

Climate and Agriculture: Bridging the Information Gap

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Professor of Agrometeorology
Washington State University, USA

APEC Climate Symposium 2012
St. Petersburg, Russia
October 8, 2012



Weather and Agriculture

- Weather has an important impact on agriculture, both crop and animal production.
- For dryland agriculture more than 90% of the variability in yield can be explained by weather conditions.

Weather and Agriculture

- Providing weather data, advisories, weather data products and decision support systems to managers could help improve production and product quality, optimize resource use and reduce environmental impact.

Weather in the News

TheStar.com; February 9, 2012

Europe, Winter 2012

European cold weather kills hundreds, saps power systems, freezes Danube

Article

Comments (2)

Published On Thu Feb 09 2012

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Lighthouse and lampposts are covered with heavy ice in the central Adriatic Croatian port of Senj, some 200 kilometres from Zagreb on Thursday.

HRVOJE POLAN/AFP/GETTY IMAGES

Weather in the Southeast: Extremes

MSNBC.com; January 12, 2010


Cold records are shattered across Florida

Overnight temperatures in teens, 20s; some 'heavy fruit damage'



Phil Coale / AP

Ronnie Reichter surveys the ice sculpture in his front yard on Monday in Hosford, Fla., after overnight temperatures fell into the teens,.

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 Video



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[South in shock
from extreme cold](#)

Jan. 11: As the bitter cold continues to hover over 60 percent of the country, the Deep South, in particular, is feeling the bite. NBC's Ron Mott reports.

Nightly News

Tri-City Herald, Dec 6, 2010

Early freeze worries Columbia Valley grape growers



- An early freeze closing out what already was one of the industry's toughest years has many Columbia Valley wine grape growers wondering how much fruit they'll be harvesting in 2011.
- Winter hasn't even officially arrived, yet growers are deeply concerned about the health of their vines, particularly the tender buds that were formed in June and carry the 2011 vintage's potential grapes.
- "It's not pretty," said Rob Andrews of McKinley Springs Vineyard in the Horse Heaven Hills. "It's too early to tell 100 percent what is going on, but in the 30 years I've been growing grapes, this is the hardest I've ever been hit.
- "We're looking at a tough 2011."

Weather in the news

- “Global climate change damaging to farm crops in Europe” – Feast and famine in Europe as global warming scorches farms.
 - *The Daily Telegraph (London), August 31, 2003*

August 15, 2011

Gov. Gregoire requests farm disaster assistance for all 39 Washington counties

- OLYMPIA – Gov. Chris Gregoire today announced she has asked U.S. Secretary of Agriculture Tom Vilsack to determine whether to designate the entire state of Washington a farm disaster area due to weather-related productions delays and crop losses. The delays are the result of cold and wet weather conditions in every corner of the state throughout the spring and summer.

Tri-City Herald, Oct 4, 2012

Drought worsens in some key Midwest farming states

Published: October 4, 2012

By JIM SUHR — AP Business Writer

ST. LOUIS — The nation's worst drought in decades is showing no sign of letting up in several key Midwest farming states, worrying farmers harvesting the summer's withered corn crop in record time that their winter crops may also be at risk.

Overall drought conditions in the lower 48 states held steady over the seven-day period ending Tuesday, with about one-fifth of the total land area in extreme or exceptional drought, the two worst classifications, according to the U.S. Drought Monitor's weekly update of its drought map released Thursday.

Conditions worsened, though, in Kansas and Iowa, the nation's biggest corn producer, and nearly 98 percent of Nebraska was still deemed to be in one of the two worst categories.

The unrelenting dryness won't have much effect on the region's corn and soybean crops, which are already being plucked from the fields. But it could hurt other crops, such as winter wheat.

According to the map, which is put out by the National Drought Mitigation Center at the University of Nebraska in Lincoln, 75 percent of Iowa is enduring extreme or exceptional drought. That's up roughly 10 percentage points from the previous week.

Just over 93.25 percent of Kansas was in the same predicament, which was an increase of roughly 5 percentage points.

