National Agricultural Statistics Service (NASS)
Provider of timely, accurate, and useful statistics in service to U.S. agriculture

www.nass.usda.gov
# Continuous Agricultural Statistics Programs

## Crops:
- grains
- hay
- oilseeds
- cotton
- tobacco
- potatoes
- sugar
- other field crops
- citrus fruit
- non-citrus fruit
- nuts
- vegetables
- floriculture
- crop progress
- acreage
  - prospective plantings
  - planted
  - harvested
- yield & production
  - forecasts
  - final
  - by utilization
- stocks
- disposition
- processing
- prices received by farmers
- agricultural chemical use

## Livestock:
- cattle
- hogs
- sheep
- goats
- equine
- poultry
- milk & dairy products
- aquaculture
- bees & honey mink

## Other:
- inventory
  - total
  - by class
  - births
  - deaths
  - predator losses
- marketings
- slaughter
- production/disposition
  - meat
  - other products
    (milk, dairy products, wool, mohair, eggs, honey, etc.)
- prices received by farmers
- inventory/production values

## Other information:
- number of farms
- land in farms
- land values
- cash rents
- agricultural labor
  - number of workers
  - hours worked
  - wages paid
- cold storage
  - holdings
  - capacity
- cash receipts
- production expenditures

Weekly ~ monthly ~ quarterly ~ annually
Agricultural Census

- total area & land use
- irrigation
- land in government programs
  - field & forage crops
  - fruits, nuts & berries
  - vegetables & melons
  - horticultural specialties
- livestock & poultry
  - animal specialties
  - aquaculture
- production contracts
- gross value of sales
- direct sales to consumers
- government loans
  - government program payments
- farm-related income
  - grain storage capacity
- operator characteristics
  - farm organization

- fertilizer & chemical use
- farm production expenses
- inventory & value of machinery & equipment
- market value of land & buildings
- farm labor

~ years ending in “2” & “7” ~

inventories as of December 31 ~ production, sales & other information for calendar year
### Quick Stats

#### Select Commodity (one or more)
- **Program:**
  - CENSUS
  - SURVEY
- **Sector:**
  - ANIMALS & PRODUCTS
  - CROPS
  - DEMOGRAPHICS
  - ECONOMICS
  - ENVIRONMENTAL
- **Group:**
  - ANIMAL TOTALS
  - AQUACULTURE
  - CROP TOTALS
  - DAIRY
  - ENERGY
  - EXPENSES
  - FARMS & LAND & ASSETS
  - FIELD CROPS
  - FRUIT & TREE NUTS

#### Select Location (one or more)
- **Geographic Level:**
  - AGRICULTURAL DISTRICT
  - COUNTY
  - INTERNATIONAL
  - NATIONAL
  - REGION: MULTI-STATE
  - REGION: SUB-STATE
  - STATE
  - ZIP CODE

#### Select Time (one or more)
- **Year:**
  - 2014
  - 2013
  - 2012
  - 2011
  - 2010
  - 2009

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Status: 24,440,410 records available.
### Corn Dough – Selected States

This 18 States planted 92% of the 2012 corn acreage

<table>
<thead>
<tr>
<th>State</th>
<th>Week ending</th>
<th>2008-2012 Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>September 8, 2012</td>
<td>(percent)</td>
</tr>
<tr>
<td></td>
<td>September 1, 2013</td>
<td>(percent)</td>
</tr>
<tr>
<td></td>
<td>September 8, 2013</td>
<td>(percent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(percent)</td>
</tr>
<tr>
<td>Colorado</td>
<td>98</td>
<td>87</td>
</tr>
<tr>
<td>Illinois</td>
<td>100</td>
<td>93</td>
</tr>
<tr>
<td>Indiana</td>
<td>100</td>
<td>91</td>
</tr>
<tr>
<td>Iowa</td>
<td>100</td>
<td>73</td>
</tr>
<tr>
<td>Kansas</td>
<td>100</td>
<td>94</td>
</tr>
<tr>
<td>Kentucky</td>
<td>100</td>
<td>86</td>
</tr>
<tr>
<td>Michigan</td>
<td>93</td>
<td>79</td>
</tr>
<tr>
<td>Minnesota</td>
<td>100</td>
<td>68</td>
</tr>
<tr>
<td>Missouri</td>
<td>100</td>
<td>94</td>
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<tr>
<td>Nebraska</td>
<td>100</td>
<td>93</td>
</tr>
<tr>
<td>North Carolina</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>North Dakota</td>
<td>100</td>
<td>71</td>
</tr>
<tr>
<td>Ohio</td>
<td>99</td>
<td>91</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>94</td>
<td>89</td>
</tr>
<tr>
<td>South Dakota</td>
<td>97</td>
<td>90</td>
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<tr>
<td>Tennessee</td>
<td>100</td>
<td>97</td>
</tr>
<tr>
<td>Texas</td>
<td>97</td>
<td>91</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>94</td>
<td>61</td>
</tr>
<tr>
<td>18 States</td>
<td>99</td>
<td>84</td>
</tr>
</tbody>
</table>

