



Weather and Climate Information Use in Agriculture



Pai-Yei Whung, Ph.D.

Director

Office of International Research Programs

Agricultural Research Service, USDA, U.S.A.

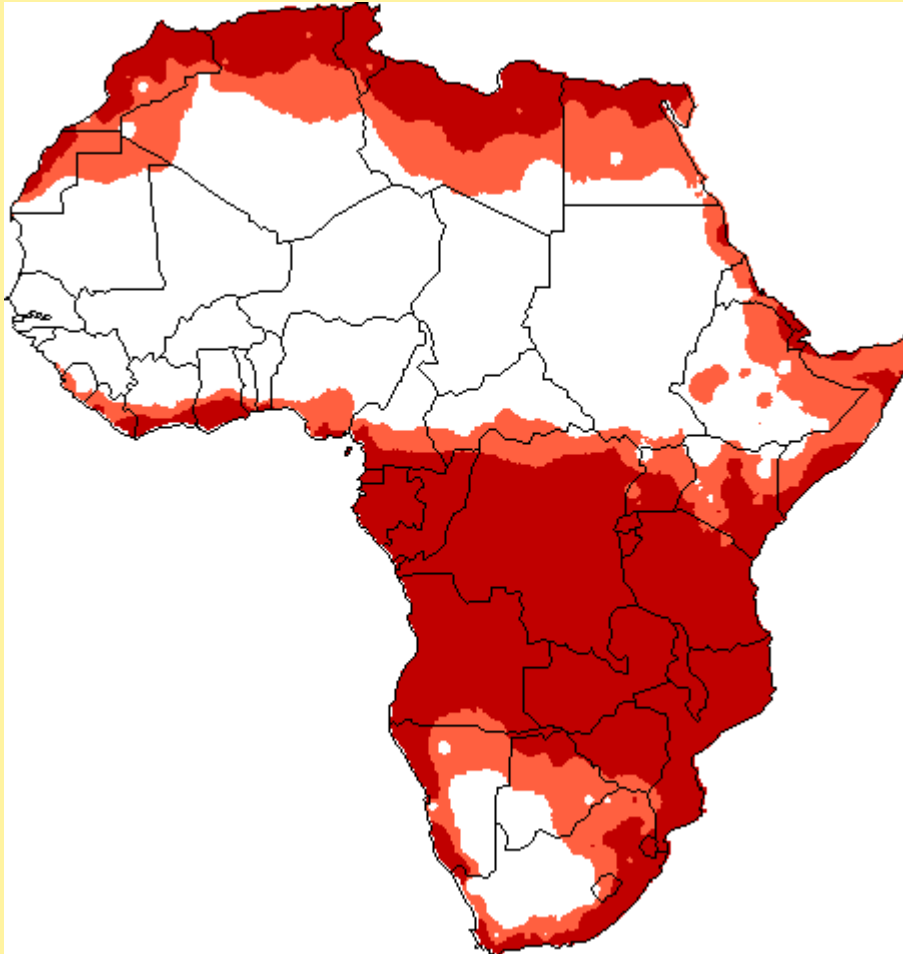


Examples

- Invasive Species Growth Early Warning System
 - Temperature and humidity
- Plant Disease Risk Assessment
 - Wind born, precipitation and human carrier
- Crop Production Prediction
 - Climate prediction
- Water Use Efficiency
 - Weather data
- USDA – NOAA Joint Agricultural Weather Facility (JAWF)