As of Monday, 54 percent of the corn crop had been brought in from the fields - the fastest pace in at least 17 years due to early planting and nearly three times the previous five-year average of 20 percent by this time, the U.S. Department of Agriculture reported. Some 56 percent of the corn crop in Iowa has been harvested, while Illinois has brought in 71 percent and Missouri 88 percent.

Federal Support, July 2012

USDA Announces Streamlined Disaster Designation Process with Lower Emergency Loan Rates and Greater CRP Flexibility in Disaster Areas

Mix of Discretionary Tools and Process Improvements Will Help Producers Suffering Effects of Extreme Weather

WASHINGTON, July 11, 2012—Agriculture Secretary Tom Vilsack today announced a package of program improvements that will deliver faster and more flexible assistance to farmers and ranchers devastated by natural disasters. Vilsack announced three significant improvements to decades-old USDA programs and processes related to Secretarial disaster designations: a final rule that simplifies the process for Secretarial disaster designations and will result in a 40 percent reduction in processing time for most counties affected by disasters; a reduced interest rate for emergency loans that effectively lowers the current rate from 3.75 percent to 2.25 percent; and a payment reduction on Conservation Reserve Program (CRP) lands qualified for emergency haying and grazing in 2012, from 25 to 10 percent.

"Agriculture remains a bright spot in our nation's economy and it is increasingly important that USDA has the tools to act quickly and deliver assistance to farmers and ranchers when they need it most," said Vilsack. "By amending the Secretarial disaster designation, we're creating a more efficient and effective process. And by delivering lower interest rates on emergency loans and providing greater flexibility for haying and grazing on CRP lands, we're keeping more farmers in business and supporting our rural American communities through difficult times. With these improvements, we're

Bloomberg, Oct 5, 2012

Food Prices May Stay High in Next Six Months on Drought: FAO

By Supunabul Suwannakij - Oct 5, 2012

Global food prices will probably stay high in the next six months after drought in the U.S. and Russia cut grain supplies, said the United Nations.

The global market “will switch to a short supply mode” for the first time in two years, said [Hiroyuki Konuma](#), the regional representative for Asia and Pacific at the UN’s Food & Agriculture Organization. “We will have to monitor it very cautiously,” he said in a phone interview on Oct. 3.

World food [costs](#) rose in September to the most expensive in six months as dairy and meat producers passed on higher feed prices to users, the FAO said yesterday. An index of 55 food items rose to 215.8 points in September from 212.8 a month earlier and compared with a 131.17 average in the past 20 years. Corn traded in [Chicago](#) jumped 50 percent since the middle of June as the worst U.S. drought in half a century killed crops.

[Food prices](#) monitored by the UN may climb 15 percent by June, surpassing the record set in February 2011, Nick Higgins, an analyst at Rabobank International, said in a report on Sept. 19. Grain and oilseed prices should “remain at elevated levels” for at least the next 12 months to ration demand and encourage crop farmers to boost planting, he said.

Associated Press, Oct 1, 2012

Bacon shortage 'baloney,' but prices to rise

Published: October 1, 2012



FILE - This June, 28, 2012, file photo shows hogs at a farm in Buckhart, Ill. U.S. agricultural economists say that a global shortage of bacon because of this year's drought will not pan out. Their consensus is that consumers will still find their ever-ubiquitous bacon at the supermarket, but they should just expect to pay more for it.

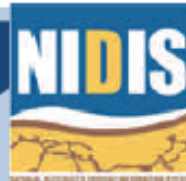
M. Spencer Green, File — AP Photo

By JIM SUHR — AP Business Writer

ST. LOUIS — Bacon lovers can relax. They'll find all they want on supermarket shelves in the coming months, though their pocketbooks may take a hit.