Of the 2012 corn acreage.
Corn Planted Acreage Up Slightly from 2012
Soybean Acreage Up 1 Percent
All Wheat Acreage Up 1 Percent
All Cotton Acreage Down 17 Percent

Corn planted area for all purposes in 2013 is estimated at 97.4 million acres, up slightly from the highest planted acreage in the United States since 1936 when an estimated 102 million acres were planted. This year, expect to harvest 89.1 million acres for grain, up 2 percent from last year.

Soybeans planted for 2013 is estimated at a record high 77.7 million acres, up 1 percent from 2012 and will be a record high, if not the highest, for crop planted area. Soybeans are estimated to be planted in New York, Pennsylvania, and South Dakota. All wheat planted for 2013 is estimated at 56.5 million acres, up 1 percent from last year. The planted area, at 42.7 million acres, is 3 percent above last year and up 2 percent from the year before. About 29.4 million acres are Hard Red Winter, 9.96 million acres are Soft Red Winter. Area planted to other spring wheat for 2013 is estimated at 12.3 million acres, down about 11.7 million acres are Hard Red Spring wheat. The estimated Durum wheat planted area is 1.54 million acres, down 28 percent from the previous year.

All cotton planted area for 2013 is estimated at 10.3 million acres, 17 percent below the 12.0 million acres, down 17 percent from 2012. American Pima area is estimated at 5.7 million acres.

Special Note
USDA’s National Agricultural Statistics Service is suspending a number of statistical surveys and reports for the remainder of the fiscal year resulting from reduced funding. Suspended commodity programs impacting the Aug 1 Crop Production report are hops, commercial apples, peaches, pears, and grapes. Check the NASS website at www.nass.usda.gov for any future updates to these programs.

Planted Acreage Update
Survey respondents who reported soybean acreage as not yet planted in Arkansas, Illinois, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, North Carolina, North Dakota, South Dakota, Tennessee, and Wisconsin during the survey conducted in preparation for the Acreage report, released June 28, 2013 were re-contacted in July to determine how many of those acres were planted or still intended to be planted. Acreage estimates in this report reflect this updated information.

Corn Production Up 28 Percent from 2012
Soybean Production Up 8 Percent from 2012
Cotton Production Down 25 Percent from 2012
Winter Wheat Production Down Slightly from July Forecast

Corn production is forecast at 13.8 billion bushels, up 28 percent from 2012. If realized, this will be a new record for the United States. Based on conditions as of Aug 1, yields are expected to average 154.4 bushels per acre, up 31.0 bushels from 2012. If realized, this will be the highest average yield since 2009. Area harvested for grain is forecast at 89.1 million acres, unchanged from the June forecast but up 2 percent from 2012.

Soybean production is forecast at 3.26 billion bushels, up 8 percent from last year. If realized, production will be the third largest on record. Based on Aug 1 conditions, yields are expected to average 42.6 bushels per acre, up 3 bushels from last year. Area harvested for grain is forecast at 86.4 million acres, down less than 1 percent from June but up slightly from 2012. Planted area for the Nation is estimated at 77.2 million acres, down less than 1 percent from June.
## US crop area ranked statistics