P. truncatus growth index

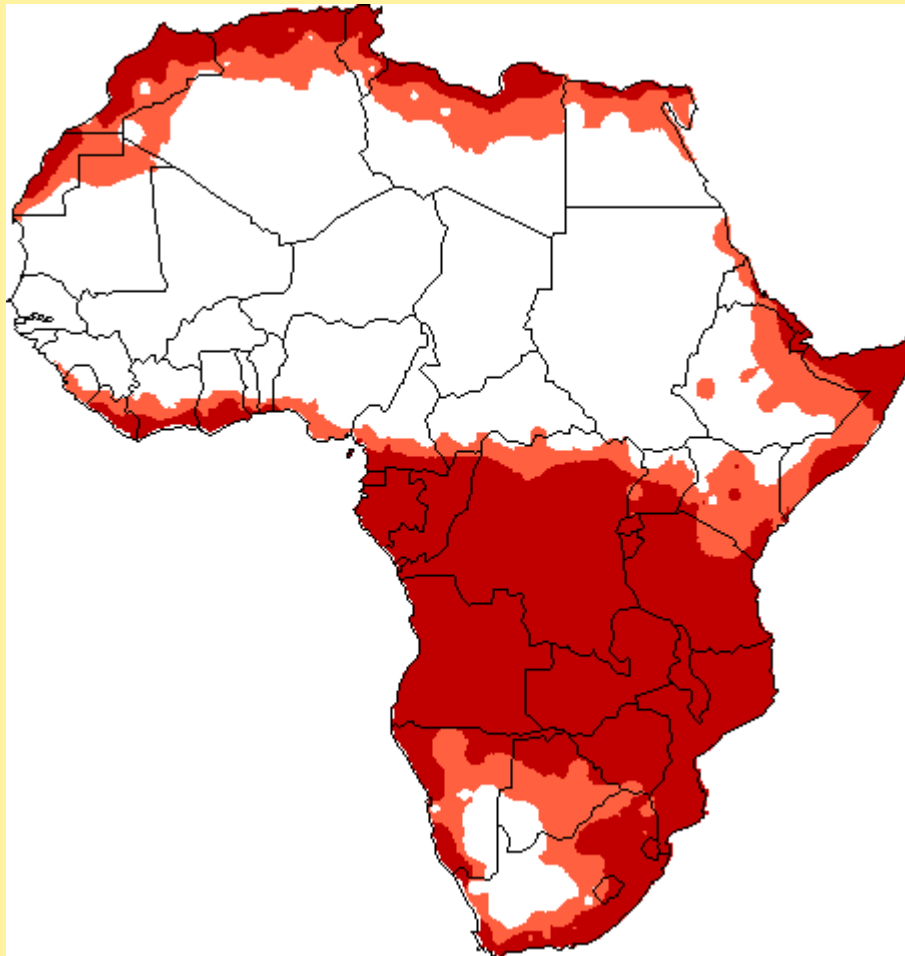


January

Source: N. Holst and W.G. Meikle



P. truncatus growth index

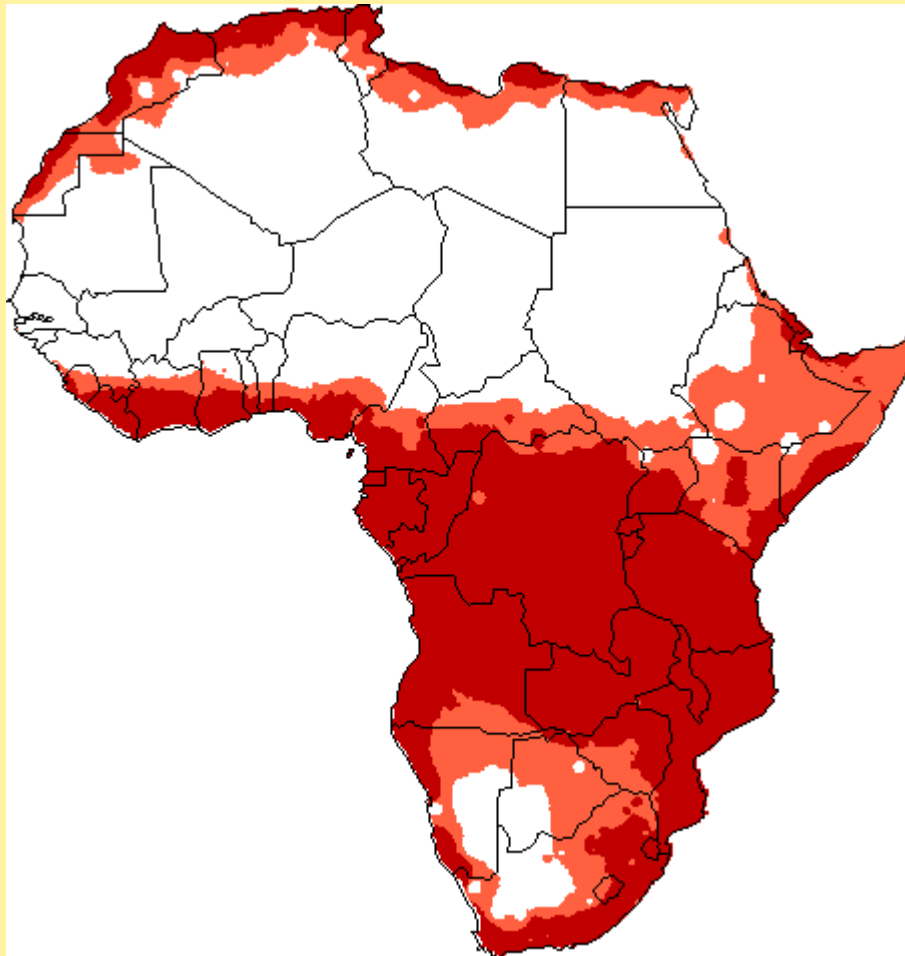


February

Source: N. Holst and W.G. Meikle



P. truncatus growth index

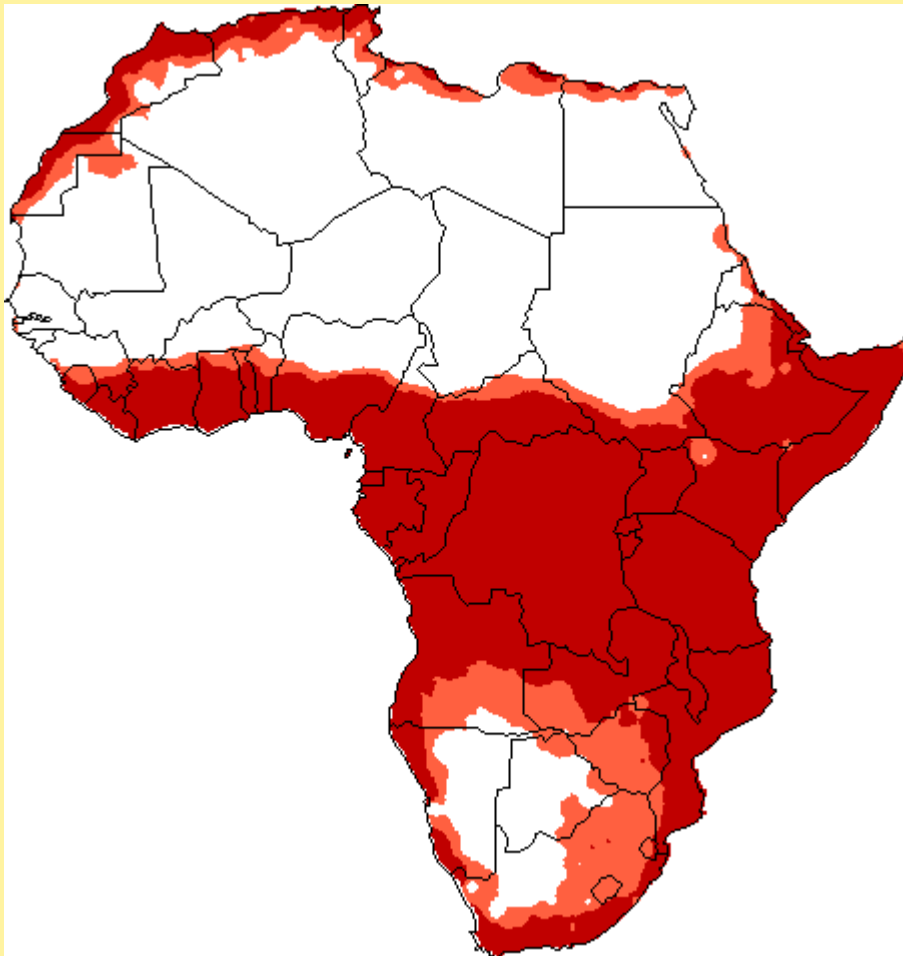


March

Source: N. Holst and W.G. Meikle



P. truncatus growth index

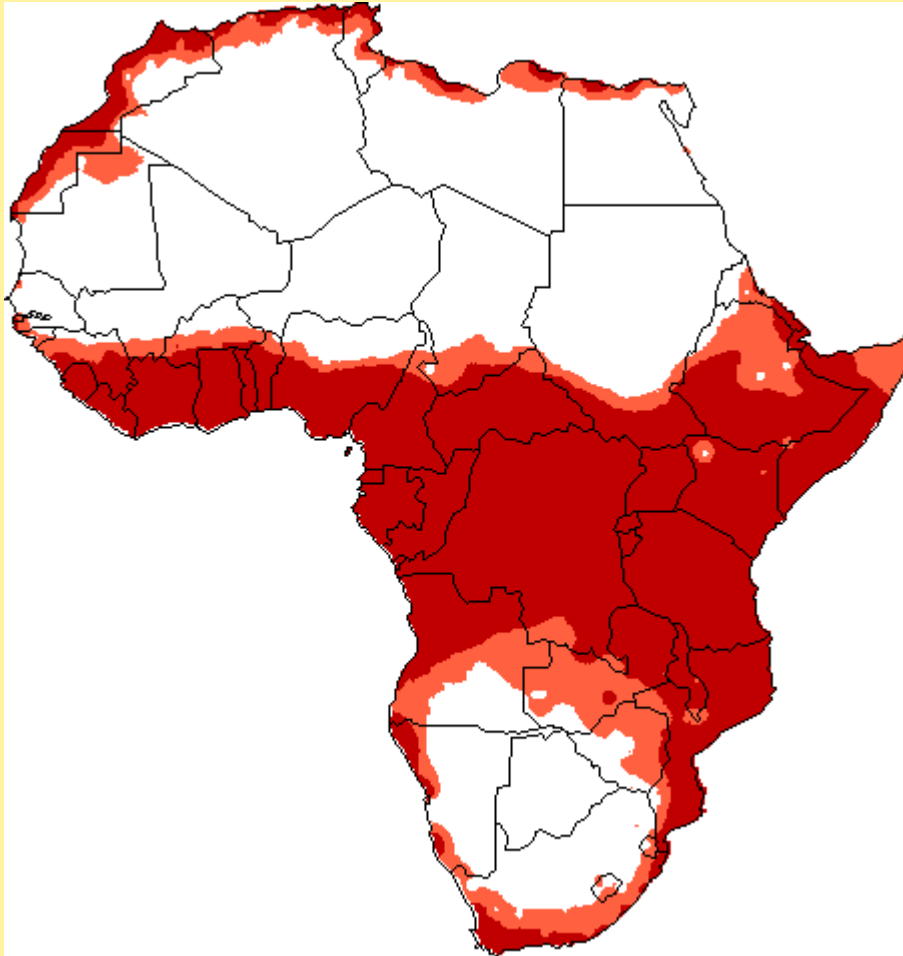


April

Source: N. Holst and W.G. Meikle



P. truncatus growth index

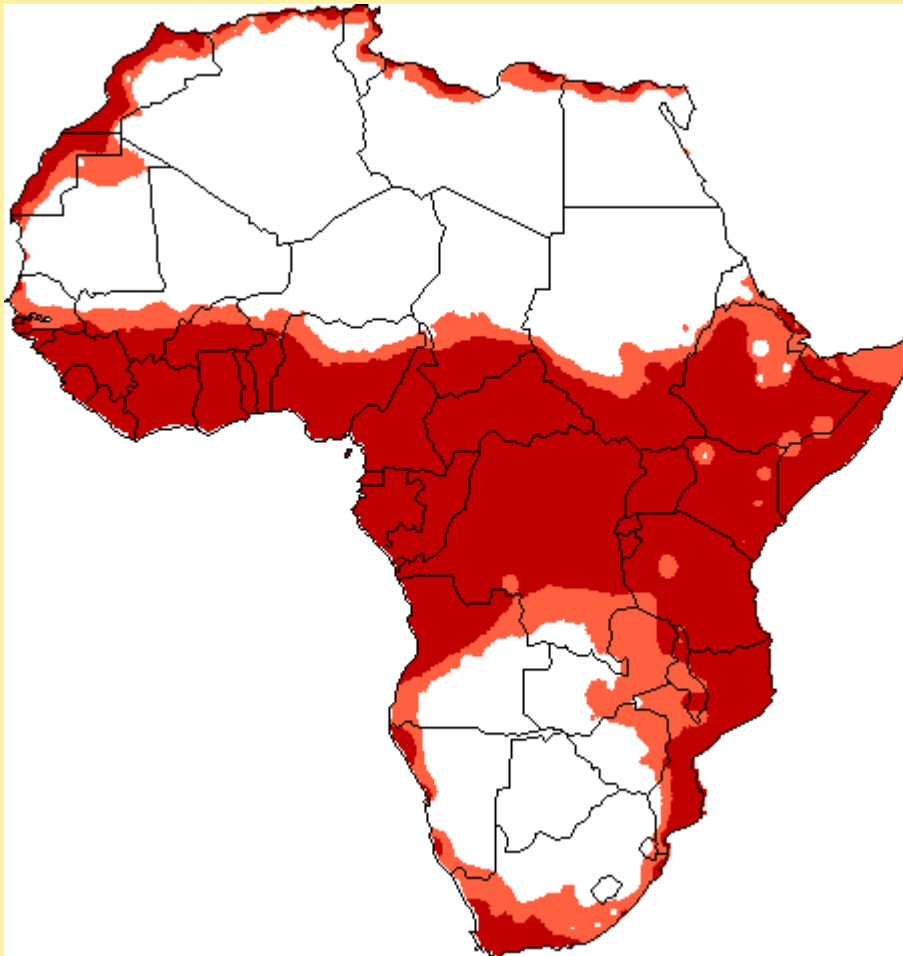


May

Source: N. Holst and W.G. Meikle



P. truncatus growth index

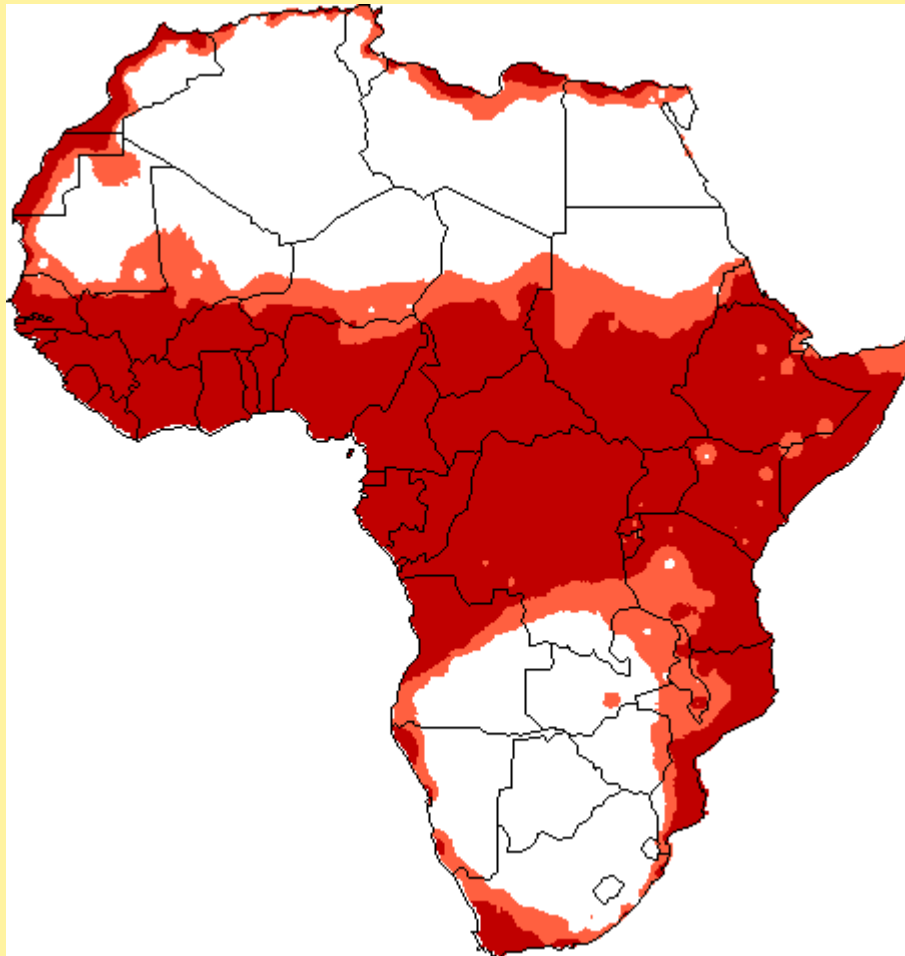


June

Source: N. Holst and W.G. Meikle



P. truncatus growth index

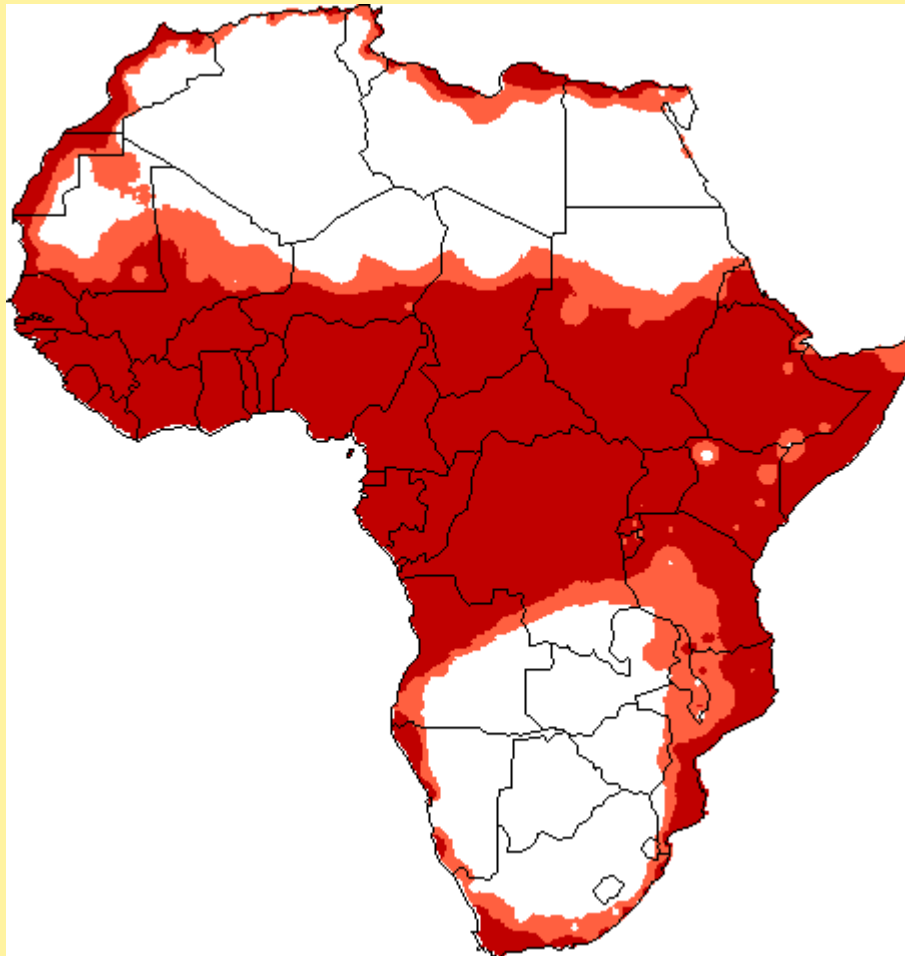


July

Source: N. Holst and W.G. Meikle



