Geospatial resolution of cropland carbon fluxes in the United States were improved using inventory-based carbon accounting

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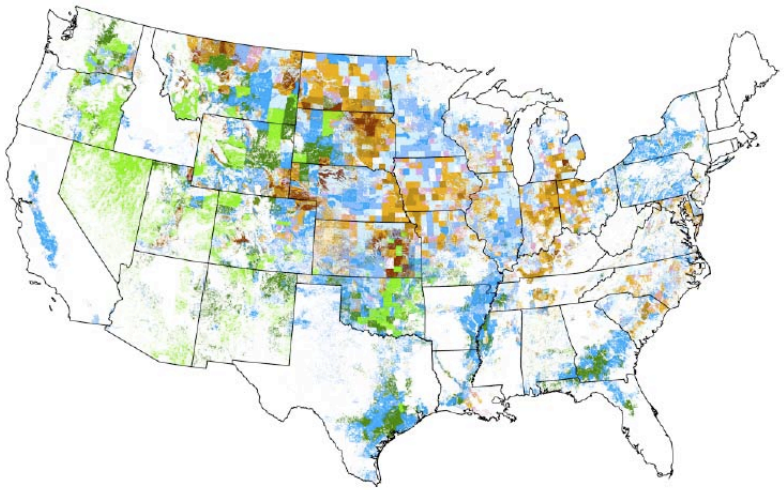
- A framework has been developed for estimating NEE and NECB from U.S. agricultural practices at a sub-county scale, based on available inventory data and satellite-derived land cover data.
- This framework provides the means to evaluate carbon dynamics associated with crop species in a spatially explicit manner.
- As expected, net carbon gain in croplands is greatest in the U.S. corn belt where estimates of production and removal of harvested biomass are high, relative to other crops.
- Estimates of carbon balance for U.S. croplands based on this method provide an indication of which crops and management practices are contributing to carbon sources and sinks and where the sources and sinks are located.



Net ecosystem carbon balance for U.S. croplands in 2004.
Brown = crops that were sinks for carbon
Blue and green = crops that were sources of carbon

U.S. DEPARTMENT OF ENERGY

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

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Net annual soil carbon change, fossil fuel emissions from cropland production, and cropland net primary production were estimated and spatially distributed using land cover defined by NASA's moderate resolution imaging spectroradiometer (MODIS) and by the USDA National Agricultural Statistics Service (NASS) cropland data layer (CDL). Spatially resolved estimates of net ecosystem exchange (NEE) and net ecosystem carbon balance (NECB) were developed. The purpose of generating spatial estimates of carbon fluxes, and the primary objective of this research, was to develop a method of carbon accounting that is consistent from field to national scales. NEE represents net on-site vertical fluxes of carbon. NECB represents all on-site and off-site carbon fluxes associated with crop production. Estimates of cropland NEE using moderate resolution (;1 km2) land cover data were generated for the conterminous United States and compared with higher resolution (30-m) estimates of NEE and with direct measurements of CO2 flux from croplands in Illinois and Nebraska, USA. Estimates of NEE using the CDL (30-m resolution) had a higher correlation with eddy covariance flux tower estimates compared with estimates of NEE using MODIS. Estimates of NECB are primarily driven by net soil carbon change, fossil fuel emissions associated with crop production, and CO2 emissions from the application of agricultural lime.
NEE and NECB for U.S. croplands were □274 and 7 Tg C/yr for 2004, respectively. Use of moderate- to high-resolution satellite-based land cover data enables improved estimates of cropland carbon dynamics.

West TO, Brandt CC, Baskaran LM, Hellwinckel CM, Mueller R, Bernacchi CJ, Bandaru B, Yang B, Wilson BS, Marland G, Nelson RG, De La Torre Ugarte GG, Post WM (2010) Cropland carbon fluxes in the United States: Increasing geospatial resolution of inventory-based carbon accounting. *Ecological Applications* 20:1074--1086.