<table>
<thead>
<tr>
<th>Largest crops by area</th>
<th>mil. ha. (2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>35.4</td>
</tr>
<tr>
<td>Soybeans</td>
<td>30.8</td>
</tr>
<tr>
<td>Wheat</td>
<td>19.8</td>
</tr>
<tr>
<td>(Winter, spring, durum)</td>
<td>(14.1, 4.9, 0.9)</td>
</tr>
<tr>
<td>Hay</td>
<td>22.8</td>
</tr>
<tr>
<td>(alfalfa, all other)</td>
<td>(7.0, 15.8)</td>
</tr>
<tr>
<td>Cotton</td>
<td>3.8</td>
</tr>
<tr>
<td>Sorghum</td>
<td>2.0</td>
</tr>
<tr>
<td>Barley</td>
<td>1.3</td>
</tr>
<tr>
<td>Rice</td>
<td>1.1</td>
</tr>
</tbody>
</table>

*Figures established by a large “area frame” based survey conducted early each June*
Area trends of the top US 3 crops

United States Harvested Area (acres)
NASS Research and Development Division
Geospatial Information Branch

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[Image of various maps and data visualizations]

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[Image showing different types of data and maps available on the NASS website]

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[Image of a map showing crop progress in Arkansas, 2007]
Annually derived Cropland Data Layer (CDL)
## Mapped Crop Categories

<table>
<thead>
<tr>
<th></th>
<th>1. Corn</th>
<th>41. Sugarbeets</th>
<th>73. Other Tree Fruits</th>
<th>227. Lettuce</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Cotton</td>
<td>42. Dry Beans</td>
<td>74. Pecans</td>
<td>228. Cucumbers</td>
</tr>
<tr>
<td>3</td>
<td>Rice</td>
<td>43. Potatoes</td>
<td>75. Almonds</td>
<td>229. Pumpkins</td>
</tr>
<tr>
<td>4</td>
<td>Sorghum</td>
<td>44. Other Crops</td>
<td>76. Walnuts</td>
<td>230. Lettuce/Durum Wht</td>
</tr>
<tr>
<td>5</td>
<td>Soybeans</td>
<td>45. Sugarcane</td>
<td>77. Pears</td>
<td>231. Lettuce/Cantaloupe</td>
</tr>
<tr>
<td>8</td>
<td>Tobacco</td>
<td>48. Watermelons</td>
<td>204. Pistachios</td>
<td>234. Durum Wht/Sorghum</td>
</tr>
<tr>
<td>9</td>
<td>Sweet Corn</td>
<td>49. Onions</td>
<td>205. Triticale</td>
<td>235. Barley/Sorghum</td>
</tr>
<tr>
<td>10</td>
<td>Pop. or Orn. Corn</td>
<td>50. Pickles</td>
<td>206. Carrots</td>
<td>236. WinWht/Sorghum</td>
</tr>
<tr>
<td>12</td>
<td>Barley</td>
<td>52. Lentils</td>
<td>208. Garlic</td>
<td>238. WinWht/Cotton</td>
</tr>
<tr>
<td>18</td>
<td>Rye</td>
<td>58. Clover/Wildflowers</td>
<td>214. Broccoli</td>
<td>244. Cauliflower</td>
</tr>
<tr>
<td>19</td>
<td>Oats</td>
<td>59. Soy/Grass Seed</td>
<td>216. Peppers</td>
<td>245. Celery</td>
</tr>
<tr>
<td>20</td>
<td>Millet</td>
<td>60. Switchgrass</td>
<td>217. Pomegranates</td>
<td>246. Radishes</td>
</tr>
<tr>
<td>25</td>
<td>Rape Seed</td>
<td>68. Apples</td>
<td>222. Squash</td>
<td>251. Corn - Non-Irrigated</td>
</tr>
<tr>
<td>26</td>
<td>Mustard</td>
<td>69. Grapes</td>
<td>223. Apricots</td>
<td>252. Soybean - Non-Irrigated</td>
</tr>
<tr>
<td>28</td>
<td>Other Hay</td>
<td>71. Other Tree Nuts</td>
<td>225. WinWht/Corn</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Camelina</td>
<td>72. Citrus</td>
<td>226. Oats/Corn</td>
<td></td>
</tr>
</tbody>
</table>
2011 CDL, Pocahontas, Iowa

Land Cover Categories
(by decreasing acreage)

AGRICULTURE
- Corn
- Soybeans
- Grassland Herbaceous
- Alfalfa
- Oats
- Other Hay/Non Alfalfa
- Pop or Oh Corn
- Winter Wheat
- Fallow/Idle Cropland