P. truncatus growth index

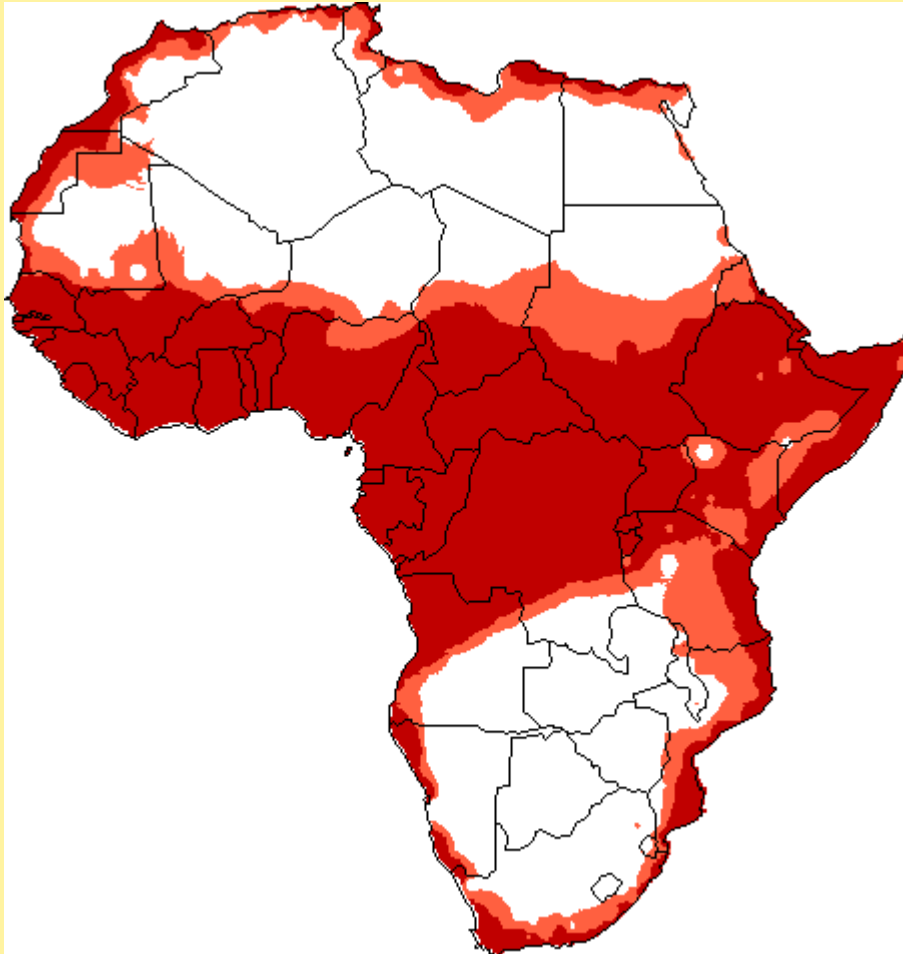


August

Source: N. Holst and W.G. Meikle



P. truncatus growth index

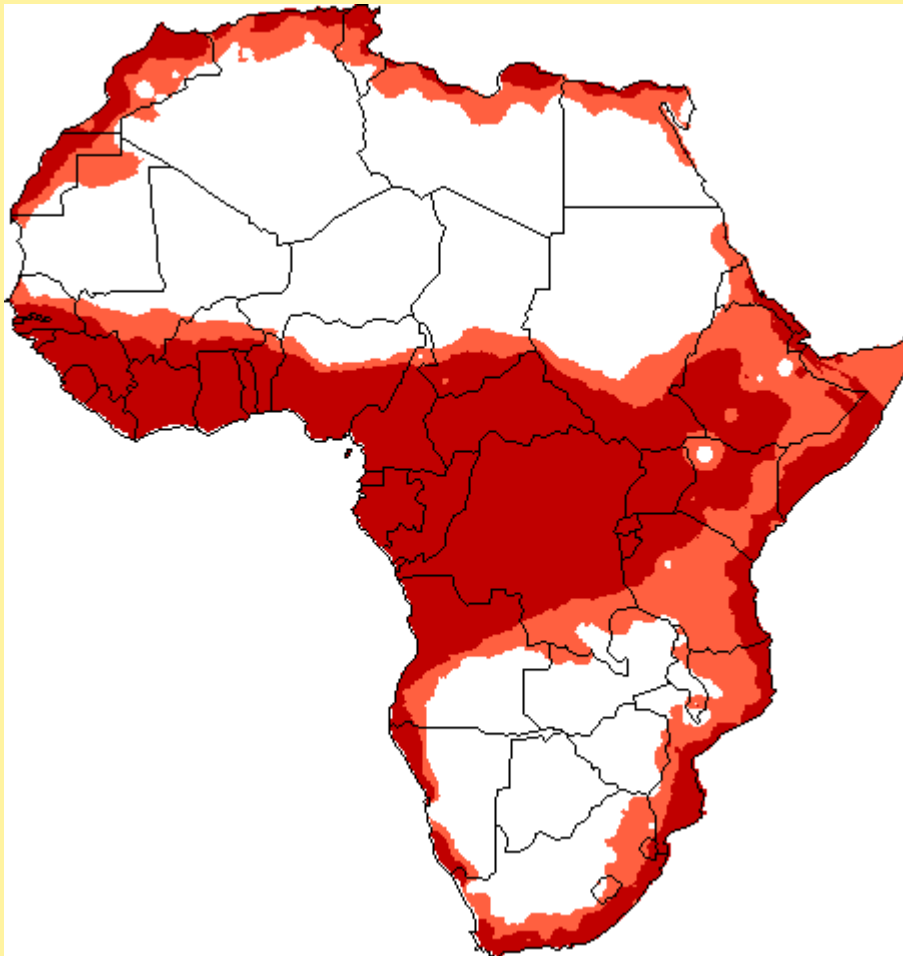


September

Source: N. Holst and W.G. Meikle



P. truncatus growth index

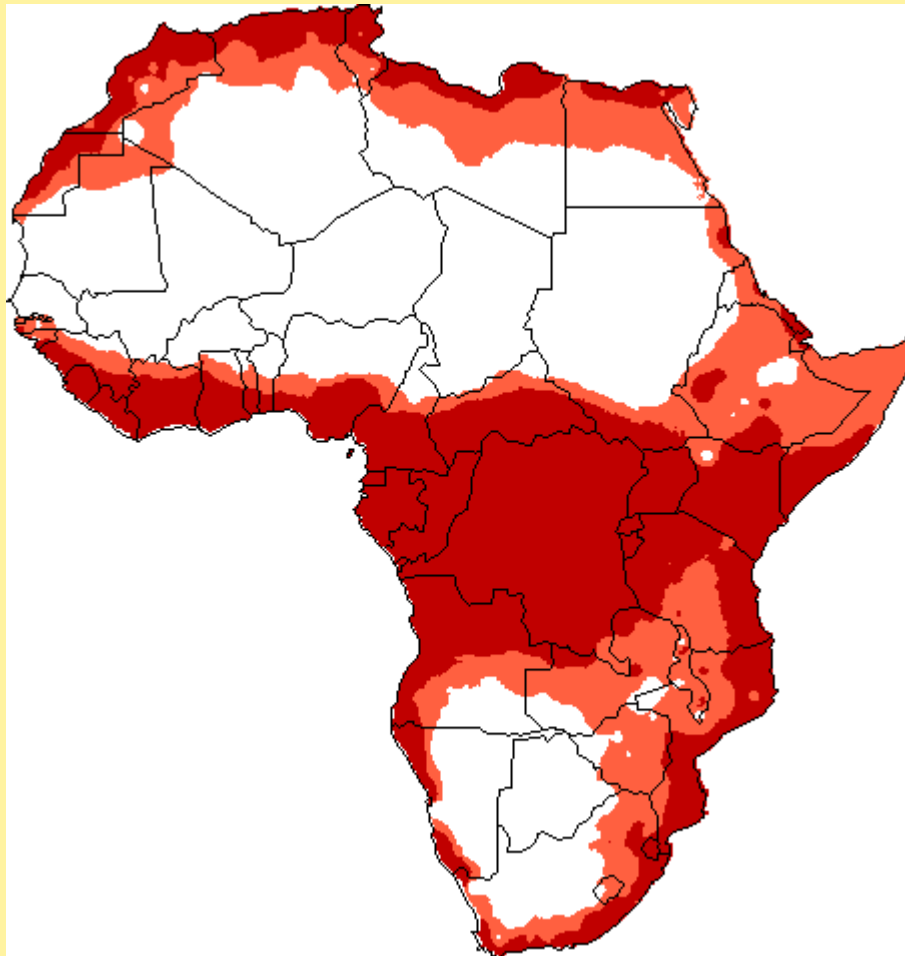


October

Source: N. Holst and W.G. Meikle



P. truncatus growth index

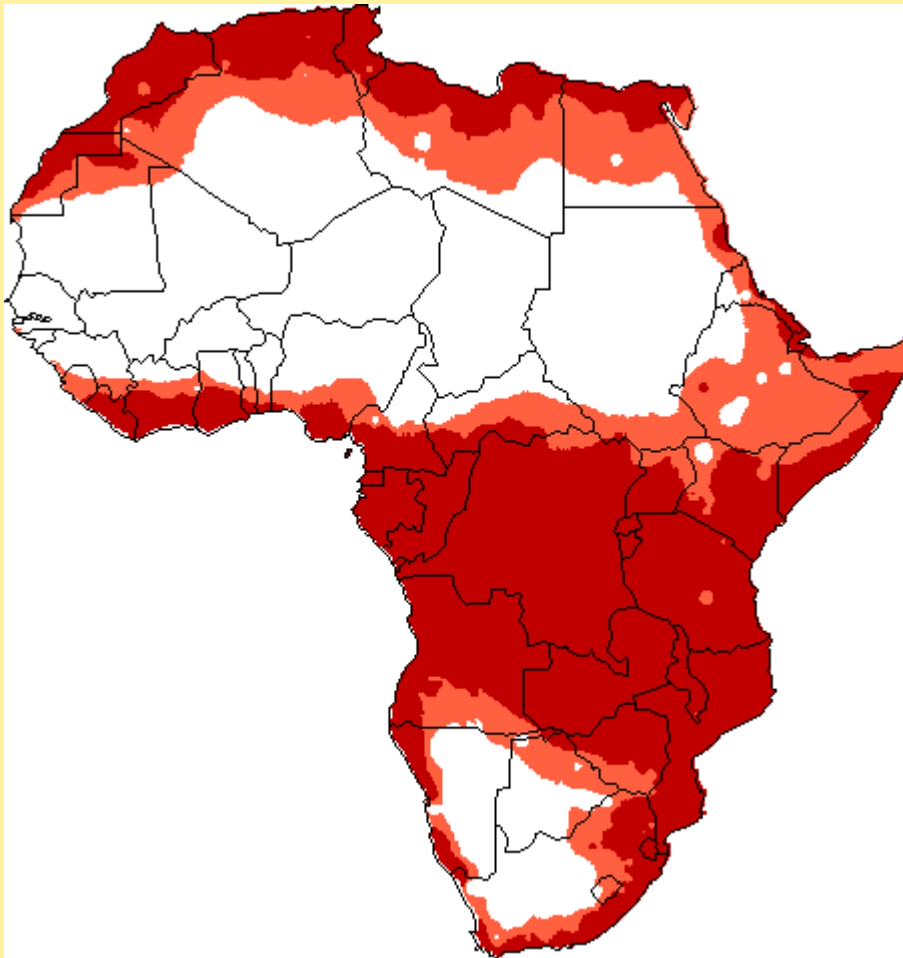


November

Source: N. Holst and W.G. Meikle



P. truncatus growth index



December

Source: N. Holst and W.G. Meikle



Asian Citrus Canker

Xanthomonas axonopodis pv. *citri* (Xac)

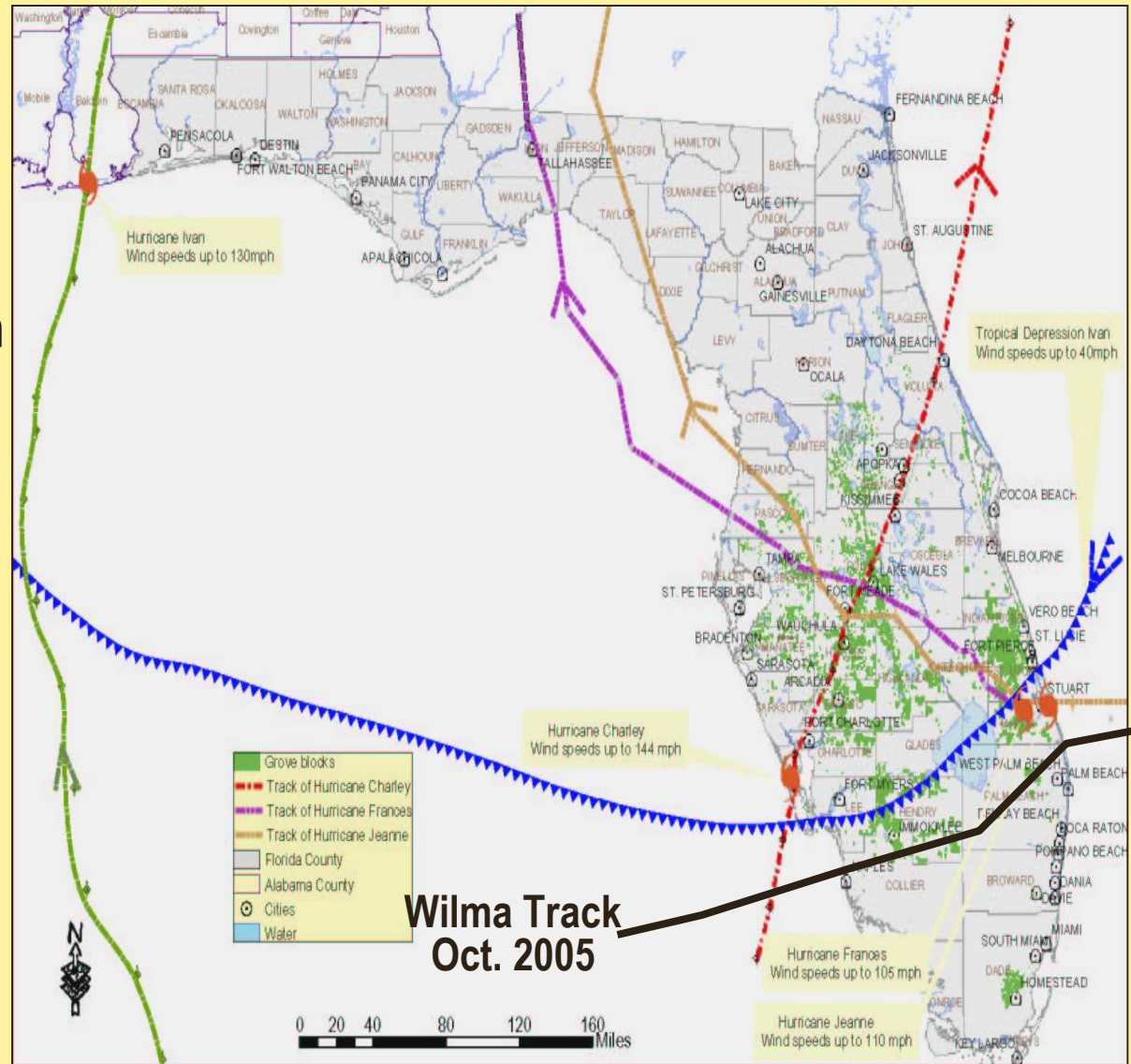


3 5 87



Florida Hurricane Paths 2004-2005

- Charlie 8/13/04
 - 144 mph
- Frances 9/5/04
 - 106 (120) mph
- Ivan 9/15/04
