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August 2008

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Abstract

Emissions of the three most important long-lived greenhouse gases (GHG) have increased measurably over the past two centuries. Carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) concentrations in the atmosphere have increased by approximately 35%, 155%, and 18%, respectively, since 1750. In the U.S., agriculture accounted for close to 7% of total GHG emissions (7260 Tg CO₂ eq.) in 2005. Livestock, poultry, and crop production contributed a total of 481 Tg CO₂ eq. to the atmosphere in 2005. This total includes an offset from agricultural soil carbon sequestration of roughly 32 Tg CO₂ eq. The primary agricultural sources are N₂O emissions from cropped and grazed soils (263 Tg CO₂ eq.), CH₄ emissions from enteric fermentation (112 Tg CO₂ eq.), and CH₄ emissions from managed livestock waste (41 Tg CO₂ eq.). Forests in the United States contributed a net reduction in atmospheric GHG of approximately 787 Tg CO₂ eq. in 2005, which offset total U.S. GHG emissions by approximately 11%. In aggregate, the U.S. agricultural sector (including GHG sources for crop, poultry, and livestock production and GHG removal from the atmosphere via sinks for in) was estimated to be a net sink of 306 Tg CO₂ eq. in 2005.

Keywords: climate change, greenhouse gas, land use, carbon stocks, carbon sequestration, enteric fermentation, livestock waste, nitrous oxide, methane, rice cultivation, energy consumption.

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Dear Reader:

I am pleased to present you with this report, *The U.S. Agriculture and Forestry Greenhouse Gas Inventory: 1990-2005*, an update to USDA Technical Bulletin 1907 (2004) which accounted for greenhouse gas emissions and sinks for the agricultural and forestry sectors through 2001.

This report is consistent with the Environmental Protection Agency's (EPA's) *Inventory of U.S. Greenhouse Gas Emissions and Sinks* (2007) in its assessment methods. However, EPA's national-scale reporting here has been disaggregated to provide a State-by-State presentation. We believe this format will serve as a useful resource to land managers, planners, and others with an interest in greenhouse gas dynamics and their relationships to land use and land use change.

Data collection and analysis, as well as coordination of this *Inventory*, could not have been accomplished without the contributions of Stephen Del Grosso, Ronald Follett, and USDA's Agricultural Research Service. I also express my thanks to Linda Heath and James Smith of the USDA Forest Service, James Duffield of USDA's Office of Energy Policy and New Uses, Stephen Ogle at the Natural Resources Ecology Laboratory of Colorado State University, and Tom Wirth in EPA's Office of Atmospheric Programs for their data, analysis, and review. Their thoughtful and diligent efforts compose the foundation of this report, which we hope will serve as a useful resource for a broad spectrum of land management-focused professionals and other interested individuals.

Sincerely,

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Director, USDA Global Change Program Office

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Glossary of Terms and Units

CO ₂	Carbon dioxide
CH ₄	Methane
N ₂ O	Nitrous oxide
NO _x	Nitrogen oxides
C	Carbon
GHG	Greenhouse gas
GWP	Global warming potential
Tg	Teragram (10 ¹² grams)
Tg CO ₂ eq.	Teragrams of carbon dioxide equivalent
Gg	Gigagram (10 ⁹ grams)
Mg	Megagram (10 ⁶ grams)
t	Metric ton (1,000 kg)
ha	Hectares
DE	Digestible energy (percent)
Y _m	Fraction of gross energy converted to CH ₄
TDN	Total digestible nutrients
VOCs	Volatile organic compounds
VS	Volatile solids
DM	Dry matter
Btu	British thermal unit
Qbtu	Quadrillion British thermal units
Tbtu	Trillion British thermal units
EF	Emission factor
MCF	Methane conversion factor