



VI. Soil loss tolerance and erosion rates

A. How erosion reduces crop yields

- **Gully erosion** is dramatic but less common.
- More subtle and widespread is **sheet erosion**: a few millimeters of soil is lost at a time.
- Loss of soil means loss of N and P for crops, which must be replaced with fertilizers.
- The soil gets thinner, resulting in a shallower rooting zone and less water held in the soil.
- Consequently, crops require more frequent irrigation.
- Because of these factors, soil loss leads to increased resource substitution.

B. Definition

- **Soil loss tolerance** is the maximum level of soil erosion that will permit high crop production to be maintained economically and indefinitely (i.e. sustainable agriculture) (**Slide 9**)
- Common definition: The amount of soil that a farmer can afford to lose.
- The soil loss tolerance is different for different soils and depends on the nature of the field, farm and region.
- A smart farmer should prevent erosion from exceeding the soil loss tolerance rate.

C. Application: Current erosion vs. soil loss tolerance rates (**Slides 10 [map] and 11 [table]**)

- In the Midwest erosion is high, but soils are very deep and fertile with a very high loss tolerance; about 30% of the farmland is exceeding the tolerance rate.
- In the Southeast Piedmont there is low erosion, but soils are thin and infertile; 48-54% of farms are exceeding the loss tolerance rate.
- The best investment in soil conservation would be in the Piedmont.
- Follett and Stewart argued that it is unethical to waste the interest of future generations in conservation of topsoil to maintain current agricultural production. (**Slide 12**)

VII. Conclusion: Broader Perspectives on Sustainability

- We don't know what agricultural technologies will be available in 50 years.
- The technological optimist would argue that we are already spending too much on the Conservation Reserve Program.
- The conservationist would reply: If we lose our topsoil, can we meet future demands for food?
- There is an ethical debate over this question:
 - Fahey argues that we should conserve soil because it is a living, breathing and essential part of all ecosystems on the land.
 - Barrett (1997) argued, in contrast, that our concern should not be with soil *per se*, because soil only indirectly benefits society through crop production. (**Slide 13**)