NON-AGRICULTURE*
- Developed/Open Space
- Herbaceous Wetlands
- Developed/Low Intensity
- Woody Wetlands
- Open Water
- Deciduous Forest
CDL generalities

- Annual land cover classification targeted to identifying *circa* summer cultivated crops
- Encompasses all of conterminous USA (since 2008, some states prior)
- 56m or 30m resolution
  - Depending on year but now all 30m
- Built with a supervised boosted classification tree methodology
  - Implemented with See 5.0
- Utilizes ground/training data from USDA Farm Service data and ancillary data from National Land Cover Database
- Highly robust for dominant crop types
  - corn, soybeans, wheat, rice, cotton, etc.
- Used internally by NASS to refine planted acreage estimates
- Derived primarily from
  - Resourcesat-1 AWiFS
  - Landsat-5 TM
  - DMC Deimos-1 and UK-2
  - Landsat-8 OLI and TIRS
Landsat 8 Collections

L8, 2013, Cycle 6, Jun 18 - Jul 03
Crop area mapping lessons learned

• Heavy volumes of time-series imagery important
  – Agriculture is a dynamic land cover
• Fine spatial resolution is somewhat important
  – Particularly if field sizes are relatively large
• Multi-spectral resolution least important
  – The time component reigns supreme
• Crop area estimation by “pixel counting” alone is not sufficient
  – A bias measurement of the classification is needed
  – “regression estimator”
• Some sort of reasonably accurate “ground truth” needed to drive the classifier
  – ~ 1% of land cover might be sufficient
Yields results primarily derived from two surveys

**Agricultural Yield**
- Farmer reported survey data of expected crop yields.
- Data obtained throughout the growing season.
- Conducted in all states except Alaska and Hawaii.
- Sample size in the 1000s per state.
- Farm operator contacts are selected from the March Crops/Stocks survey (small grains) and the June Crops/Stocks survey (late season crops and tobacco).
- Primarily telephone based.

**Objective yield**
- Corn, Cotton, Soybeans, Wheat, Potatoes.
- Only done in states where the commodities are primarily found.
- Samples selected from areas found in June Area Survey (“Acreage”).
- Performed at 100s of sample sites per state.
- Biophysical plant/seed measurements obtained.
- Each plot revisited a few times per season.
Remote Sensing Yield

**Third method for yield estimates**

- **Premise**
  - There is a Relationship between crop
    - Biomass, vigor, “greenness”, NDVI
    - and
  - Land surface temperature
  - And the resulting crop yield
- **Utilize MODIS data to obtain biomass and temperature variables**
- **National, State, ASD, and County**
  - Corn and Soybeans only
  - “Speculative” region only
  - i.e. Corn Belt
Moderate Resolution Imaging Spectroradiometer (MODIS)
Corn yield dependence at county level speculative region, 2006-2011

Correlation coefficient (r)
Soybean yield dependence at county level speculative region, 2006-2011
Winter wheat yield dependence at county level
Kansas, 2006-2011
Cotton yield dependence at county level
TX & AR, 2005-2011
Estimated Corn Yield
October 1, 2012
Estimated Soybean Yield

October 1, 2012
MODIS-derived crop dynamics based on CDL areas
This winter: Try to understand all common MODIS derived variables and how they relate to various crops’ yields

• Explore fully beyond only corn and soybeans
  – Wheat
  – Rice
  – Potatoes
  – Cotton

• Compare the full suite of common MODIS variables
  – NDVI
  – EVI
  – LAI
  – FPAR
  – LST (daytime and nighttime)

• Test Both Terra and Aqua platforms
  – Truly assess the AM vs PM overpass time

• Look at pixel scale issues
  – 250 m vs. 500 m vs. 1000 m (particularly for NDVI)
Final thoughts about crop production monitoring using earth observation satellites

• A wealth of satellite data already exists
  – Free and with significant history
    • Terra and Aqua MODIS
    • Landsat 7 and 8
  – Others are out there too to supplement
    • DMC, Rapideye, Digital Globe, SPOT, IRS, etc...
    • Plus those coming online like VIIRS, Sentinel II,
• Computing infrastructure can handle it
• .....and the research is there to guide best practices
Thank You

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www.nass.usda.gov
http://www.nass.usda.gov/Research_and_Science/
http://nassgeodata.gmu.edu/CropScape