# Farming for Beetles, Bees and Biomass

**Part 1: Comparing Biodiversity between Crops**

Scientific question # 1:

1. What scientific question related to biodiversity are the researchers trying to answer with this study? Refer to the background reading.

Scientific Data:

To answer their first question, the scientists calculated the average **species richness** for each crop. Species richness is the number of different plant, insect predator and bee species they found. They organized their data in this table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Crop** | **Plant richness** | **Insect predator richness** | **Bee richness** |
| Corn | 10.9 | 2.9 | 16.0 |
| Switchgrass | 14.7 | 11.6 | 27.7 |
| Prairie | 21 | 14.6 | 22.2 |

1. What data will you graph to answer your question?

Independent variable: (a)

Dependent variables: (a)

(b)

(c)

Graphing and interpreting data: Below is a graph of the data.

Figure 1: A comparison of the average number of plant and beneficial bug species found in each crop. The error bars represent standard error, a measure of the amount of variation in the species counts between fields.

1. Based upon this evidence, write a statement that helps answer the first scientific question. Justify your reasoning using data.
2. *Your next step as a scientist*: Science is an ongoing process. Did this study fully answer your original question? What new questions do you think should be investigated? What future data should be collected to answer them?
3. Why does biodiversity matter? The researchers also want to measure how bug and plant biodiversity could be benefiting people. The ways we benefit from biodiversity and ecosystems are called ecosystem services. In the table below list the ecosystem services associated with the organisms compared in this study. List the services they compared and any others you can think of.

|  |  |
| --- | --- |
| **Type of biodiversity** | **Ecosystem services (how could benefit people)** |
| Plants |  |
| Predatory bugs |  |
| Bees |  |

1. **Making predictions**: Based upon the results and what you know about these crops, make predictions about which crop (corn, switchgrass, or prairie) will have the highest biomass, pest predation, and pollination.

|  |  |  |
| --- | --- | --- |
| **Ecosystem service** | **Top crop** | **Your reasoning** |
| Plant biomass |  |  |
| Egg predation |  |  |
| Flower pollination |  |  |

**Part 2: Comparing ecosystem services & Balancing tradeoffs**

Scientific question # 2:

1. What scientific question related to ecosystem services are the researchers trying to answer with this study? Refer to the background reading.

Scientific Data: Below is a table summarizing the results of the measured ecosystem services for the three crops.

|  |  |  |  |
| --- | --- | --- | --- |
| **Crop** | **Plant biomass (g/m2)** | **Proportion of pest eggs eaten** | **Number of seeds/sunflower** |
| Corn | 2073 | 0.14 | 8 |
| Switchgrass | 637 | 0.48 | No data |
| Prairie | 654 | 0.55 | 15.5 |

Interpreting the data:

1. Review the scientific question guiding this this research on ecological services. Based upon this evidence, write a statement that helps answer the scientific question. Justify your reasoning using data.
2. Do the results match your predictions? Describe and propose an explanation for any differences.
3. The researchers were not able to measure pollination rates in switchgrass. Based upon the bee biodiversity results from Part 1, how do you think that the pollination rate for switchgrass would compare to the other crops.

Balancing tradeoffs:

1. In this case, is it possible to maximize biodiversity and all ecosystem services by growing one crop? Explain.
2. Farmers grow corn for a good reason: it produces a lot biomass and valuable grain which makes their farm profitable. Can you think of any ways, as a society, we could encourage farmers to use some of their land to grow other crops like prairie or switchgrass, which aren’t as profitable but provide other ecosystem services?