 - 140mph
 - TS 40 mph
- Jeanne 9/26/04
 - 110 mph
- Wilma 10/2005





Planning for Mitigation (Rick Bennett)

- Improve serological and molecular detection methods
- Transient expression vector system to screen potentially useful genes in citrus trees
- Systematically express gene products in citrus trees that are suspected to be useful
- Genes that appear to be useful will then be transformed into citrus trees and tested further
- **Weather-based predictive models**
- Evaluate windbreak planting as infection barriers



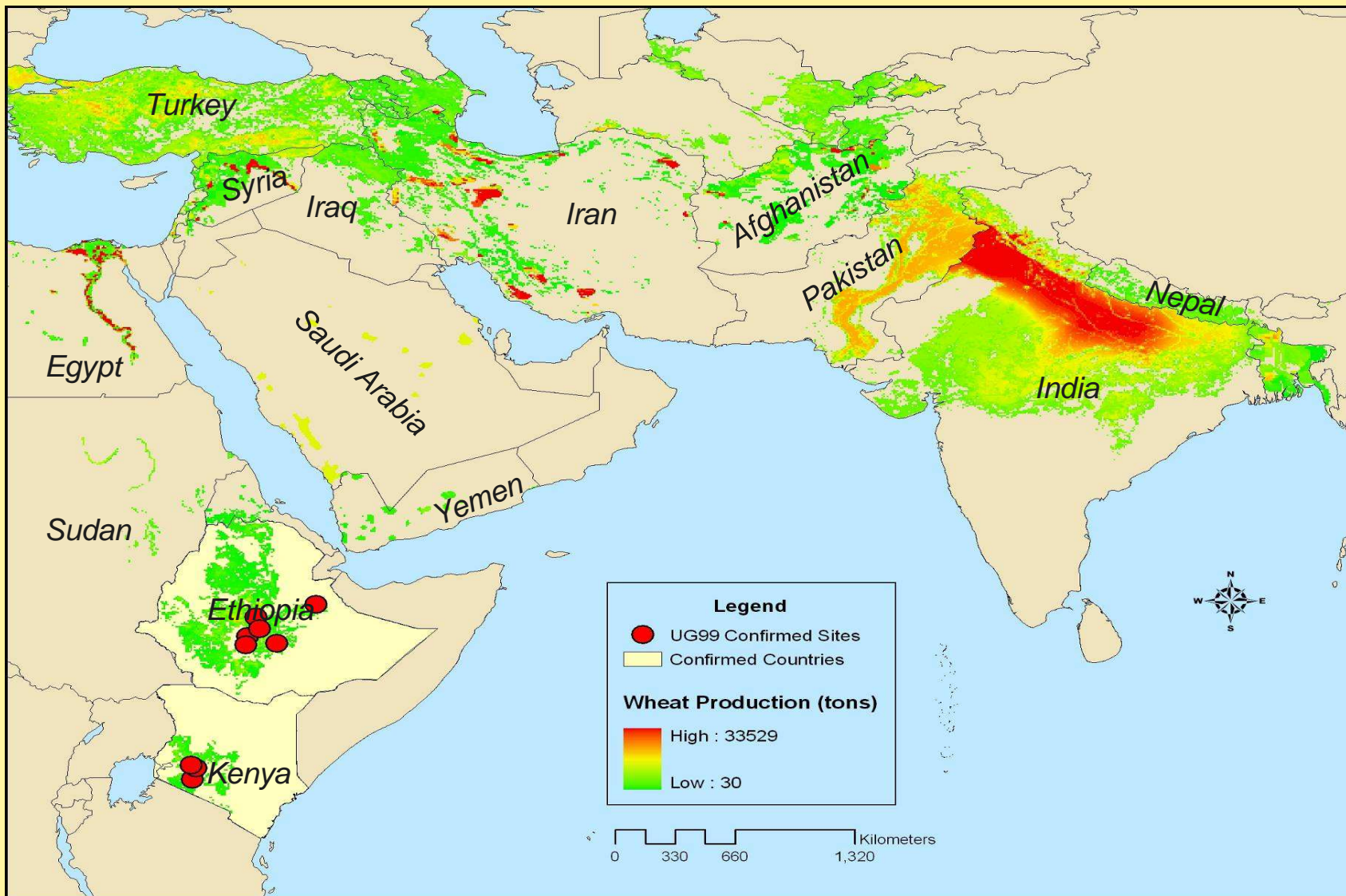
Wheat Rust (Kay Simmons)

- New wheat stem rust (Ug99) found in East Africa
- Most virulent in 50 years
- Little resistance in Africa, India, Pakistan, And China
- Preliminary tests show U.S. vulnerable



