ORNL sows seeds with new agricultural carbon accounting tool

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Carbon dioxide emissions from agricultural activity in the United States can now be tracked with unprecedented resolution because of a method developed at Oak Ridge National Laboratory.

A team led by Tristram West uses satellite remote sensing, computational resources and high-resolution national inventory datasets to pinpoint agricultural-based carbon emissions nationwide. The method, outlined in the journal Ecological Applications (http://www.esajournals.org/doi/full/10.1890/08-2352.1), provides a link between ground-based estimates and atmospheric measurements for any given agricultural point in the nation.

"This is a significant step toward compiling datasets and establishing a method useful for carbon accounting purposes," said West, a member of ORNL's Environmental Sciences Division.

"Until now, we have done project-level reporting and national-level reporting as two independent exercises," West said. "The first was for carbon credits while the second was for international reporting to the United Nations."

West noted that, with the current system, emissions from economic sectors are reported nationally as required under the U.N. Framework Convention on Climate Change. Project-level emissions are monitored on a case-by-case basis under independent projects or regional programs.

Doing both - project- and national-level reporting - in a consistent manner will become increasingly important as the U.S. and other countries move forward with climate agreements and legislation to reduce carbon dioxide emissions, according to West.

"If the U.S. enters into national or international agreements on emissions reductions, a consistent framework for monitoring and reporting net carbon dioxide emissions from the project to national levels will prove more effective and provide more accurate and consistent reporting than independent reporting processes," West said.

The ORNL method uses land cover data derived from NASA satellites to refine geospatial cropland carbon fluxes nationwide. Meanwhile, the Department of Agriculture's cropland data layer enables field-scale delineation of specific crops and allows for refined estimates of carbon fluxes.

Ultimately, this effort provides estimates of net ecosystem exchange of carbon for any given agricultural point in the U.S. This information about carbon flux based on crop, soil and management practices gives a measure of the total vertical carbon flux, including fossil fuel emissions occurring on site.

The research effort also provides estimates of net ecosystem carbon balance, which includes all carbon sources and sinks associated with crop production in a defined area.

"This means that upstream emissions from fertilizer production, for example, are accounted for in the same place where the crop is produced," West said. "This method allows for an estimate of the total impact of changing cropland management on net CO2 emissions."

Cropland management has proved to be an important consideration. For

example, researchers reported that reduced tillage practices from 1990 to 2004 resulted in a net emissions reduction of 8.8 million metric tons of CO2 from burning fossil fuels in the U.S.

West notes that this version of the carbon accounting framework can be improved by anticipated improvements in annual crop species-specific biomass and crop residue production.

Provided by Oak Ridge National Laboratory