Climate Outlook USA, Fall 2012

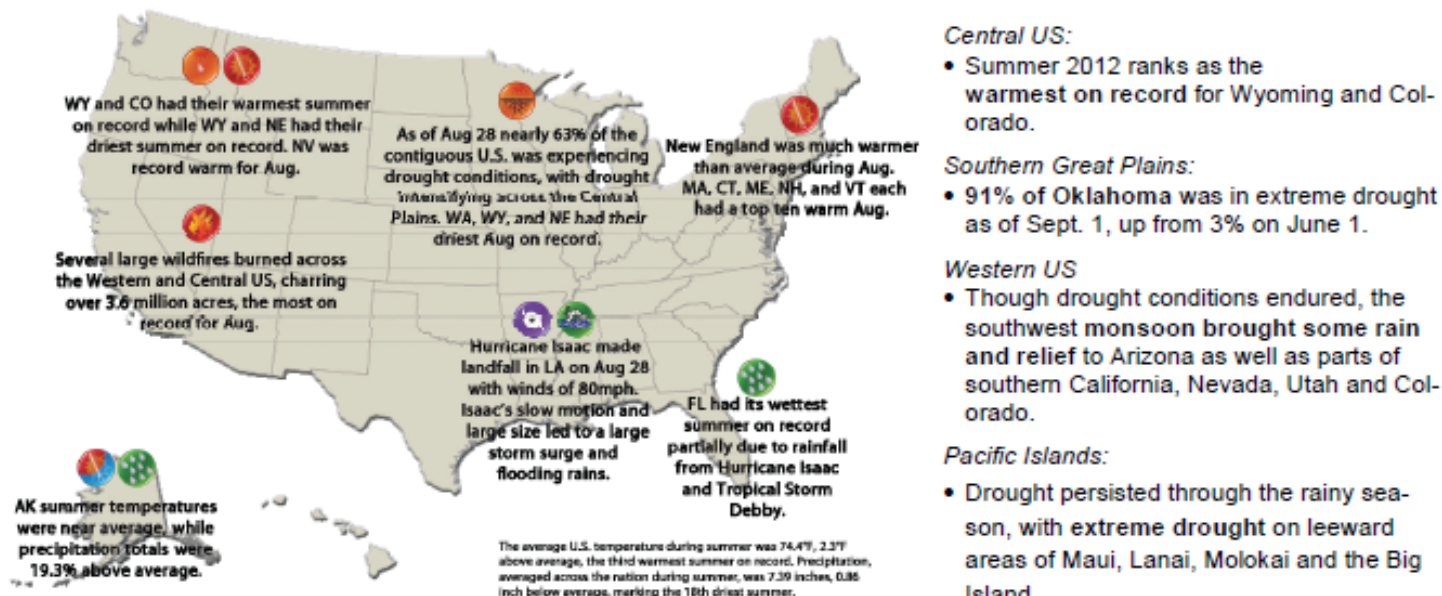
Quarterly Climate
Impacts and Outlook



The Western States
Fall 2012

National Outlook — Significant Events for Summer 2012

Extreme Drought Persists Across the Western States



Central US:

- Summer 2012 ranks as the warmest on record for Wyoming and Colorado.

Southern Great Plains:

- 91% of Oklahoma was in extreme drought as of Sept. 1, up from 3% on June 1.

Western US

- Though drought conditions endured, the southwest monsoon brought some rain and relief to Arizona as well as parts of southern California, Nevada, Utah and Colorado.

Pacific Islands:

- Drought persisted through the rainy season, with extreme drought on leeward areas of Maui, Lanai, Molokai and the Big Island.

Climate and Weather

- Does a farmer have options to modify or change his production system?
- If so, what are these options?
- Can weather and climate information play a role?
- How do we provide this information?

What is Agriculture?

- Food (for human consumption)
 - Crops
 - Meat, dairy products, eggs, etc.
- Feed (for livestock consumption)
- Fiber (for clothing and other uses)
- Fuel (for energy)
- Flowers (horticulture and green industry)
- [Forestry]

Agriculture?

