A Tour of USDA NASS's Decision Support System

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"... providing timely, accurate, and useful statistics in service to U.S. agriculture."

Outline and Disclaimer

- 1. Motivating need for Decision Support System (DSS)
 - Relevant, timely, consolidation of multiple data sources
 - National Academies of Sciences, Engineering, and Medicine (2017a,b,c, 2019)
- 2. Project origins, open source software, and public data inputs
- 3. Added value for National Agricultural Statistics Service (NASS) estimation programs

Disclaimer: The findings and conclusions of this presentation are those of the authors and should not be construed to represent any official USDA or U.S. Government determination or policy.

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Mother Nature Does **NOT** Respect Due Dates!

Hurricane season 2017: Harvey (August 25), Irma (September 10)



Crop Production

ISSN: 1936-3737

Released September 12, 2017, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA).

Special Note

Hurricane Harvey made landfall on Friday. August 25 near Rockport, Texas. The resulting rainfall caused flooding in parts of southeastern Texas and southwestern Louisiana. As a result, data collection activities for the September C rop Production report were impacted in these areas and the full impact of this weather event may not be fully reflected in this report. Therefore, NASS will collect harvested acreage information will be collected from all producers surveyed in Louisiana for com. Upland cotton, rice, sorghum, soybeans, and sugarcane; and in Texas for com. Upland cotton, alfalfa hay, other hay, rice, sorghum, and soybeans.

Hurricane Irma made landfall on Sunday, September 10. NASS will also collect harvested acreage information in preparation for the October Crop Production report in Alabama, Florida, Georgia, and South Carolina. Harvested acreage will be collected in these four States from all producers surveyed for Upland cotton, penants, and soybeans.

Corn Production Up Less Than 1 Percent from August Forecast Soybean Production Up 1 Percent Cotton Production Up 6 Percent

Figure: September 2017 Crop Production Report





"To be...

		Acres	1	1	
10.	Acres left to be pla	nted	610	610	
		to be irrigated [If double reage of each crop irrigated.]	620	620	
16.	^{16.} Winter Wheat	Planted	540	540	
17.	(include cover crop)	For grain or seed	541	541	
20.	Oats	Planted and to be planted	533	533	
21.	(include cover crop)	For grain or seed	534	534	
24.	Corn	Planted and to be planted	530	530	
25.	[exclude popcorn and sweet corn]	For grain or seed	531	531	
29.	Other uses of grains planted	Use			
	(Abandoned, silage, green chop, etc.)	Acres			
30.		Alfalfa and Alfalfa Mixtures	653	653	
31.	Hay [Cut and to be cut for dry hay.]	Grain	656	656	
33.	cut for any nay.j	Other Hay			
34.	Plante	ed and to be planted	600	600	
35.	Soybeans Follow	ing another harvested crop	602	602	
81.	Other crops	Acres planted or in use	848	848	

- June Area Survey
- Example Ohio instrument
- June 1 reference date
- Two-week data collection
- Respondents also report intentions ('to be')
- Acreage report published June 28, 2019

Intentions may change...





...or not to be"

Heavy rains impacted subsequent planting activity

- User interest in planted area totals published June 28, 2019
- Announced re-contact efforts¹ with release of Acreage report

		Corn		Soybeans					
State	2018 Final (1,000 Acres)	2019 June ² (% Change)	2019 August ³ (% Change)	2018 Final (1,000 Acres)	2019 June ² (% Change)	2019 August ³ (% Change)			
Illinois	11,000	0%	-3%	10,800	-5%	-7%			
Indiana	5,350	3%	-5%	5,950	-11%	-9%			
Kansas	5,450	8%	17%	4,750	-1%	-3%			
Michigan	2,300	0%	-13%	2,300	-9%	-24%			
Missourri	3,500	-3%	-7%	5,850	-9%	-13%			
Ohio	3,500	-6%	-20%	5,000	-6%	-16%			
South Dakota	5,300	-9%	-15%	5,650	-22%	-38%			

References and Data-Accessed September 15, 2019

- (1) Reference: June 28, 2019 USDA NASS Agricultural Statistics Board Notice
- (2) Reference: American Farm Bureau Federation-Groundtruthing USDA's June Acreage Report
- (3) Author calculations based on Corn Data and Soybean Data in NASS August 2019 Crop Production





Mother Nature Controls Key Factors of Crop Production

Anecdotes provided by state Farm Bureau agents:

- Illinois- "prevented-planting of corn...planting soybeans"
- Michigan-"corn...will go to silage, not grain"
- Ohio-"[crops are] behind, struggling...in need of replant"
- Indiana-"Anticipated yields...less than the 10-year average"
- Kansas-"...will require near optimal temperatures and...precipitation...an earlier than normal frost could be devastating"