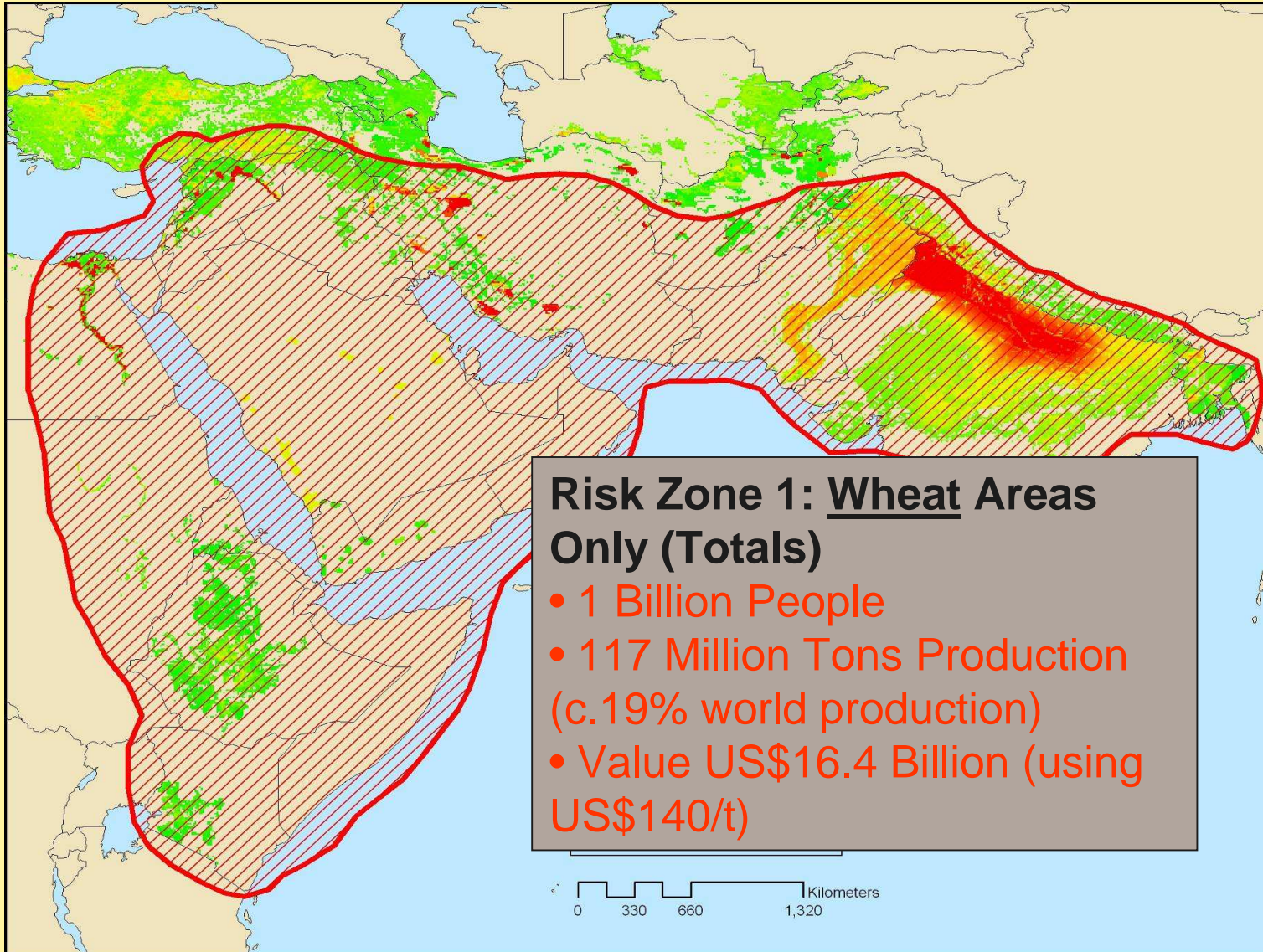


Wheat Stem Rust (Ug99) and Wheat Production (CGIAR)





Potential Risk Areas – Initial Assessment





Peanut Planting Dates (Southeast Climate Consortium)

SOUTHEAST

WEDNESDAY, APRIL 12, 2006

FARM PRESS

TIMELY, RELIABLE INFORMATION FOR SOUTHEAST AGRICULTURE

Early soybeans show promise in Southeast

By Paul L. Hollis
Farm Press Editorial Staff

Soybean producers in Alabama who tried an Early Soybean Production System (ESPS) this past year generally enjoyed better-than-average yields, thanks in large part to ideal weather conditions, says Dennis Delaney, Auburn University Extension agronomist.

The majority of the ESPS soybeans are being grown in north Alabama's Tennessee Valley, says Delaney, although they're also being grown in other parts of the state, including south Alabama's Wiregrass Region.

"The early system has become a viable option for some of our growers, especially now that we have improved varieties.

(See Early, Page 8)

SOME SOYBEAN PRODUCERS in the lower Southeast are finding a fit for an Early Soybean Production System on their farms.



Constitution in the House and pass legislation to help farmers who suffered a variety of weather and economic disasters including the hurricane-spawned high-energy prices of 2005?

That's the question that was on the minds of a group of senators and farm organization leaders who held a rally on Capitol Hill to build support for the Emergency Agricultural Disaster Assistance Act of 2006.

The latter, introduced by Sen. Kent Conrad, D-N.D., would provide emergency funding to farmers and ranchers who suffered weather-related crop production shortfalls, quality losses and damage to livestock feed supplies. It will also provide payments for the loss of livestock.

"This bill gives our farmers and

(See Sen., Page 4)

Early peanut planting dates being forecast

By Paul L. Hollis
Farm Press Editorial Staff

The Southeast Climate Consortium has released its peanut planting outlook for spring 2006, calling for an increased likelihood of warmer and drier-than-normal conditions in Alabama, Florida, and Georgia.

The Southeast Climate Consortium, or SECC, is a coalition of six universities — Florida State University, University of Florida, University of Miami, University of Georgia, Auburn University and University of Alabama-Huntsville. The programs of the SECC are designed around broad themes of product assessment and evaluation, program evaluation, and economic analysis and highlight research done into the fields of climate, forestry, agricultural risk, Extension, and natural resources and the environment.

The latest climate forecast from the SECC indicates that the region will be

(See Early, Page 3)

Early peanut planting being forecast

(Continued from Page 1)

dominated by the effects of the La Niña conditions in the Pacific Ocean in the next three to six months. La Niña is characterized by unusually cold ocean temperature as compared to El Niño, which is characterized by unusually warm ocean temperatures.

For detailed rainfall and temperature predictions for individual counties, you

and the risk of tomato spotted wilt virus (TSWV) in any planting date decision. Studies show a dramatic increase in tomato spotted wilt virus for peanuts planted in early- to mid-April.

There also is a risk of increased TSWV on peanuts planted in mid- to late-April. Growers who decide to plant earlier are advised to consider planting varieties with good resistance to TSWV such as AP-3, C-99R or Georgia 02C. For more information, check the University of Georgia Peanut Disease Risk Index or the University of Florida EDIS publication SS-AGR-13 at <http://edis.ifas.ufl.edu/AG247>

A warm spring in the counties located

“It is recommended to plant after the 4-inch soil temperature has reached 65 degrees F. for three consecutive days or longer. The Florida Automated Weather Network and Georgia Automated Environmental Monitoring Network monitor soil temperature data at several locations in Florida and Georgia, respectively.”

in lower latitudes may allow for earlier plantings if soil temperatures and moisture conditions are conducive to uniform germination and emergence of seed.

It is recommended to plant after the 4-inch soil temperature has reached

65 degrees F. for three consecutive days or longer. The Florida Automated Weather Network and Georgia Automated Environmental Monitoring Network monitor soil temperature data at several locations in Florida and Georgia, respectively.

Growers practicing conservation-

to Nov. 30.

The National Weather Service counted 27 named storms last year.

The AccuWeather meteorologists also stress that the northeast is overdue for a “powerful hurricane.” Weather cycles and above-normal ocean temperatures make it a question of when, not if, they say.

“The increased likelihood of a warmer and drier-than-normal spring may encourage growers to plant early. However, growers must consider other factors such as soil temperature and the risk of tomato spotted wilt virus (TSWV) in any planting date decision. Studies show a dramatic increase in tomato spotted wilt virus for peanuts planted in early- to mid-April.”

tillage peanut production with cover crops and strip-till may consider killing cover crops earlier this year to avoid further depletion of soil moisture, according to the SECC forecast.

Meanwhile, a private weather forecasting company is predicting that this year’s hurricane season will be more active than normal but not as busy as last year’s, and that the northeast U.S. will be hit by a major hurricane within five years.

The experts at AccuWeather, based in State College, Pa., predict this year’s hurricane season won’t quite top last year’s record number and named storms and 14 hurricanes.

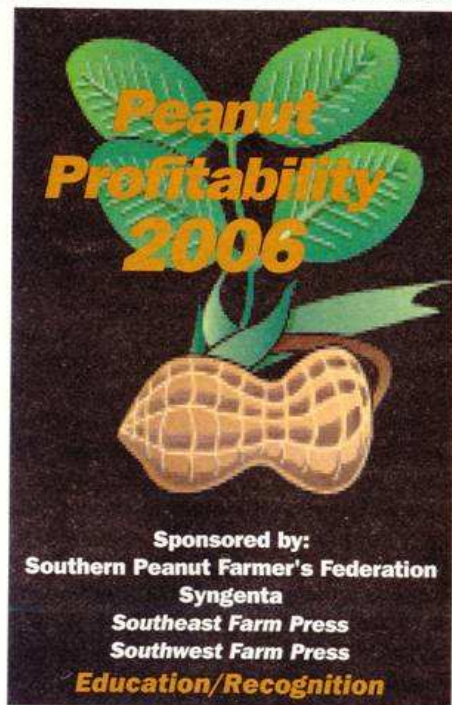
A normal season consists of 11 named storms, with five or six hurricanes, says Ken Reeves, senior meteorologist and director of the company’s forecast operations. The season runs from May 15

The meteorologists likened current weather cycles and ocean temperatures to those in the 1930s, 1940s and 1950s, particularly the pattern that led to a 1938 hurricane that struck Providence, R.I., and killed 600 people. Wind gusted to 186 miles per hour, according to AccuWeather. Surges of 15 to 20 feet and waves of 25 to 50 feet left much of Providence 10 to 15 feet underwater.

AccuWeather says northeast hurricane damage could rival or surpass that caused by Katrina, which inundated New Orleans and was the costliest storm in U.S. history. The forecasting company plans to release a more detailed forecast, including landfall and strength predictions, in May.

