

## Agriculture and Greenhouse Gases Fact Sheet

### NRCS Air Quality and Atmospheric Change Team

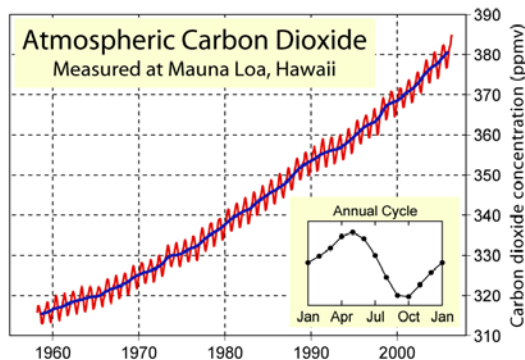
Interest in climate change and carbon offset trading has gained great interest in many parts of the agricultural community over the past few years. But why should we as NRCS conservationists be interested in these issues? Conservation systems that we design and help implement can often have a positive influence on the emission or storage of certain compounds which, when in the atmosphere, can affect climate change.

#### Where does it all start?

To understand why these emissions from agriculture can help control climate change, one must first understand what can cause the earth temperature to change. Sunlight strikes the earth surface, and causes the surface to warm. Certain gases in the atmosphere absorb and re-emit heat that comes from the earth's surface. These gases are called greenhouse gases, and are a mainstay of a process called the **greenhouse effect**. The **greenhouse effect** is the process in which the absorption and emission of thermal infrared radiation by a planet's atmosphere warms that planet's surface. To demonstrate the effectiveness of the greenhouse effect, with natural levels of greenhouse gases in the atmosphere, the earth has an average temperature of about 59



degrees Fahrenheit; without greenhouse gases, the earth would have an average temperature of only 0 degrees Fahrenheit - far too cold to support life as we know it.



The concerns of many in the scientific community are that increasing amounts of greenhouse gases in the atmosphere will cause warming in the atmosphere beyond current levels. Indeed, measurements of atmospheric concentrations of carbon dioxide show that levels have increased

markedly over the past 50 years. So, as carbon dioxide levels continue to rise, the earth likely will see temperatures increasing across the globe.

#### What are the greenhouse gases from agriculture?

There are three main greenhouse gases emitted by agriculture: **carbon dioxide**, **nitrous oxide**, and **methane**. Carbon dioxide comes mostly from tillage of high carbon soils, emissions from engines, and burning of organic matter. Nitrous oxide comes from soil nutrient processes and manure. Methane is mainly from animals and manure. All of these gases can be controlled by designing and implementing good conservation systems that include practices that manage greenhouse gas emissions:

**Carbon Dioxide** can be controlled by practicing reduced or no-till crop production systems which limit soil disturbance and protect soil carbon. These systems can also reduce the number of trips across a field, limiting carbon dioxide emissions from tractor engines. Limiting burning of trash and residues can control combustion sources of carbon dioxide.



**Nitrous Oxide** is a bi-product of the conversion of ammonia to nitrate and ultimately to nitrogen gas. Practices that control nitrification (ammonia to nitrate) and denitrification (nitrate to nitrogen gas) will help minimize emissions of nitrous oxide from the soil. These practices can include using soil testing to determine existing soil fertility levels; plant tissue testing to determine plant and crop nutrient needs, using split applications of nitrogen fertilizers before and during the growing season to more closely meet crop nutrient needs; and utilizing a nitrification inhibitor with nitrogen applications to control nitrification and denitrification.

**Methane** from agriculture comes mainly from animals and their manures. Methane emissions can be controlled by practicing good animal feed management which limits methane production in the animal; using aerobic manure systems which limit methane production; and capturing methane by using an anaerobic digester to treat animal manures.

### **Interest in Carbon Offsets and Carbon Trading**

Beyond environmental and agronomic concerns over global warming, there has been much interest in agriculture's ability to store carbon in the soil and vegetative matter (carbon sequestration), or reduce methane emissions, and trading that carbon value for cash. Some states (such as California and those in the Northeast), have enacted or are evaluating the potential to limit greenhouse gas emissions through legislation and regulation. This is still an emerging issue, both for the country as a whole and agriculture as an interested industry.



---

NRCS is developing guidance and improving conservation practice standards to help the agency address greenhouse gases and climate change. For more information, contact the Air Quality and Atmospheric Change National Technology Development Team (<http://www.airquality.nrcs.usda.gov/>) at the West National Technology Support Center in Portland, Oregon. (Primary contact: Roel Vining, [roel.vining@por.usda.gov](mailto:roel.vining@por.usda.gov))  
2/10/2009