Economic decisions, progress, condition, trend yield, and phenology





University of Florida/NASS Collaboration

AgroClimate Tools

- Origins with Southeast Climate Consortium (SECC)
- Currently managed by University of Florida
- Decision tools for farmers

Collaboration to customize tools for NASS internal use

- Nebraska pilot began in 2015
- Nationwide expansion summer 2017





Public Data Inputs and Software

Statistics in DSS derived from NASS data and these inputs:

- 1. Oregon State University PRISM Climate Data
- 2. NOAA National Centers for Environmental Prediction Real-Time Mesoscale Analysis (RTMA) Data
- 3. USDA Natural Resources Conservation Service Soil Survey Geographic Database (SSURGO)

Free or open-source software underpinnings:

- MySQL and PostgreSQL with required PostGIS 2.4.5 extension
- Apache Server, PHP, WordPress
- R v3.4.3: reshape, reshape2, ggplot2, rJava, zoo, stringr, sp, RPostgreSQL, RMySQL, rgdal, RCurl, raster, plyr, ncdf4, maptools, mailR, Jsonlite, RJSONIO, doMC, compare, foreach, AgroClimate

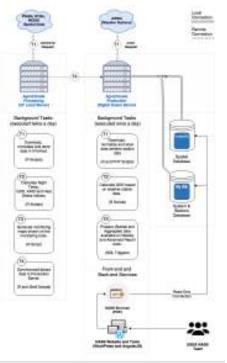




DSS Structure

Browser-based, menu-driven

- Intuitive, user-friendly
- Read-only connection
- Spatial and systems databases
- R scripts derive and aggregate statistics
- Curated data matched to NASS deliverables
- Visualize, summarize, export



Monitoring Capabilities

Home

Monitoring Tools

External Monitoring Tools

Is • Forecasts & Outlooks •

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Log Out

Precipitation and Temperature – Map Rainfall and Temperature – Stations Drought Index – ARID GDD – Map GDD – Stations Venetating Indicor

County Yield Statistics

Weekly Summary Report Advanced Summary Report Weekly Maps

- The Weekly and Advanced Summary Report Tools summarize weather and climate information at the county, district and state level and are customized to match the time-frame for NASS's Weekly Crop Progress and Condition Reports.
- The Weekly Map Tool displays variables at State and Regional Field Office level. The summary of the weather information - for the week ending on Sunday - is available every Monday morning at 9:00 am EST.





Menu for Summary Reports: Derived Statistics

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Field Office Review and Weekly Reports

Compare/contrast April 29, 2019 Crop Progress and Condition

Features	Wyoming	Illinois
Weekly Narrative	Х	Х
Crop/Livestock Progress	Х	Х
Crop/Livestock Condition	Х	Х
<i># Days for Fieldwork</i>	Х	Х
Soil Moisture	Х	Х
State/District Weather		Х
Weather Maps		Х

Opportunities: standardize, provide additional useful data

- Link: Wyoming Crop Progress for April 29
- Link: Illinois Crop Progress for April 29





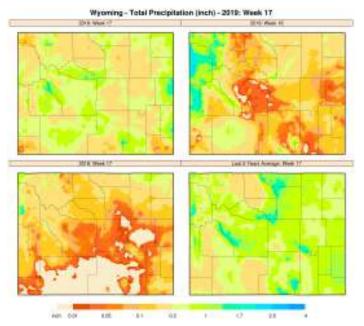
Wyoming District Weather: April 22-April 28, 2019

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Avenue	23.9	217	343	30	26.8		23.8	367	22.8





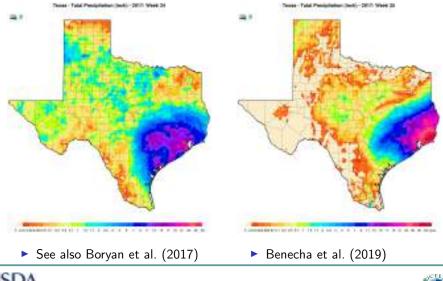
Wyoming Weather Map: April 22-April 28, 2019



Weekly Map Menu-Exporting Texas Precipitation

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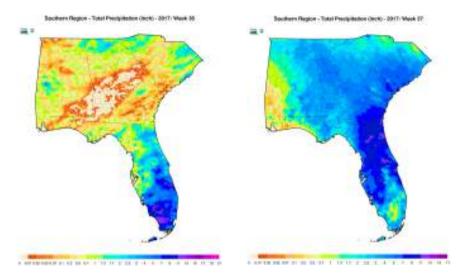
Texas Precipitation: August 21-September 3, 2017