AccuWeather serves clients worldwide with forecasts, data, graphics, consulting services and computer equipment.

e-mail: phollis@farmpress.com

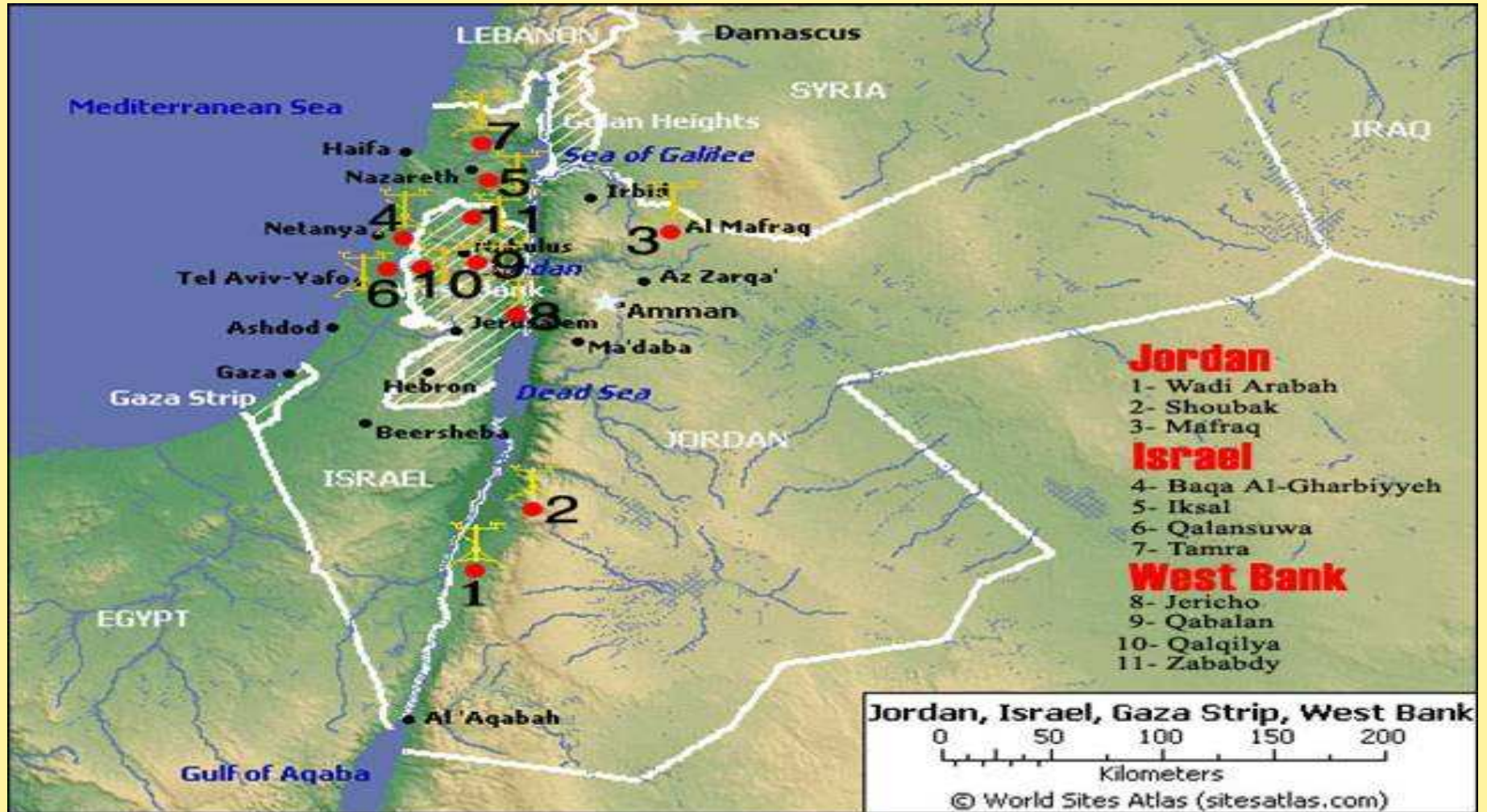


can use the climate risk tool developed by the SECC at the AgClimate Web site (www.agclimate.org).

The increased likelihood of a warmer and drier-than-normal spring may encourage growers to plant early, according to the forecast. However, growers must consider other factors such as soil temperature



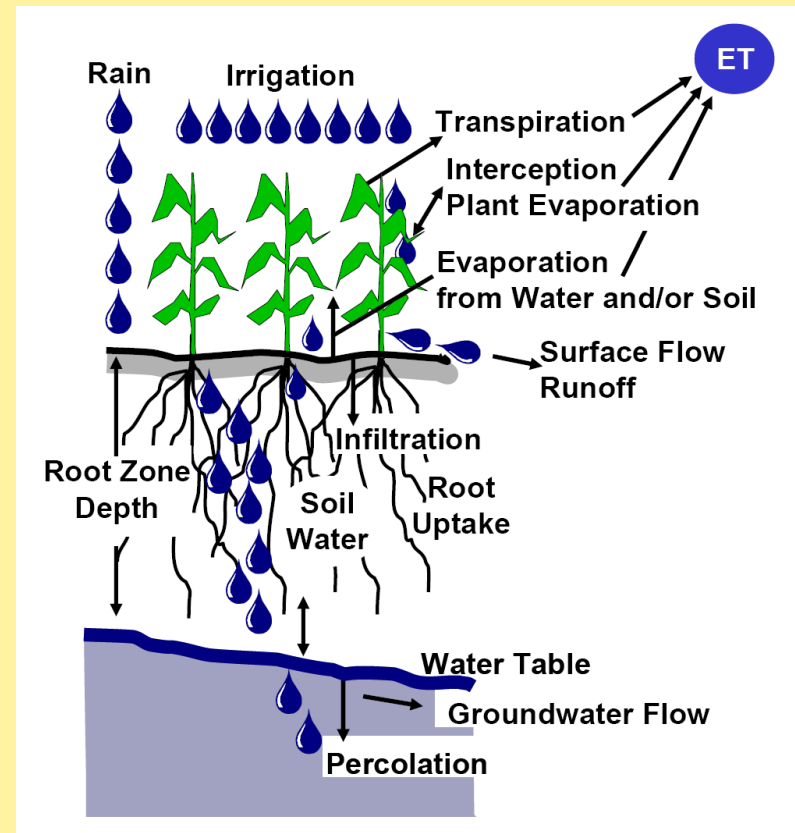
Middle-East Irrigation Water Management



Water Use Efficiency (WUE)

$$WUE = \frac{\text{Yield}}{\text{Water Use}}$$

- Changes with:
 - Irrigation scheduling
 - Irrigation method
 - Crop variety
 - Fertility management
 - Tillage management





Irrigation Scheduling

- Paradigms
 - Soil water sensor – replenish water used
 - Plant stress sensor – irrigate when stressed
 - Weather sensors – irrigate to replace estimate of water used
- Weather based irrigation scheduling
 - Measure wind speed, air temperature, relative humidity, and solar radiation
 - Estimate crop water use



JAWF Background Information (Ray Motha)

- World Agricultural Outlook Board/USDA – National Weather Service/NOAA
- World Agricultural Outlook Board has the operational responsibility for monitoring and analyzing the impact of global weather on agriculture

USDA Situation and Outlook Organizational Structure

Secretary/Deputy Secretary

Chief Economist

WAOB Chairperson

Chief Meteorologist/
Joint Agricultural Weather Facility

Interagency Agricultural
Projections Coordinator

Interagency Commodity Estimates Committees
Chaired by WAOB Senior Analysts

Grains

Livestock

Fibers

Oilseeds

Specialty Crops



World Agricultural Outlook Board



Scope of Products

- **Tactical Ag Weather Products (Short-term)**
 - Routine & Special Assessments
 - Weekly Weather and Crop Bulletin (WWCB)
 - JAWF in Stoneville, Mississippi (Weather Data)
- **Strategic Ag Weather Products (Long-term)**
 - Drought Monitor
 - Supply/Demand Estimates
 - National and International Monitoring
 - Planting Recommendations



Routine Operational Assessment

- Daily highlights of agricultural developments
- Weekly global weather briefing for USDA analysts



Satellite image with enhanced low cloud-top temperatures (degrees C) for 7:35 a.m. EDT (NOAA)

Agricultural Weather Highlights - Friday - November 15, 2002

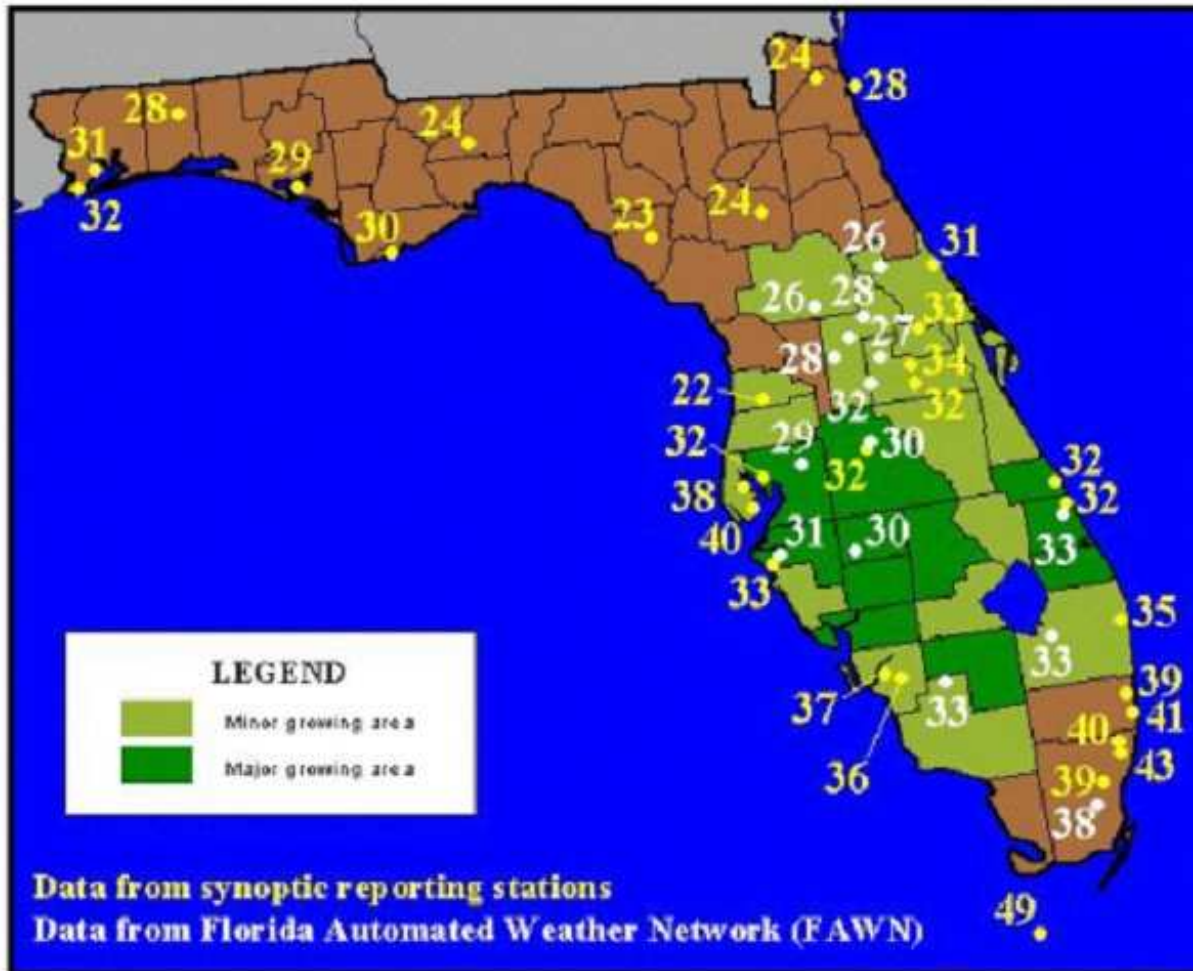
- *In the West*, cool weather favors autumn fieldwork, following a period of highly beneficial precipitation. Although recent soil moisture improvements are aiding *Northwestern* winter wheat, more precipitation is needed to ensure proper autumn establishment.
- *On the Plains*, cool, unsettled weather is slowing winter wheat development and hampering final summer crop harvesting. Across the *northern and central High Plains*, light rain and snow showers are boosting soil moisture reserves for wheat establishment.
- *In the Corn Belt*, widespread precipitation (rain and wet snow) is slowing final summer crop harvesting in the *Ohio Valley*, but cool, dry weather prevails elsewhere in the *Midwest*.
- *In the South*, showers are causing some renewed fieldwork delays from the *lower Mississippi Valley northward into the Tennessee Valley*. Cotton harvesting in the *Delta States* typically nears completion by mid-November, but one-quarter to one-third of the crop currently remains in the field.

