

# What is the problem?

• “Concern is mounting about the rapid buildup of atmospheric CO<sub>2</sub> and other greenhouse gases and the implications for our climate and environment...”

*U.S. Climate Action Report 2001*

• Fossil fuel consumption and land use changes and practices have contributed to the increase in greenhouse gases in the earth’s atmosphere, where carbon accounts for about 80% of greenhouse gases

## One Solution: Carbon Sequestration

• Scientists believe that increasing the amount of carbon sequestered in the soil can reduce global atmospheric CO<sub>2</sub> levels

• Replace conventional summer-fallow practices with chemical-fallow practices (i.e., no-till) and current year alternate year monoculture cropping systems with annual cropping systems

• A new market and future government programs may purchase carbon sequestration services from producers

• Net emitters of carbon will purchase the *offsets* generated by participating agricultural producers

## What is CASMGs?

• CASMGs is a consortium of nine land grant universities and the Pacific Northwest National laboratory

• CASMGs research will improve the scientific basis for using land management practices to increase soil carbon sequestration

• CASMGs will provide information for Montana producers to individually analyze whether they should implement carbon sequestration strategies

# Consortium for Agricultural Soils Mitigation of Greenhouse Gases (CASMGs)

MSU CASMGs researchers will

- Further investigate the processes and identify the best management practices of soil carbon sequestration and soil greenhouse gas emission mitigation
- Integrate biophysical and economic models to assess and predict carbon sequestration potential
- Verify changes in soil carbon and greenhouse gas emissions resulting from changes in land use
  - Provide information and decision making tools to producers and policymakers



The Economic Component will:

- Assess the competitiveness of U.S. agricultural producers as suppliers of carbon credits
- Use economic models to quantify producer responses to economic incentives for sequestering soil carbon (fig. 1)
- Use ecosystem models to estimate the amount of carbon sequestered and the yields for various production systems, using soil and climate data
- Offer producers incentive payments to change their management practices in order to increase soil carbon

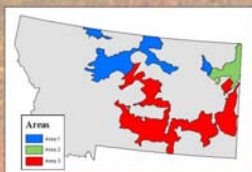


Figure 1. Three resource areas in central and eastern Montana, where field level inputs, production practices, soil and climate data have been collected

The Biophysical Component will:

- Evaluate “best management practices” in accumulating soil organic carbon in Montana cropland (fig. 2)
- Compare the impact on soil carbon of no-till versus conventional tillage and intensifying cropping systems from crop-fallow to annual cropping (fig. 3)
- Investigate how soil carbon sequestration is affected by the quantity and spatial distribution of surface crop residues
- Assess the impact of changing cropping systems on nitrous oxide emissions. Nitrous oxide, a greenhouse gas, is 310 times more powerful at trapping heat in the atmosphere

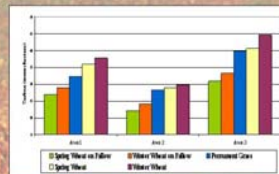


Figure 2. Soil carbon levels predicted by the Biophysical Model for cropping systems in Montana

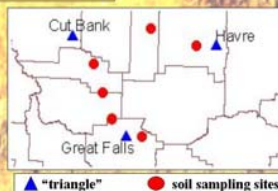


Figure 3. In the “triangle” the relationship between soil carbon and land management practices is investigated

# Future Resources for Montana Producers

• An on-line analysis tool that producers can use to calculate break-even “participation” levels by farm size and tillage/management systems

• Enterprise budgets for mechanical till, minimum till and no-till for Montana production regions

• Web-based case studies using enterprise budgets on tillage/management systems

• Educational materials on the carbon cycle, greenhouse gas mitigation strategies, carbon markets and other relevant issues for producers and policymakers

## Early research results

• Montana dryland grain producers could sequester as much as 20 million metric tons of carbon in soils over a 20-year period at a cost competitive with industrial reductions or other sinks

• If carbon is priced at \$30/tonne, grain producers in Montana who switch from crop/fallow to a more continuous cropping scheme could obtain total payments ranging from \$12-15 million per year for 20 years

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