- The agricultural system is a **complex** system that includes many interactions between biotic and abiotic factors



Agriculture

- Abiotic factors = Non-Living
 - Weather/climate
 - Soil properties
 - Crop management
 - Crop and variety selection
 - Planting date and spacing
 - Inputs, including irrigation and fertilizer

Agriculture

- Weather/Climate
 - Rainfall/Precipitation
 - Temperature
 - Solar radiation
 - Relative humidity
 - Dewpoint
 - Soil temperature
 - Soil moisture
 - Atmospheric pressure

Agriculture

- Biotic factors
 - Pests and diseases
 - Weeds
 - Soil fauna

Agriculture

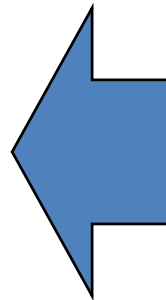
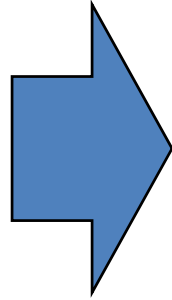
- Socio-economic factors
 - Prices of grain and byproducts
 - Input and labor costs
 - Policies
 - Cultural settings
 - Human decision making
- Environmental constraints
 - Pollution
 - Natural resources

Agriculture

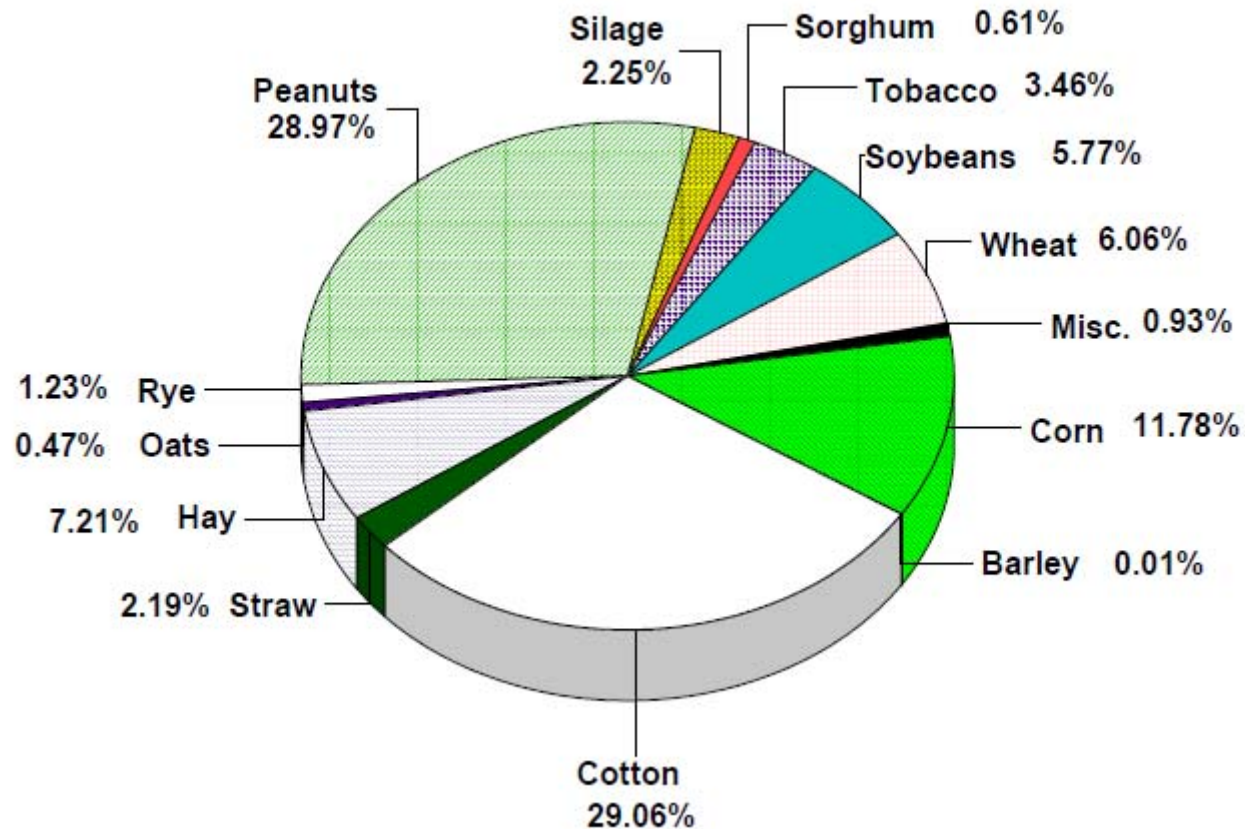
- The agricultural system is a **complex** system that includes many interactions between biotic and abiotic factors
 - Management
 - Some of these factors can be modified by farmer interactions and intervention, while others are controlled by nature