Outlook: A developing storm system will track northward along the *East Coast* during the weekend, bringing widespread rainfall to the *Atlantic Coast States*. Snow is possible across the *interior Northeast* and rain will likely change to snow in the *central Appalachians*. In the storm's wake, unseasonably cold weather will affect areas as far south as the *Gulf Coast States*. Elsewhere, dry, warmer weather will prevail across the *Plains and Southwest*, while scattered showers are possible in the *Pacific Northwest*. The *NWS 6-10 day outlook* for November 20-24 calls for below-normal precipitation for much of the Nation, except for wet weather in *Washington and Maine*. Warmer-than-normal weather is expected across the *western half of the U.S.* and the *Midwest*, while below-normal temperatures are forecast in the *eastern Gulf Coast and southern Atlantic States*.

Contact: Brad Rinner, Agricultural Meteorologist, USDA/NOAA/NCAR, Washington, D.C. (202-220-2397)

Minimum Temperatures in Florida Orange Producing Areas

January 27, 2000



Weather Analysis

- Northerly winds brought cold air into Florida, dropping low temperatures to near or slightly below freezing in Florida citrus areas.*
- Widespread citrus damage is not expected, however, as minimum temperatures remained above 28 degrees F in major producing areas.*

Orange Information

- Damage to fruit typically occurs when temperatures drop below 28 degrees F.*
- Florida orange production accounts for approximately 79% of national production annually.*

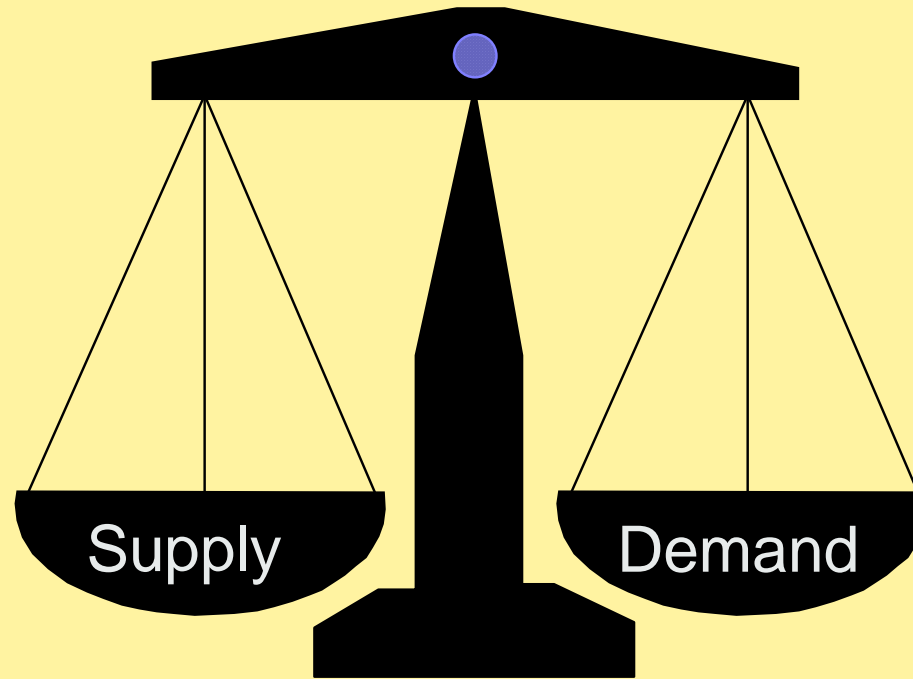


Joint Agricultural Weather Facility (JAWF)



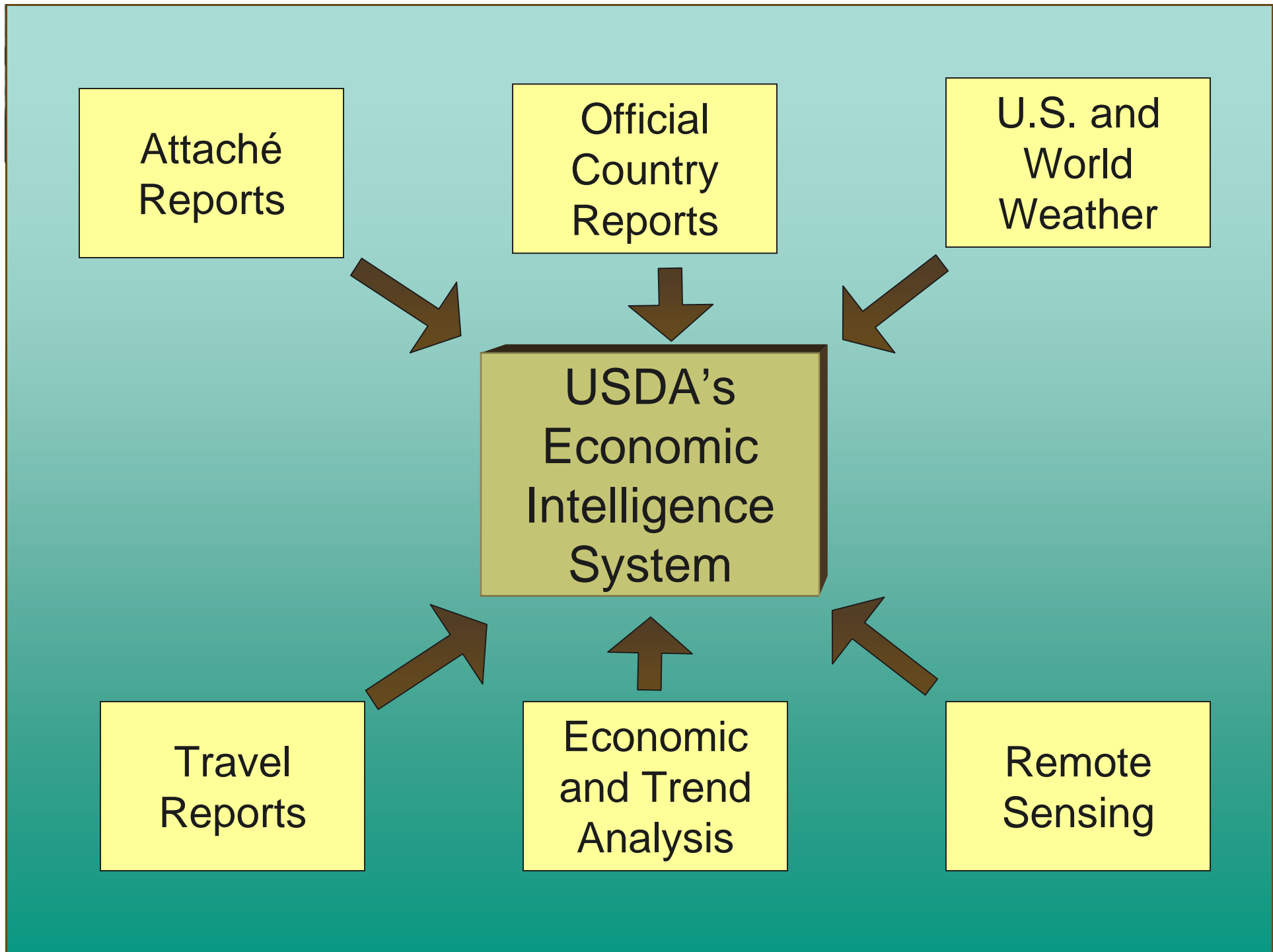
Supply and Demand

Beginning
Stocks
+
Imports
+
Production



Domestic
Use
+
Exports
+
Ending
Stocks

Estimates for
Grains - Soybeans - Cotton - Livestock - Sugar
Estimates Revised Monthly



Attaché
Reports

Official
Country
Reports

U.S. and
World
Weather

USDA's
Economic
Intelligence
System

Travel
Reports

Economic
and Trend
Analysis

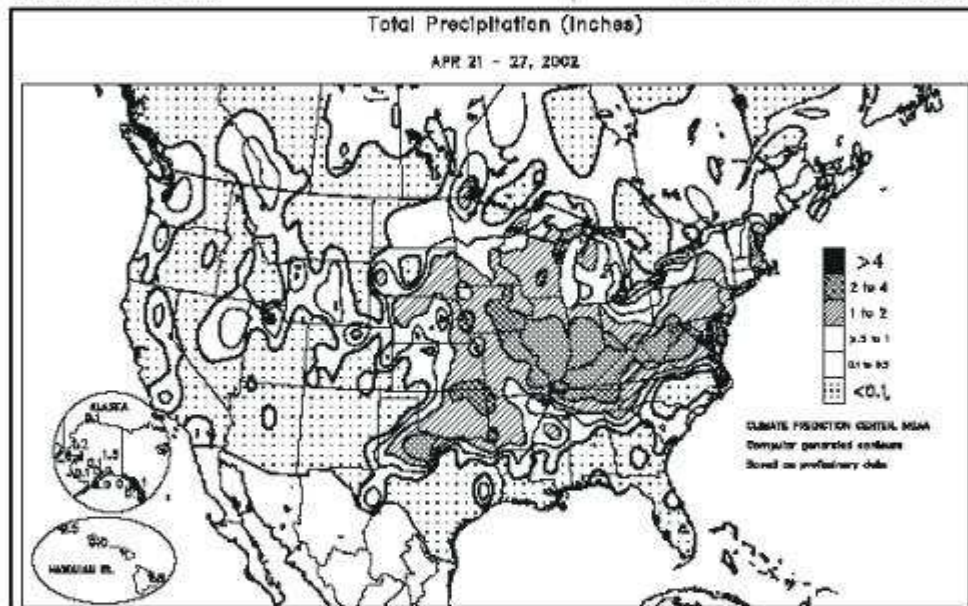
Remote
Sensing



WEEKLY WEATHER AND CROP BULLETIN

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service

U.S. DEPARTMENT OF AGRICULTURE
National Agricultural Statistics Service
and World Agricultural Outlook Board



