Harvested Area and Yield for 4 Crops 1995-2005

Metadata and Technical Documentation

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Abstract:

Croplands cover ~15 million km2 of the planet and provide the bulk of the food and fiber essential to human well-being. Most global land cover data sets from satellites group croplands into just a few categories, thereby excluding information that is critical for answering key questions ranging from biodiversity conservation to food security to biogeochemical cycling. Information about agricultural land use practices like crop selection, yield, and fertilizer use is even more limited. Here we present land use data sets created by combining national, state, and county level census statistics with a global data set of croplands on a 5 minute by 5 minute (~10 km by 10 km) latitude/longitude grid. The resulting land use data sets depict five-year averages for 1995, 2000, and 2005 area (harvested) and yield of wheat, maize, rice, and soybean.

Citation:

Ray, D. K., Ramankutty, N., Mueller, N. D., West, P. C., & Foley, J. a. (2012). Recent patterns of crop yield growth and stagnation. Nature Communications, 3, 1293. https://doi.org/10.1038/ncomms2296

Based on previous research:
Monfreda, C., N. Ramankutty, and J. A. Foley (2008), Farming the planet: 2. Geographic distribution of crop areas, yields, physiological types, and net primary production in the year 2000, Global Biogeochem. Cycles, 22, GB1022, doi:10.1029/2007GB002947.

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Data Products:
The following data products are included for each of 175 crops:
- Harvested Area: fractional
  o Crop-specific data representing the average fractional proportion of a grid cell that was harvested in a crop during the 1997-2003 era.
- Yield : tons per hectare
  o Crop-specific data representing the average yield for a crop in tons per hectare during the 1997-2003 era

Formats:
All data are provided in the following formats:
- .tif : Geotiff (More information: http://trac.osgeo.org/geotiff/)

Resolution:

- Spatial: Five arc-minute by five arc-minute resolution (~10km x 10km at equator)
- Temporal: Five year averages for 1995 (1993-1997), 2000 (1998-2002), and 2005 (2003-2007).

Map Projection:
- Data presented as five-arc-minute, 4320 x 2160 cell grid
- Spatial Reference: GCS_WGS_1984
- Datum: D_WGS_1984
- Cell size: 0.083333 degrees
- Layer extent:
  o Top : 90
  o Left: -180
  o Right: 180
  o Bottom: -90

Agricultural Inventory Data:
We collected maize, rice, wheat, and soybean area harvested and production numbers from ~13,500 fixed political units to build our national and subnational information of crop yields (yield is the ratio of production and harvested area) at each of these political units. What we describe here is the data used in this specific study, approximately 600,000 census statistics per crop. Out of the 226 political units (nations) for which the Food and Agriculture Organization (FAO) provides national-level data, we

collected data at the next administration level for 51 countries, and also at the third administration level for 17 countries. These 51 countries account for ~79% maize, ~80% rice, ~70% wheat, and ~97% soybean harvested areas globally, between 2004-200860. More importantly, these 51 countries account for ~91% maize, ~83% rice, ~78% wheat and ~99% of soybean total global production during the same years. Where sub-national data are available, the frequency of reporting varies among countries. Our largest gap of missing subnational information is from the former Soviet Republics.

Frequently Asked Questions and Tips:

- Why does the harvested area fraction exceed 1 (100% or more of a cell in a single crop)?
  - o A grid cell may be more than 1.0 or 100% due to multiple harvests per year. For example, if a crop is produced in 60% of the grid cell's area, and harvested twice in one year, that cell would have a value of 1.2, or 120%.
- These data sets are not intended to be interpreted at the individual grid cell level. Although they are presented at five-minute resolution, the best way to use these maps is to compare counties, states, regions, countries, or continents.

