wicking moisture.)

Step 3, Layer the Scraps and Bran

1. Sprinkle about 1 cup of Bokashi bran evenly across the cloth at the bottom of the top bucket. This is your starter layer of microbes.
2. Add 1–2 inches of food scraps (the chopped, non-rotten mix) on top of the bran.
3. Sprinkle another thin layer of Bokashi bran over these scraps, ensuring they are well-coated.
4. Thoroughly mix the layers with a small garden scoop or other mixing tool.
5. **Compress** the layer firmly (you can press down with a tool or gloved hand) to remove air pockets. Remember, we want anaerobic conditions.
6. Continue layering in this order: food scraps → bran → compress, then repeat with more scraps, more bran, etc. Each time, press down to keep the mixture compact and oxygen-free.
7. Stop filling when the bucket is about $\frac{3}{4}$ full. (Avoid overfilling, as you need space at the top for the final layer and the lid.)
8. Top it off with one more cup of Bokashi bran evenly spread over the last layer of scraps. Then place the second cloth circle on top of the packed mixture.
9. Seal the bucket tightly with its airtight lid. **Do not open it again** until the first monitoring day. Label the date. The bucket will now sit undisturbed to ferment for about one week.

Step 4, Fermentation Monitoring and Data Collection

For the next three weeks, you’ll collect data to observe the fermentation process. Use a notebook or the **Data Collection Worksheet** to record your observations. Remember to keep the bucket sealed except during brief check-ins to maintain anaerobic conditions.

- **At Setup (Day 0):** Record initial observations **before** sealing the bucket. Note the smell (likely just food or bran smell at start) and the appearance of the mix. There won’t be any leachate yet, but make sure the bottom bucket is empty and dry. This is your baseline. Seal the lid tightly after this.
- **After 1 Week (Day 7):** It’s time for the first check. Open the bucket **briefly** (just a crack) to observe the contents. Record the smell (has it changed? any sour or fermented odor?), and look at the appearance (any white mold or yeast on top? is it getting mushy?). Immediately lift the top bucket out, keeping it over the bottom to catch drips, and measure the leachate that has collected in the bottom bucket. Use pH strips or a meter to test the pH of the leachate. Also note the odor of the leachate. Record all these data points. Then reseal the bucket.



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- **Ongoing Monitoring (Days 10–21):** Continue to monitor every 3–4 days (about 3–4 more times over the next two weeks). Each time, quickly open the lid to check and **record the following**: the smell and appearance inside the bucket, the volume of new leachate (drained liquid) in the bottom bucket, the pH of the leachate, and the odor of the leachate. Always reseal tightly after each check. NOTE: In optimal conditions, the bokashi fermentation process is usually completed in around 10-14 days.
- **Final Check (Day 21):** After about 3 weeks of fermentation, perform one last observation. Summarize how things have changed from start to finish: total leachate generated, overall pH trend, how the smell evolved, and any visible changes to the scraps.

Note: When handling the fermented material at the end, keep those gloves on, it's not dangerous, but it can be pretty acidic and have a strong odor. Also, **save the fermented Bokashi material** after the final check. We will **use it in a later activity** (in Module 3 on soil health) to see how it benefits plants/soil. This connects our waste project back to soil, a full circle!

Step 5, Reflection & Wrap-Up

At the end of the fermentation period (after your final observations), take time to discuss and reflect on what happened. Consider the following questions with your team (these tie back to what you learned in Module 2 Lessons A, B, and C, and even Module 1):

- **How did the pH change over time?** What does a drop in pH indicate about the fermentation process?
- **How did the smell evolve from start to finish?** Describe the odors (e.g., from fresh/neutral to sweet-sour/vinegary) and what that tells us about microbial activity.
- **What types of microbial processes might explain the changes you observed (pH, smell, appearance)?** Think about the microbes in Bokashi (like lactic acid bacteria producing acids, yeasts breaking down sugars, etc.).
- **What was the total volume of leachate collected over the 3 weeks?** What might a greater or lesser amount of liquid tell us about the decomposition of the scraps?
- **How do these results connect to reducing food waste and recycling nutrients through soil amendments?** In other words, how did this activity help “close the loop” in our food system (turning cafeteria waste into something that can enrich soil)?
- **What are the broader implications?** Consider how fermenting food waste in a Bokashi system (instead of sending it to a landfill) could benefit the environment. (Hint: Think back to Lesson B’s carbon math. Bokashi avoids methane emissions from landfills and creates valuable by-products. How does this align with climate action or sustainability goals?)
- **If we wanted to expand this project, what behavior changes or practical steps would be needed?** For example, how would students and staff need to participate (sorting food waste, maintaining buckets), and what challenges or solutions might arise? (*This is where **systems thinking** comes in; consider how different parts of the school system would need to work together.*)

After the discussion, make sure the fermented solids are **stored properly** (sealed, in a cool place). In an upcoming module, you’ll get to use this fermented material to enrich soil and observe plant growth, linking this activity to real-world soil health improvements (and touching on the UN Sustainable Development Goals around waste and sustainable agriculture on the way).

Tips for Success:

- **Chop scraps small:** Smaller pieces mean more surface area for microbes, speeding up fermentation.
- **No rotten food:** This bears repeating, starting with fresh (non-putrid) waste ensures beneficial Bokashi microbes aren’t overtaken by bad actors.
- **Use plenty of bran:** A good rule of thumb is ~1 tablespoon of Bokashi bran per cup of food scraps. A generous layer of bran on top of each addition (and especially the top layer) helps inoculate the mix thoroughly.



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- **Include the cloth layers:** They help distribute moisture and keep the top of the scraps covered, which can prevent flies and absorb excess liquid.
- **Keep it airtight:** Oxygen is the enemy in this process. Once sealed, resist the urge to peek until the designated monitoring days; this ensures a true anaerobic fermentation.

Skills You'll Use:

- Setting up a **two-bucket anaerobic fermentation system** for waste management.
- Recording both qualitative data (smell, appearance observations) and quantitative data (leachate volume, pH measurements) over time.
- Understanding **microbial competition and anaerobic ecology** (how different microbes thrive without oxygen and how they preserve the food).
- Applying **systems thinking** to a real example of a **circular nutrient system**, turning cafeteria waste into a resource for soil, and illustrating sustainable practices.

By the end of this activity, you'll have seen how food waste, something most people throw away, can become a powerful resource through microbial teamwork. Bokashi isn't just composting; it's fermentation in action, transforming cafeteria scraps into a nutrient-rich soil amendment while preventing methane emissions from landfills. You're witnessing a small-scale model of the circular economy: closing the loop between what we eat and how we restore the soil that grows our food. So be curious, stay observant, and remember, every bucket of "waste" you transform is one more step toward a sustainable future!