Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_

### Lesson 4.3 Biofuels Agriculture

Below is a table with data on some of the factors that need to be considered in a cost/benefit analysis of the production of biofuels crops.

|  |  |  |  |
| --- | --- | --- | --- |
| **Crop type** | **Perennial**  **verses**  **annual** | **Annual**  **Biomass**  **Yield**  people fbf-1 yr-1 | **Change in**  **soil carbon**  people fbf-1 yr-1 |
| **Conventional corn** | A | 227 | -8.9 |
| **No till corn** | A | 227 | -2.5 |
| **Switchgrass** | P | 180 | +2.4 |
| **Prairie grass** | P | 81 | +1.8 |

People = the mass of an average person (~150 lbs)

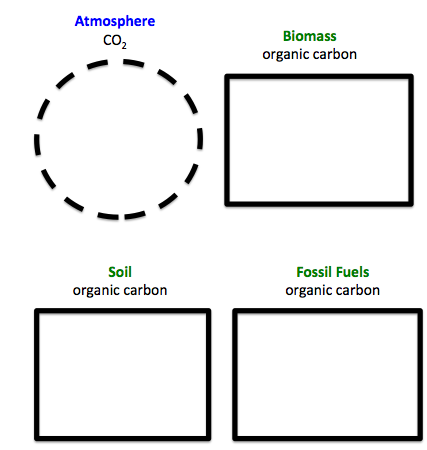
Fbf = area the size of a football field

1. **Type of agriculture.** Compare corn that is grown in the conventional way where furrows are plowed in the ground and seeds dropped into them with no-till corn where the corn seeds are drilled into the ground without plowing.
   1. Which planting method produces more biomass? *Conventional till No till*
   2. Which planting method is more helpful in keeping carbon in the soil?

*Conventional till No till*

* 1. Which data did you use to determine your answer to part b?

1. **Annual vs perennial.** 
   1. Which type of crop produces more biomass? *Annual Perennial*
   2. Which data did you use to determine your answer to part a?
2. Which type of crop is more helpful in keeping carbon in the soil? *Annual Perennial*
3. Which data did you use to determine your answer to part c?
4. Which type of crop is likely to require more energy for planting, tending, and harvesting? *Annual Perennial* Explain your answer.
5. The diagram below shows the movement of carbon associated with production and use of the biofuel, ethanol that we have considered so far. Label each arrow and add an arrow representing the change in soil carbon associated with growing corn and grasses.



**Soil**

**Organic carbon**

**Fossil Fuels**

**organic carbon**

In diagrams like this, we often use the width of the arrow to represent the amount of material that is moving. Compared to the arrow that represents the amount of carbon that moves from the atmosphere into biomass, how wide should the arrow representing the change in soil carbon be?

1. **Cost/benefit analysis.** Remember that in order to have biofuels help with the global warming problem, we want to maximize the amount of plant biomass produced and minimize the amount of energy needed to produce it. If you were a congressman thinking about environmental policy, which option would you support?
   1. *Conventional corn No till corn Switchgrass Prairie grass*
   2. Explain your answer including which data you used to make your decision.
   3. What other data might you need to consider to determine if this is a good choice?