HIGHLIGHTS

April 21 - 27, 2002

Highlights provided by USDA/WA/COP

Cool conditions persisted across the Northwest and returned to the remainder of the northern half of the United States, while very warm weather continued across the Nation's southern tier. Freezes caused varying degrees of damage, primarily to orchard crops, in the Northern States. Meanwhile, heavy precipitation, including locally severe thunderstorms, fell along the boundary between cool and warm air, especially from the eastern Plains to the Mid-Atlantic region. Cool weather slowed small grain development across the interior Northwest, where some pastures and dryland crops were in need of additional moisture. A much more serious

(Continued on page 5)

Contents

Crop Moisture Maps	2
Palmer Drought Maps	3
Weather Data for the Delta and Bootheel & SPC Tornado and Hail Reports, April 27-28	4
Temperature Departure Map	5
Soil Temperature and Pan Evaporation Maps	6
Extreme Maximum and Minimum Temperature Maps	7
Growing Degree Day Maps	8
National Weather Data for Selected Cities	9
Crop Progress and Condition Tables	12
National Agricultural Summary	14
State Agricultural Summaries	15
International Weather and Crop Summary	20
Subscription Information & April 23 Drought Monitor	24

Crop Progress and Condition

Week Ending April 28, 2002

Winter Wheat Percent Headed				
	Apr 28 2002	Prev Week	Prev Year	5-Yr Avg
AR	80	37	70	79
CA	99	75	95	93
CO	0	0	0	1
ID	0	0	0	0
IL	1	1	1	3
IN	1	0	3	4
KS	8	0	3	4
MI	0	0	0	0
MO	17	6	18	15
MT	0	0	0	0
NE	0	0	0	0
NC	65	35	60	57
OH	0	0	9	8
OK	57	18	36	46
OR	0	0	0	0
SD	0	0	0	0
TX	36	*20	47	48
WA	0	0	0	0
18 Sts	22	9	19	21
These 18 States planted 90% of last year's winter wheat acreage.				

Corn Percent Planted				
	Apr 28 2001	Prev Week	Prev Year	5-Yr Avg
CO	15	3	12	16
IL	25	18	46	32
IN	4	2	36	22
IA	33	12	14	19
KS	49	26	50	44
KY	43	30	71	49
MI	6	1	7	6
MN	22	3	0	26
MO	62	52	51	45
NE	32	8	19	18
NC	80	60	81	72
ND	8	0	1	10
OH	5	2	12	16
PA	13	7	7	8
SD	11	1	3	7
TN	79	63	83	70
TX	75	66	66	70
WI	8	1	9	9
18 Sts	26	13	25	25
These 18 States planted 93% of last year's corn acreage.				

Cotton Percent Planted				
	Apr 28 2002	Prev Week	Prev Year	5-Yr Avg
AL	47	22	44	32
AZ	65	53	62	62
AR	24	6	17	7
CA	85	60	75	68
GA	21	12	14	15
LA	40	9	38	25
MS	19	5	25	14
MO	26	10	28	14
NC	14	7	6	10
OK	4	*1	8	4
SC	19	14	8	13
TN	16	1	14	7
TX	18	16	16	17
VA	30	6	25	14
14 Sts	26	15	23	19
These 14 States planted 98% of last year's cotton acreage.				

Sorghum Percent Planted				
	Apr 28	Prev	Prev	5-Yr



Crop Condition

Winter Wheat Crop Condition by Percent					
	VP	P	F	G	EX
AR	3	18	37	37	5
CA	0	0	10	90	0
CO	19	21	47	12	1
ID	0	8	23	62	7
IL	0	4	26	54	16
IN	0	7	31	52	10
KS	17	23	35	23	2
MI	1	4	27	50	18
MO	1	6	26	58	9
MT	36	30	25	9	0
NE	9	21	41	28	1
NC	0	7	35	55	3
OH	3	6	26	51	14
OK	21	16	29	30	4
OR	21	19	22	29	9
SD	2	7	31	52	8
TX	24	23	29	20	4
WA	1	2	34	51	12
18 Sts	15	17	32	31	5
Prev Wk	15	18	32	31	4
Prev Yr	8	16	35	35	6

* - Revised

VP - Very Poor

P - Poor

F - Fair

G - Good

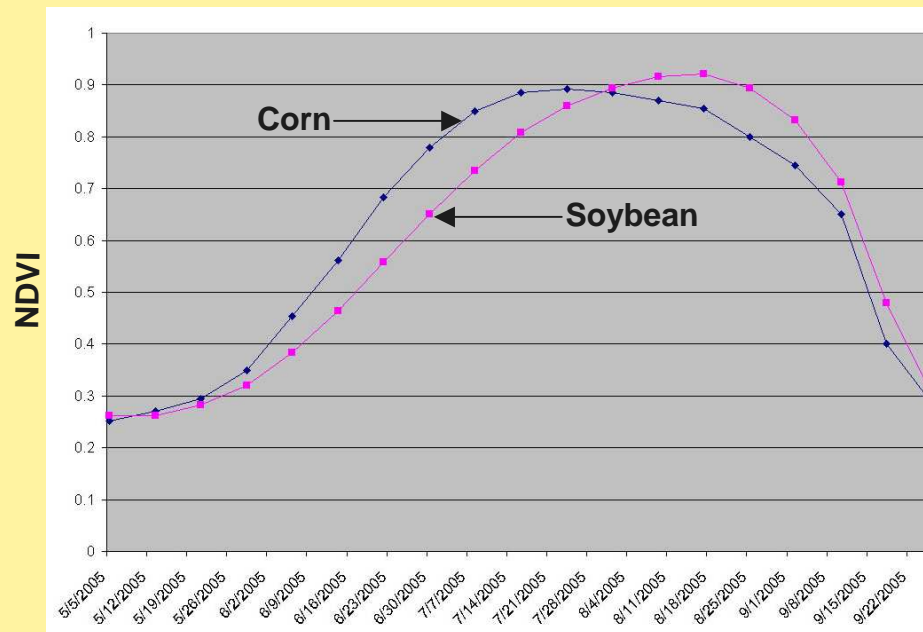
EX - Excellent

National crop conditions for selected States are weighted based on the year 2000 planted acres.



Improved Crop Yield Prediction

NASA-ESE Data: **TERRA Satellite**
MODIS-250 m resolution
8-day composite reflectance data
(Paul Doraiswamy) **Data Archive: 2001-05**



NDVI profile for Corn and Soybean crop through the crop growing season in Iowa.

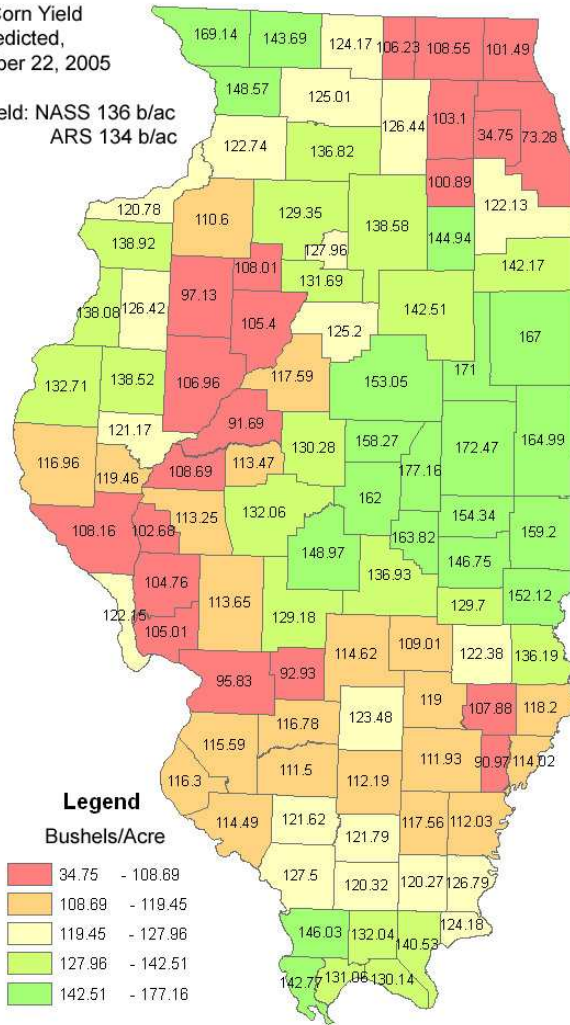
$$\text{Normalized Difference Vegetation Index} = \frac{(\text{Near Infrared} - \text{Visible})}{(\text{Visible} + \text{Near Infrared})}$$



2005 Corn and Soybean Yield Prediction

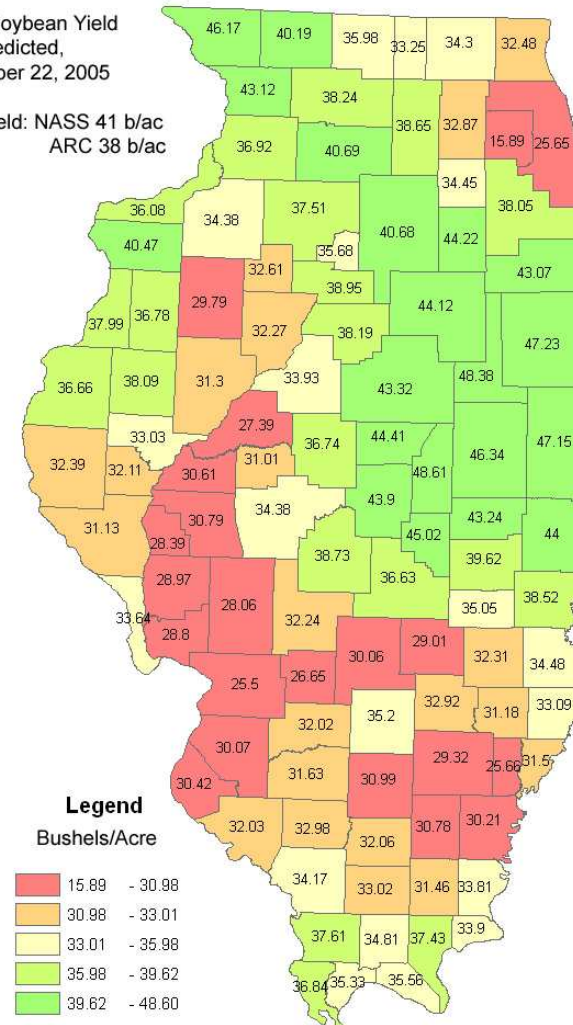
Illinois Corn Yield
ARS Predicted,
September 22, 2005

State Yield: NASS 136 b/ac
ARS 134 b/ac



Illinois Soybean Yield
ARS Predicted,
September 22, 2005

State Yield: NASS 41 b/ac
ARC 38 b/ac





Climate & Wx Information for Agriculture - Lessons Learned

- We need improved short-term to seasonal forecasts.
- Relate weather and climate data to meaningful agricultural information.
- Communication (e.g. extension service, education, training) is essential.
- Also, we need to ask
 - What information does the user need?
 - When does the user need this information?
 - To answer these questions, there must be an established mechanism
..... between users & providers