Cover crop design challenge

Focus questions	How might cover crops improve soil health? How might farmers benefit from the use of cover crops?
Vocabulary	Cover crop, nitrogen fixation, erosion, water infiltration, ground cover, weed suppression, flood irrigation

Materials

- 2 state scenario cards
- 1 deck of cover crop cards

Activity 1: Engage

Two truths and a lie: Test your soil knowledge! For each of the two sets, do your best to guess the incorrect statement about soil. Which one is the lie?

Set 1

1. Soil acts as a natural filter for both air and water.
2. Soil formation is a simple process that happens relatively quickly.
3. Soil can help preserve archeological artifacts.

Set 2

1. Cover crops often are very susceptible to pests and increase pesticide use.
2. Cover crops help prevent the leaching of nutrients into local groundwater sources.
3. Cover crops are often used to help with soil erosion from seasonal storms.

Activity 2: Explore

1. In groups of three, obtain one state scenario card and a deck of cover crop cards.
2. Using the information provided on the scenario card, select three cover crops from the deck of cover crop cards to help the farmer with their soil needs. Record your choices along with your justification in the table below (provide a *minimum of two justifications* per cover crop).

Scenario 1

State: _____ Commodity crop: _____

Crop choice 1:	Crop choice 2:	Crop choice 3:
Justification:	Justification:	Justification:

3. Return your scenario card and swap it for a different state. Repeat the decision-making process using the cover crop cards. Record your choices along with justification in the table below. *Note:* Information given on scenario cards assume normal weather conditions and planting patterns for the commodity crops. However, climates are shifting, so this isn't always the case for farmers, and they will need to adjust accordingly.

Scenario 2

State: _____ Commodity crop: _____

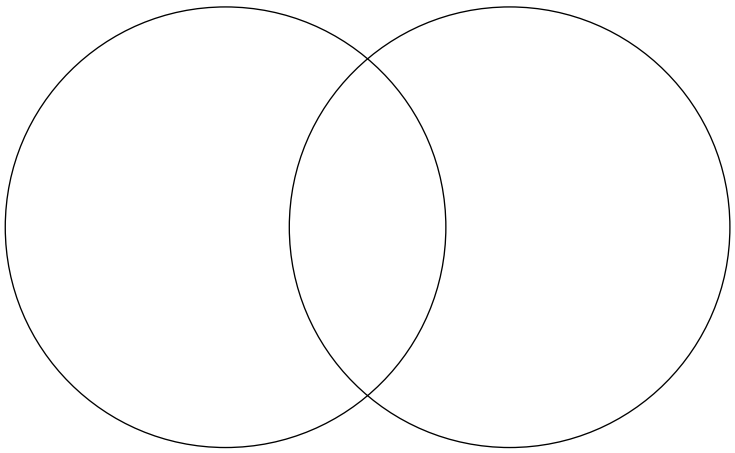
Crop choice 1:	Crop choice 2:	Crop choice 3:
Justification:	Justification:	Justification:

Activity 3: Explain

1. Create a Venn diagram to compare and contrast your two scenarios. Include at least three items in each category.

State 1
State:

Goal:



State 2
State:

Goal:

2. Were the goals of each scenario similar or different? How did this impact your choices of cover crops?

3. A Nebraska corn farmer has a 410 acre farm. One of the cover crops they have chosen for their mix is sold in 50-pound bags, 4,100 seeds per pound. Based on their local conditions, they will need to use about 55 pounds per acre of seed of their chosen cover crop, but only want 30% coverage since they are using two other crops as well. Their seed bag tag indicates a germination percentage of 82%.
   a. **Calculate** the number of bags of cover crop seed the farmer will need to order to ensure proper seeding of his land. Show all work. Include units in the final answer.

$$410 \text{ acres} \times \frac{55 \text{ lbs}}{1 \text{ acre}} \times \frac{1 \text{ seed bag}}{50 \text{ lbs}} = 451 \text{ bags}$$

$$451 \text{ bags} \times 0.30 \text{ (30\% coverage)} = 135.3 \text{ bags}$$
(They will need to purchase 136 bags)

   b. **Calculate** the number of seeds that will germinate once the farmer has seeded his land. Show all work. Include units in the final answer.

4. Often farmers will look at the cost per pound of seed, much as consumers might do for products while grocery shopping. However, taking into account the number of seeds per pound, as well as the planting rate (how many pounds per acre they will need to use with a specific planting method), to determine cost per acre gives the farmer a different picture of their cost. Company A offers their crimson clover seed at $1.80/lb. There are 140,000 seed per pound and a planting rate of 25 pounds per acre with Company A. Company B offers their balansa clover seed at $2.60/lb. There are 480,000 seeds per pound and a planting rate of 10 pounds per acre with Company B. Both companies are using the same planting method. **Calculate** the cost per acre for each company. Show all work. Include units in the final answers. Which company should the farmer purchase their seed from? Why?

Company A **Company B**

$$\frac{\$1.80}{1\text{ lb}} \times \frac{25\text{ lbs}}{1\text{ acre}} =$$

5. **Describe** one additional method farmers can use to improve the health of their soil aside from cover crops.

6. **Propose** a reason why a farmer might be hesitant to plant cover crops in their fields.

7. **Research:** What are typical crops for your state? Find at least three examples. Is the distribution of the crops the same statewide; why or why not? How has the production of these crops impacted the soil health in your state? How can cover crops and other best practices improve or help to mitigate human impact on soils?

Activity 4: Elaborate

Video 1

Watch this video from **Natural Resources Defense Council (NRDC): youtu.be/3j5MRJeCoYs**.

1. What are three major benefits from the use of cover crops on the Lehmans' farm that are discussed?

2. How can we encourage farmers to use cover crops?

3. What is the common misconception about the use of cover crops?

Video 2

Watch this video from **SARE Outreach (Sustainable Agriculture Research and Education): youtu.be/PrQ_wu67ItM**.

1. When are cover crop benefits more pronounced?

2. When should legumes be planted as cover crops?

3. Describe the benefits of cover crop residues adding organic matter to the soil.

4. How does a cover crop residue reduce herbicide costs?

Activity 5: Evaluate

How would you be able to tell if your choice of cover crops were successful in achieving your goal? Write a thoughtful multi-sentence answer and be specific.

Rubric for self-assessment

Skill	Yes	No	Unsure
I can describe the soil health benefits of cover crops.			
I can identify why farms may be hesitant to use cover crops.			
I can describe how cover crops are involved in biogeochemical (nitrogen, carbon) cycles.			