**NAMES\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Legume Scenario Lab-Plant and Soil Science**

Sometimes farmers grow crops of rye and other grasses and then plow them under the soil to decay. This practice helps to increase crop yields of other plants. Farmers may also practice crop rotation, where they plant a legume crop such as peas or vetch in a growing season before a non-legume crop. Legumes are plants that have colonies of nitrogen-fixing bacteria that live on their nodules found in their roots. This practice adds nitrogen to the soil.

In an effort to determine which practice provides the best crop yields, scientists performed an experiment in Georgia. They grew corn on land that had previously received one of five treatments. Three fields had been previously planted with three different legumes. A fourth field had been planted in rye, then its stubble plowed under at the end of the growing season. The fifth field was left bare before the corn was planted. None of the fields received fertilizer while the corn was growing. The table shows how much corn was produced per hectare of land (kg/ha) in each field. One hectare is equivalent to 10,000 square meters.

**Corn Production**

|  |  |
| --- | --- |
| **Previous Crop** | **Average Yield of Corn (kg/ha)** |
| Alfalfa | 2876 |
| Hairy vetch | 2870 |
| Austrian peas | 3159 |
| Rye | 1922 |
| None | 1959 |

1. Use the data in the table to create a bar graph. Be sure to include axis labels and a title. It is suggested that each previous crop be represented with a different colored bar, which then requires a key with the graph.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

2. Compare the effect of growing legumes to that of growing grass on the yield of corn. How do the yields differ from the yield on the field that had received no prior treatment?

3. Which treatment produced the highest corn yield? The lowest corn yield?

4. Based on your knowledge of the nitrogen cycle, how can you explain these results?

5. Why was the fifth field left bare?

6. Using this activity’s example, identify the biotic and abiotic elements of the model. Be specific.

7. Consider the following story. A man in Yuba City planted plum trees. Before actually installing the orchard, he designed it with extra wide rows between the trees. In between the trees, he planted strips of alfalfa. Each year, he harvested both plums and alfalfa hay.

a. Why do you think the rows were extra wide?

b. Do you think the alfalfa added nitrogen to the soil? If so, who benefitted and how?

Alfalfa-

Plum Trees-

The Grower-

When the scientists in Georgia tested soil samples from each of the test plots, they found interesting correlations. Using the soil test kit provided, test the soil from the growth test for nitrogen. Fill out the following table, then use the yield data (kg/ha) and the nitrogen data to develop a graph that shows the correlation between yield and nitrogen level from this study.

|  |  |
| --- | --- |
| **Test plot** | **Nitrogen level** |
| Test Plot A- Alfalfa |  |
| Test Plot B- Hairy Vetch- |  |
| Test Plot C- Austrian Peas |  |
| Test Plot D- Rye |  |
| Test Plot E- None |  |

8. Using your graph, explain the importance of using legumes in a crop rotation system.