

## Resource Concerns

# Greenhouse Gases

Soil

Water

Air

Air Quality Impacts

Greenhouse Gases

Odors

Ozone Precursors

Particulate Matter

Plants

Animals

Energy

### Air Quality Impacts - Greenhouse Gases

Emissions increase atmospheric concentrations of greenhouse gases.

#### What is it?

Direct and indirect emissions of greenhouse gases (GHGs - primarily CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O for agriculture) cause increased concentrations of GHGs in the atmosphere and can cause resultant changes in climate. Greenhouse gases from activities such as crop fertilization (natural and synthetic), tillage and agricultural soils management, manure management, livestock enteric fermentation, internal combustion engines, rice cultivation, and land use conversion contribute to excess agricultural greenhouse gas (GHG) emissions to the atmosphere. A portion of nitrogen fertilizer that is applied to crops and grasslands is volatilized through a complex microbial process (nitrification and denitrification) and emitted to the atmosphere as nitrous oxide (N<sub>2</sub>O). Methane (CH<sub>4</sub>) is produced as part of the normal digestive processes in animals and through the anaerobic (without oxygen) decomposition of manure and managed waste. The combustion of fossil fuels as an energy source results in direct carbon dioxide (CO<sub>2</sub>) emissions to the atmosphere. Soil tillage increases soil organic matter decomposition and releases soil carbon, in the form of carbon dioxide (CO<sub>2</sub>), to the atmosphere.

#### Why is it important?

Greenhouse gas, primarily carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), accumulation in the atmosphere can have a potent impact on the climate. Greenhouse gases absorb and emit infrared radiation resulting in the “greenhouse effect,” and can cause changes in climate.

#### What can be done about it?

There are many opportunities to reduce GHGs in agriculture. Planting and growing trees can provide long term solutions to sequester carbon dioxide (CO<sub>2</sub>) from the atmosphere. Reducing tillage increases the ability of the soil to store carbon in the form of organic matter and reduces the release of nitrous oxide (N<sub>2</sub>O). The efficient use of nitrogen fertilizer through split applications, soil injections and side-dressing can reduce nitrous oxide (N<sub>2</sub>O) emissions. Anaerobic manure handling facilities, such as methane digesters or biogas recovery systems, can capture methane emissions from manure and supply renewable energy. Increasing on-farm energy efficiency and the use of renewable energy sources (solar, wind, and biofuels) can reduce greenhouse gas emissions.

### Greenhouse Gases at a Glance

Problems / Indicators - Greenhouse gas emissions	
Causes	Solutions
<ul style="list-style-type: none"> <li>• CO<sub>2</sub> emissions from the use of fossil fuels</li> <li>• CH<sub>4</sub> production from animal operations</li> <li>• CO<sub>2</sub> and N<sub>2</sub>O from soil tillage</li> <li>• Loss of carbon from soils and plants</li> <li>• Excessive N<sub>2</sub>O emissions from cropping systems</li> </ul>	<ul style="list-style-type: none"> <li>• Renewable energy (solar, wind, biofuels), and better combustion processes and efficiencies</li> <li>• Anaerobic manure handling facilities</li> <li>• Conservation tillage and reduced soil disturbance</li> <li>• Riparian forest buffers</li> <li>• Tree and shrub planting</li> <li>• Nitrogen fertilizer management</li> </ul>