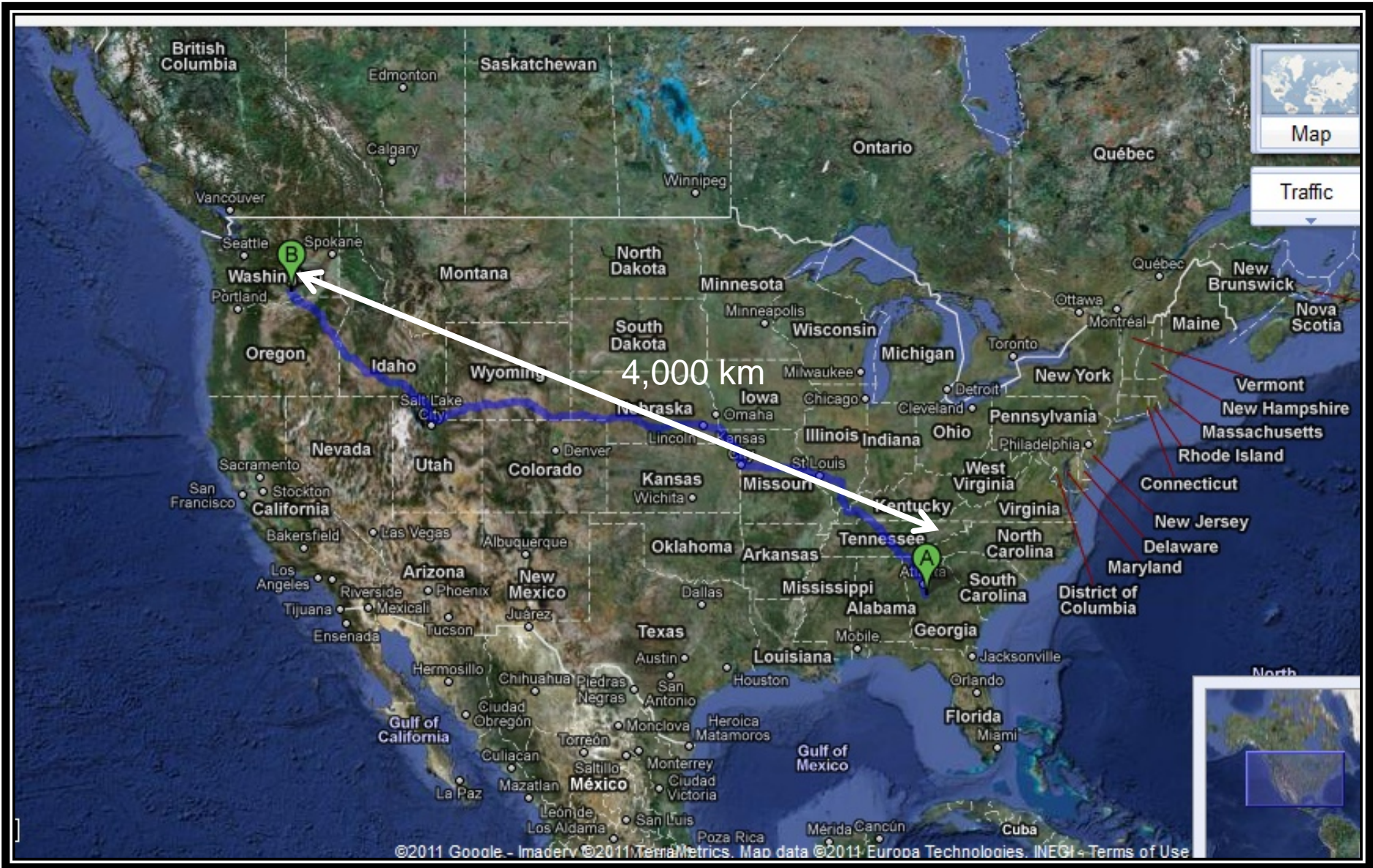
Value of Production System





Georgia Agriculture Row and Forage Crops - 2008 \$ 2,009,762,474





State of Washington

Top Forty Agricultural Commodities, Washington, 2008-2010

Commodity	Rank 2010	Value of Production		
		2008	2009	2010
		<i>\$1,000</i>	<i>\$1,000</i>	<i>\$1,000</i>
Apples	1	1,288,128	1,412,846	1,443,890
Milk ¹	2	1,002,496	684,003	950,061
Wheat	3	745,163	594,267	925,265
Potatoes	4	692,850	645,502	654,456
Cattle & Calves	5	496,127	472,958	568,317
Hay, All	6	581,302	452,410	508,680
Cherries, All	7	297,061	230,905	367,208
Nursery & Greenhouse Products ²	8	321,006	299,868	300,002
Grapes, All	9	199,165	210,084	213,744
Pears, All	10	170,734	158,336	189,319
Onions, All	11	140,332	219,417	168,810
Hops	12	258,642	265,330	160,937
Sweet Corn, All	13	141,208	173,447	146,656
Corn for Grain	14	84,132	103,619	139,656
Eggs	15	136,448	106,499	120,732
Aquaculture(incl. trout eggs & fish) ³	16	115,320	118,873	102,689
Corn for Silage	17	94,185	80,782	82,013
Broilers ⁴	18	70,387	57,248	61,360
Mint Oil	19	54,932	71,012	60,832

Climate and Weather

- Traditional agronomic crops versus high value crops
 - Wheat, maize/corn and soybean
 - Potatoes
 - Peanut and cotton
- Vegetable and fruits
- Grass/pasture for grazing versus hay production



1-FIRST SWELLING



2-SIDE GREEN



3-GREEN TIP



4-TIGHT CLUSTER