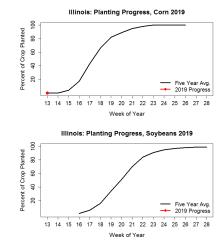




Southern Region Precipitation: September 4-17, 2017

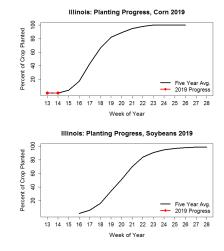


► See also Hurricane Irma: NASS Flood Assessment Report



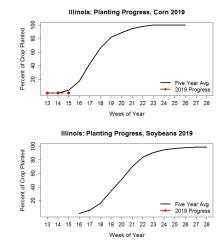






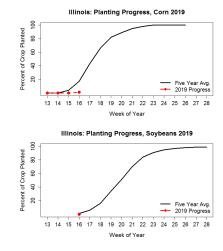






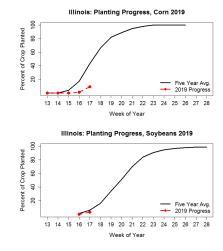






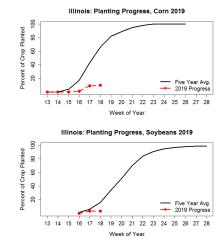






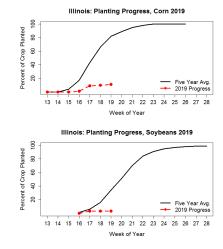






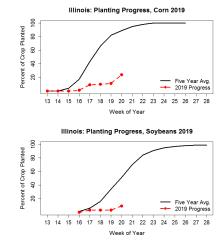






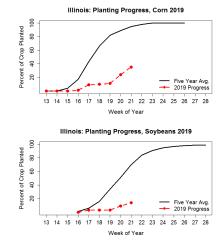






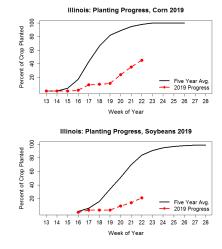






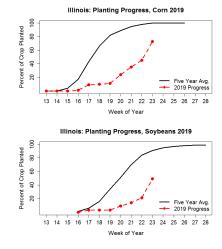






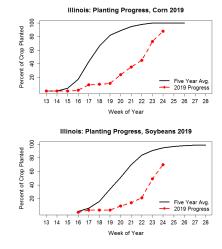






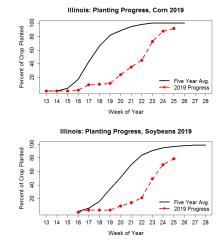






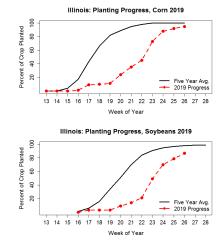






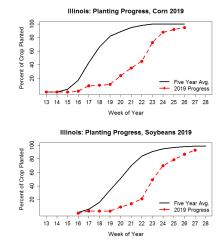






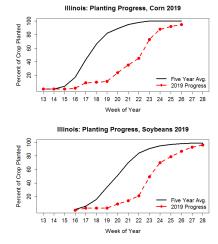












Illinois 2019: Corn and Soybeans Planted Progress Data





Planned Extensions: Alerts and Modeling

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Trend: Platte County, Non-Irrigated Corn Yield, 2015



Planned Extensions: Crop Simulation Modeling

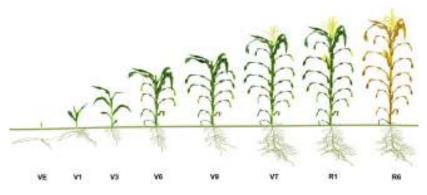


Figure: Image Source-Pioneer Agronomy Sciences

- Simulate progress as functions of weather, soil, management
- Crop phenology and health of crop at critical points in time





Linking to External Monitoring Tools from One Dashboard



- NASS Cropland Data Layer
- UNL U.S. Drought Monitor
- NWS Climate Prediction Center ENSO Diagnostics

- NOAA NWS National Hurricane Center
- UNL High Plains Regional Climate Center

Conclusions

The DSS provides timely and relevant auxiliary data

- 1. Tailored for internal use at NASS
- 2. Offered first to field offices for use in routine duties
- 3. Standardization of Crop Progress and Condition reports
- 4. Weather data complements and augments other approaches
 - Survey data
 - Administrative data
 - Remote sensing of disasters
 - Modeling
- 5. Planned enhancements coming soon





Additional References

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