

County-level Estimates for Carbon Distribution in U.S. Croplands, 1990-2005

Method of Estimation

The United States Department of Agriculture (USDA), National Agricultural Statistics Survey (NASS) produces estimates of crop yields per county per year. These yield estimates can be converted to carbon by converting units reported by NASS to one standard unit (kg), converting to dry matter, and multiplying by a carbon content factor of 0.45 (Brady and Weil, 1996). Yield estimates are divided by the harvest index to estimate total above-ground biomass. Multiplying aboveground biomass with the root:shoot ratio provides an estimate of below-ground biomass. Finally, summing above- and below-ground biomass provides an estimate for total net primary productivity (NPP). This method follows approaches used by Prince et al. (2001), Hicke and Lobell (2004), and Hicke et al. (2004). A mean harvest efficiency of 0.95 was assumed across all crops. Factors used in our estimations are provided in Table 1.

Table 1. Factors used to estimate NPP-carbon for U.S. crops.

Crop	Reporting units	mass per unit (kg)	Conversion to Dry matter	Harvest Index	Root:shoot ratio
corn grain	bushel	25.4	0.87	0.53	0.18
corn silage	ton	907.2	0.26	1.00	0.18
soybean	bushel	27.2	0.92	0.42	0.15
oats	bushel	14.5	0.92	0.52	0.40
barley	bushel	21.8	0.90	0.50	0.50
wheat	bushel	27.2	0.89	0.39	0.20
sunflower	pound	0.453	0.93	0.27	0.06
hay	ton	907.2	0.85	1.00	0.87
sorghum grain	bushel	25.4	0.87	0.44	0.08
sorghum silage	ton	907.2	0.26	1.00	0.18
cotton	bale	217.7	0.92	0.40	0.17
rice	hundredweight	50.8	0.91	0.40	0.46
peanuts	lbs	0.45	0.91	0.40	0.07
potatoes	hundredweight	50.8	0.20	0.50	0.07
sugarbeets	ton	907.2	0.15	0.40	0.43
sugarcane	ton	907.2	0.70	0.70	0.18
tobacco	lbs	0.453	0.80	0.60	0.80
rye	bushel	25.4	0.90	0.50	1.02
beans	hundredweight	50.8	0.76	0.46	0.08

Our final results are provided as carbon in net primary productivity (NPP), aboveground biomass (AgB), belowground biomass (BgB), harvested and removed biomass (Harvest), and surface residue remaining following the harvest (Residue). All units are in Mg C yr⁻¹. The following NASS commodity codes are represented in our analysis: 11199199, 15499199, 11299999, 11399999, 10199999, 15831999, 18999999, 19599999, 11499199, 12121999, 10619999, 15399199, 39199999, 39299999, 13299199, 13199199, 14133699, 14133599, 14133799, 14133199, 14255599, 14244199, 14122299, 14122399, 14111299, 14111399, 14111199, 10499999, 16199999, 30429929. These represents all crops in Table 1 including subcategories of tobacco and beans.

References

- Brady, N.C. and R.R. Weil. 1996. The nature and properties of soils. 11th edition. Prentice-Hall, Inc., Upper Saddle River, New Jersey.
- Hicke, J.A. and D.B. Lobell. 2004. Spatiotemporal patterns of cropland area and net primary production in the central United States estimated from USDA agricultural information. *Geophysical Research Letters* 31, L20502, doi:10.1029/2004GL020927,2004.
- Hicke, J.A., D.B. Lobell, and G.P. Asner. 2004. Cropland area and net primary production computer from 30 years of USDA Agricultural Harvest Data. *Earth Interactions* 8, Paper No. 10.
- Prince, S.D., J. Haskett, M. Steininger, H. Strand, and R. Wright. 2001. Ecological Applications 11(4): 1194-1205.

File formats and Processing

1. Comma Delimited (CSV)
2. ArcGIS Shapefile (SHP)

Geographic coordinate system name: GCS_North_American_1983

Geographic coordinate units: decimal degrees

Horizontal Datum Name: North American Datum of 1983

Ellipsoid Name: Geodetic Reference System 80

Semi-major Axis: 6378137.000000

Denominator of Flattening Ratio: 298.257222

Bounding coordinates

Horizontal

In decimal degrees

West: -124.732769

East: -66.969271

North: 49.371730

South: 24.956376

In projected or local coordinates

Left: -124.732769

Right: -66.969271

Top: 49.371730

Bottom: 24.956376

3. Data location: <http://cdiac.ornl.gov/>

4. Data set author:

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