5-OPEN CLUSTER



6-FIRST WHITE



7-FIRST BLOOM



8-FULL BLOOM



9-AFTER BLOOM

Cherries



Wind Machines & Frost

Orchard-Rite® Wind Machines • www.orchard-rite.com

PREV

"I believe the best investment you can make in your orchard is the money you spend on frost protection."



"We believe in Orchard-Rite® wind machines because they have delivered excellent protection and dependable service. We tried a different brand of machine a while ago, but we found Orchard-Rite to be the best."

Cascade Wind Machine Service
1615 W. Ahtanum • Yakima, WA 98903

"Orchard-Rite's Auto-Start option has become quite valuable to us. It reduces the likelihood of machines being started 20 minutes late due to a power outage."

Cherries & Rain

Copters called in to dry Tri-City cherries

Published: June 3, 2012



A group of helicopters from Central Valley Helicopters in Ellensburg refuel Saturday at Vista Airport in Kennewick. The aircraft were kept busy at area cherry orchards blowing off overnight rains from the nearly ripe fruit.


Bob Brawdy — Tri-City Herald [Buy Photo](#)

By Kristi Pihl, Tri-City Herald

Helicopters were shaking water off cherry trees in some Tri-City orchards at first light Saturday morning.

Farmers were trying to keep the early morning rain from causing the cherries to crack and ruin the crop.

AgWeatherNet



World Class. Face to Face.

