Data Collection Worksheet
Grouping: 2–3 students per group
Time: ~30 minutes for initial setup, then 5–10 minutes daily (quick measurements & notes) over the growing period (2–3 weeks until harvest)

Focus question: How is space reshaping where and how we grow food, and what does your water-budget data reveal about making these systems more circular?

Materials:

- Drip emitter system OR pinhole bottle (simulated drip irrigation)
- Hydroponic reservoir with catch basin
- 2–4 seedlings (lettuce or other leafy greens)
- Measuring cup or graduated cylinder
- Ruler or measuring tape
- Scale (to weigh plants at harvest)
- Small containers/cups to collect runoff
- Data log sheet (provided separately)
- Access to water source
- Internet-enabled device (optional, for research/extension tasks)
- Gloves/safety gear

Name:_____ **Team Members:**_____

Start Date: _____ **Harvest Date:** _____

Prediction (Before You Start)

Q1. Which system do you predict will use **less water** to grow the plant – the Soil Drip or the Hydroponic system? **Why?**
Write a few sentences explaining your hypothesis. (Think about what might happen to water in soil vs. in a closed water system.)

System Setup:

System	Description of Setup (draw/write)	Notes ***Initial setup.*** Soil watered until moist; hydro tank filled. Note initial plant height/condition.
Drip		
Hydro		

Daily Water Log (If you miss a day, make a note):

Day	Drip Water Added (mL)	Drip Runoff (mL)	Net Drip Use (mL)	Hydro Top-Up (mL)	Plant Height Drip (cm)	Plant Height Hydro (cm)	Notes
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							

After the final day (Around 14-21 days), calculate:

- **Total water added to Soil system: _____** mL (sum of “Water Added to Soil” column)
- **Total runoff from Soil system: _____** mL (sum of “Runoff” column)
- **Net water used by Soil plant: _____** mL (Total added minus total runoff)
- **Total water added to Hydro system: _____** mL (sum of “Water Added to Hydro” column)
  (Hydro net use is the same as total added, since unused water stays in the container.)

Water-Use Efficiency:
Water Use Efficiency (WUE) Formula: $WUE = \frac{Total\ Water\ Used\ (L)}{Yield\ (kg)}$

System	Total Water Used (L)	Yield (kg)	Water-Use Efficiency (L/kg)
Drip			
Hydro			

Reflection and Analysis:

Q2. Which system used less water in total?

- Soil System total water **actually used** (net): _____ mL
- Hydroponic System total water used: _____ mL

Circle the more water-efficient system: **Soil / Hydroponic** (which one had the smaller number above?)

Q3. Water Use Efficiency: Describe how much water was used per unit of plant growth for each system. *(For example, divide total water used by the plant’s height or number of leaves at the end. If you measured biomass, use that.)* Show your calculations if any. Which plant got “more crop per drop”?

Q4. Why do you think one system was more efficient than the other?
Explain what might have happened to the water in each system. Consider:

- In soil: Where did the water go? (Hint: some taken up by the plant, some may be evaporated from soil, some drained out as runoff.)

- In hydroponics: Where did the water go? (Hint: taken up by the plant, maybe some evaporation from the container, but no soil to soak it up.)
  Use these ideas to explain the difference.

Q5. What challenges or issues did you notice in each system?

- *For the soil system:* e.g., Did you often see runoff (wasted water)? Was it hard to know how much to water?

- *For the hydro system:* e.g,. Did the water get dirty or need nutrient addition? Any algae growth or concerns?

Q6. Real-World Connections: Where might each method be best used in the real world?

- *Drip Irrigation (soil):* _____

- *Hydroponics:* _____
  (Think: Drip is common in fields or gardens – why? Hydro is used in urban farms/greenhouses – why?)

Q7. Design Improvement: If you were an engineer, how could you make each system use even less water or work better?

- Soil system: How to capture or reuse runoff? Other ideas (mulch on soil to reduce evaporation, etc.)?
- Hydro system: How to reduce evaporation or energy use? Could you recirculate water in a bigger system?

Q8. Reflection: In a short paragraph, summarize what you learned from the Water-Budget Ledger activity. Address the following:

- Which system was more water-efficient and by roughly how much.
- One reason that explains this result.
- One **advantage** of each system (soil vs. hydro) for growing plants, and one **disadvantage** of each, in terms of sustainability.
- How this activity helped you understand the importance of water management in agriculture (urban and rural).

Use the back of this sheet or another page if you need more space for your answers. Be prepared to discuss your answers with the class, using evidence from your data!

Skills You'll Use:

- Daily measurement and record-keeping
- Using lab tools (graduated cylinders, rulers, scales)
- Calculating efficiency (L/kg)
- Comparing system designs (drip vs hydroponic)
- Communicating findings with evidence