See included Supplemental Information for more in-depth information on data quality and methods

	Country	Source (see SI)	Number of political units	Time frame (number of years available from 1989 to 2008)	Number of census reported statistics collected per crop
1	Argentina	[49], [50]	499 municipios + 22 states + 1 national level	20 municipios + 20 states + 20 national	19960 municipios + 880 states + 40 national
2	Australia	[49], [51], [52], [53]	59 statistical divisions + 9 states + national level	10 statistical divisions + 20 states + 20 national	1180 statistical divisions + 360 states + 40 national
3	Austria	[49], [54]	9 states + 3 regions + national level	20 states + 20 regions + 20 national	360 states + 120 regions + 40 national
4	Belgium	[49], [54]	11 states + national level (prior to 2000 we used Belgium-Luxembourg)	20 states + 20 national	440 states + 40 national
5	Bolivia	[49], [55]	9 regions, + national level	11 regions + 20 national	198 regions + 40 national
6	Brazil	[49], [56], [57]	5510 municipios + 27 states + national level	20 municipios + 20 states + 20 national	220400 municipios + 1080 states + 40 national
7	Bulgaria	[49], [54]	28 provinces + national level	1 provinces + 20 national	56 provinces + 40 national
8	Canada	[49], [58]	13 (provinces & territories) + national	20 (provinces & territories) + 20 national	520 (provinces & territories) + 40 national

9	Chile	[49], [59]	13 regions + national	20 regions + 20 national	520 regions + 40 national
10	China	[49], [60]	30 provinces/autonomous regions/municipalities + national	20 provinces + 20 national	1200 provinces + 40 national
11	Colombia	[49], [61]	33 departments + national level	14 departments + 20 national	924 departments + 40 national
12	Czech Republic	[49], [54], [62]	8 states + national level	14 states + 20 national	224 states + 40 national
13	Ecuador	[49], [63]	22 states + national level	9 states + 20 national	396 states + 40 national
14	Finland	[49], [54]	6 counties + 2 states + national level	17 counties + 17 states + 20 national	204 (counties) + 68 (states) + 40 national
15	France	[49], [54]	22 counties + 8 states + national level	20 counties + 20 states + 20 national	880 (counties) + 320 (states) + 40 national
16	Germany	[49], [54]	16 states + national	20 states + 20 national	640 states + 40 national
17	Greece	[49], [54]	13 counties + 4 states + national	20 counties + 20 states + 20 national	520 (counties) + 160 (states) + 40 national
18	Hungary	[49], [54]	7 states + national	14 states + 20 national	196 states + 40 national
19	India	[49], [64], [65], [66]	552 districts + 32 states + national	20 districts + 20 states + 20 national	22080 districts + 1280 states + 40 national
20	Indonesia	[49], [67]	26 states + national level	16 states + 20 national	832 states + 40 national
21	Iran	[49], [68]	24 states + national level	20 states + 20 national	960 states + 40 national
22	Ireland	[49], [54]	2 states + national level	19 states + 20 national	76 states + 40 national
23	Italy	[49], [54]	20 counties + 12 states + national level	20 counties + 20 states + 20 national	800 counties + 480 states + 40 national
24	Japan	[49], [69]	9 states + national level	20 states + 20 national	360 states + 40 national
25	South Korea	[49], [70]	14 states + national level	20 states + 20 national	560 states + 40 national
26	Mexico	[49], [71]	2402 counties + 32 states + national level	6 counties + 20 states + 20 national	28824 counties + 1280 states + 40 national
27	Mongolia	[49], [72]	20 states + national level	13 states + 20 national	520 states + 40 national
28	Nepal	[49], [69]	14 states + national level	20 states + 20 national	560 states + 40 national
29	Netherlands	[49], [54]	12 counties + 4 states + national level	20 counties + 20 states + 20 national	480 counties + 160 states + 40 national
30	Nigeria	[49], [73]	31 states + national level	12 states + 20 national	744 states + 40 national
31	Norway	[49], [74]	18 states + national level	16 states + 20 national	576 states + 40 national
32	Pakistan	[49], [69]	5 states + national level	19 states + 20 national	190 states + 40 national
33	Paraguay	[49], [75]	19 states + national level	19 states + 20 national	722 states + 40 national
34	Peru	[49], [76]	26 states + national level	20 states + 20 national	1040 states + 40 national
35	Philippines	[49], [69]	11 states + national level	19 states + 20 national	418 states + 40 national
36	Poland	[49], [54]	16 states + national level	13 states + 20 national	416 states + 40 national
37	Portugal	[49], [54]	7 states + national level	20 states + 20 national	280 states + 40 national
38	Romania	[49], [54]	8 states + national level	14 states + 20 national	224 states + 40 national
39	Saudi Arabia	[49], [77]	14 states + national level	20 states + 20 national	560 states + 40 national
40	Slovakia	[49], [54]	4 states + national level	14 states + 20 national	112 states + 40 national
41	South Africa	[49], [78]	11 states + national level	4 states + 20 national	88 states + 40 national
42	Spain	[49], [54]	16 counties + 6 states + national level	20 counties + 20 states + 20 national	640 counties + 240 states + 40 national
43	Sri Lanka	[49], [79]	24 counties + 9 states + national level	20 counties + 20 states + 20 national	960 counties + 360 states + 40 national
44	Sweden	[49], [54]	8 states + national level	20 states + 20 - national	320 states + 40 national
45	Thailand	[49], [80]	72 counties + 5 states + national	14 counties + 14 states + 20 - national	2016 counties + 140 states + 40 national
46	Turkey	[49], [81]	73 states + national level	18 states + 20 national	2628 states + 40 national
47	United Kingdom	[49], [54]	12 counties + 4 states + national level	20 counties + 20 states + 20 national	480 counties + 160 states + 40 national