The Washington Agricultural Weather Network Version 2.0, WSU Prosser

AgWeatherNet

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WSU has 135 weather stations in farming communities

- Home
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- AWN Outlook NEW
- AWN Warnings
- Station Details
- Weather Widget NEW
- AWN Mobile NEW
- Current Conditions
- Yesterday's Weather
- AgAlertz
- Tree Fruit IPM DAS

AgWeatherNet Logon

Username:

Password:

Keep me logged in

[\[Forgot Password?\]](#)

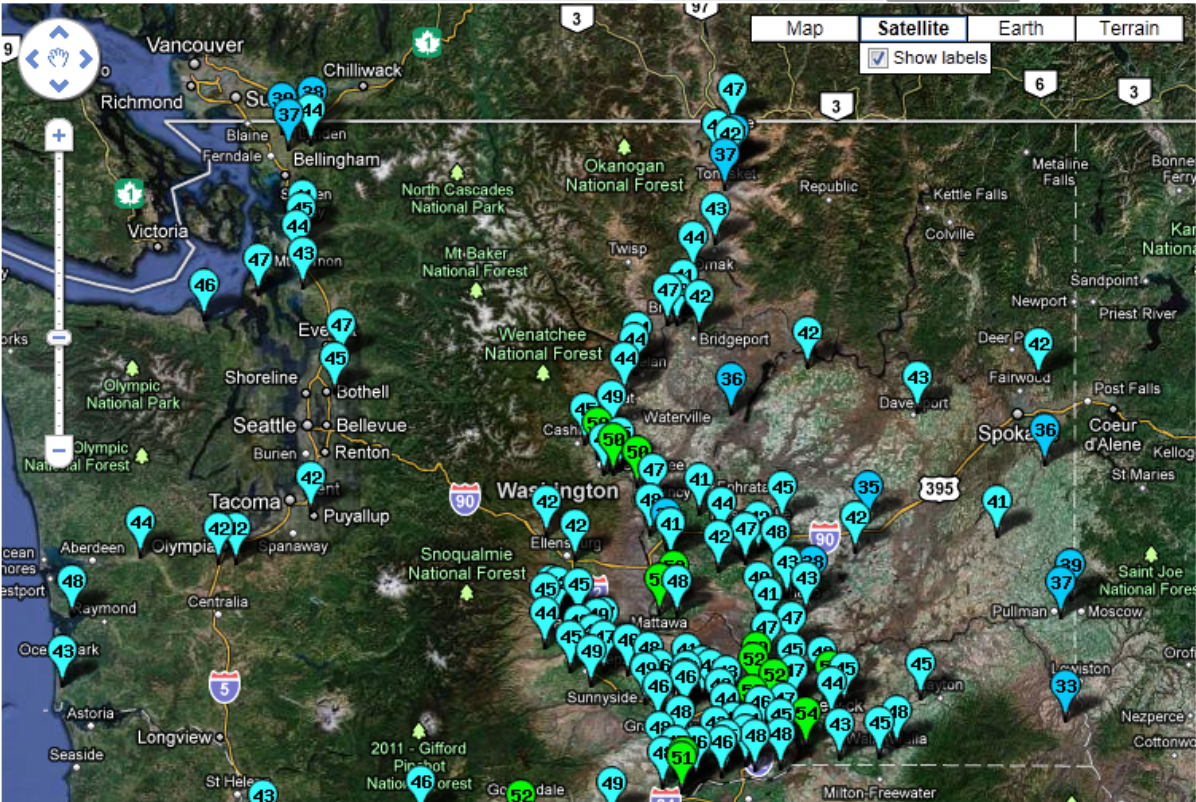
[Not registered? Sign-Up!](#)

[Tutorial](#)


Member Total: 5878
There are 7 members
6 guests viewing the site

Choose display value: Air Temperature (°F) Zoom to Station: ▼

Show labels



Temp, Wind & Rain Alerts



WASHINGTON STATE UNIVERSITY
World Class. Face to Face.

The Washington Agricultural Weather Network Version 2.0, WSU Prosser

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AWN September 2012 Weather Review

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Temp & Wind Alerts NEW

Add Low Temp Alert

Add High Temp Alert

Add High Wind Alert

Add High Rain Alert

Run/Edit Alerts

Favorites

Receive high rain alert messages

1. Please enter an alert name

Alert name

(No special characters, A-Z, 0-9 only, click Save when finished.)