48	United States	[49], [82]	3078 counties + 50 states + national level	20 counties + 20 states + 20 national	123120 counties + 2000 states + 40 national
49	Uruguay	[49], [83]	19 states + national level	2 states + 20 national	76 states + 40 national
50	Venezuela	[49], [84]	24 states + national level	1 states + 20 national	48 states + 40 national
51	Vietnam	[49], [85]	61 counties + 8 states + national level	14 counties + 14 states + 20 national	1708 counties + 224 states + 40 national
	Countries with incomplete national data				
	Former Soviet Republics	[49], [86]	1 national level	19 – national (1989-1990; 1992-2008)	38 national
	Eritrea, Ethiopia	[49]	1 national level	20 national	40 national
	Countries with complete National data for all years (1989-2008)				

Afghanistan, Albania, Algeria, American Samoa, Andorra, Angola, Anguilla, Antigua and Barbuda, Aruba, Bahamas, Bahrain, Bangladesh, Barbados, Belize, Benin, Bermuda, Bhutan, Botswana, British Virgin Islands, Brunei Darussalam, Burkina Faso, Burundi, Ivory Coast, Cambodia, Cameroon, Cape Verde, Cayman Islands, Central African Republic, Chad, Republic of Congo, Democratic Republic of Congo, Denmark, Cook Islands, Costa Rica, Cuba, Cyprus, Democratic People's Republic of Korea (North Korea), Djibouti, Dominica, Dominican Republic, Egypt, El Salvador, Equatorial Guinea, Faeroe Islands, Falkland Islands, Fiji Islands, French Guiana, French Polynesia, Gabon, Gambia, Ghana, Gibraltar, Greenland, Grenada, Guadeloupe, Guam, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Iceland, Iraq, Isle of Man, Israel including Palestine, Jamaica, Jordan, Kenya, Kiribati, Kuwait, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libyan Arab Jamahiriya, Liechtenstein, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Martinique, Mauritania, Mauritius, Mayotte, Micronesia (Federated States of), Monaco, Montserrat, Morocco, Mozambique, Myanmar, Namibia, Nauru, Netherlands Antilles, New Caledonia, New Zealand, Nicaragua, Niger, Niue, Norfolk Island, Northern Mariana Is, Oman, Palau, Panama, Papua New Guinea, Paracel Islands, Pitcairn Islands, Puerto Rico, Qatar, Reunion, Rwanda, Saint Helena, Saint Kitts and Nevis, Saint Lucia, Saint Pierre & Miquelon, Saint Vincent/Grenadines, Samoa, San Marino, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Singapore, Solomon Islands, Somalia, Spratly Islands, Sudan, Suriname, Swaziland, Switzerland, Syrian Arab Republic, Tanzania, Togo, Tokelau, Tonga, Trinidad and Tobago, Tunisia, Turks and Caicos Is, Tuvalu, Uganda, United Arab Emirates, US Virgin Islands, Vanuatu, Wake Island, Wallis and Futuna Is, Western Sahara, Yemen, Zambia, Zimbabwe.

Countries not analysed
Bosnia and Herzegovina, Croatia, Serbia and Montenegro, Slovenia, Taiwan