2. Please enter a precipitation amount

Enter a precipitation amount inches

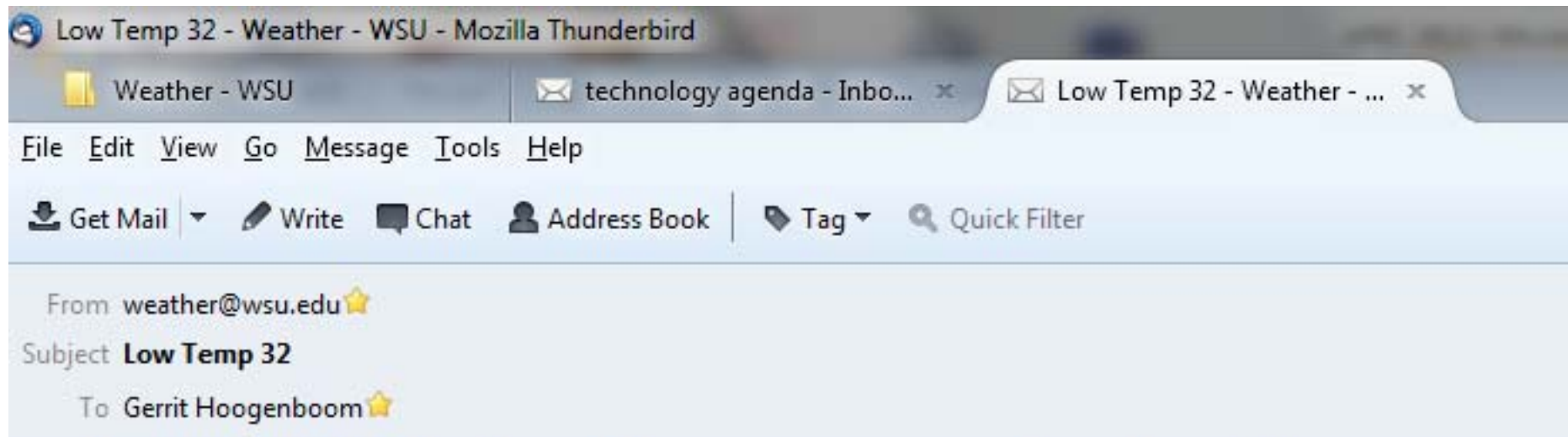
whenever precipitation amounts are above the point you have chosen, you will receive alert messages

Enter the time of day to start accumulation:

3. Please check desired sites

<p>Adams</p> <p><input type="checkbox"/> Hatton</p> <p><input type="checkbox"/> Lind</p> <p><input type="checkbox"/> Ritzville</p> <p><input type="checkbox"/> WSU Othello</p> <p>Asotin</p>	<p>Clark</p> <p><input type="checkbox"/> WSU Vancouver RE</p> <p>Columbia</p> <p><input type="checkbox"/> Huntsville</p> <p>Douglas</p>	<p>King</p> <p><input type="checkbox"/> 21 Acres</p> <p><input type="checkbox"/> Seattle</p> <p>Kittitas</p> <p><input type="checkbox"/> Broadview</p> <p><input type="checkbox"/> Thorp</p>	<p><input type="checkbox"/> Stanwood</p> <p>Spokane</p> <p><input type="checkbox"/> Fairfield</p> <p><input type="checkbox"/> Green Bluff</p> <p>Thurston</p> <p><input type="checkbox"/> East Olvmbia</p>
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Temp, Wind & Rain Alerts



You have requested to be alerted when temperatures are lower than 32 (F).

Mabton East: Air Temp=30.7F @ 6:15am PDT, Oct 7 2012.

To change your settings, log in to AgWeatherNet and select "Temp and Wind Alerts" and

AgWeatherNet: A service provided by Washington State University (www.weather.wsu.edu)

Decision Making

File Edit View Go Message Tools Help

Get Mail Write Chat Address Book Tag

From Jason Matson★

Subject **RE: Weather and modeling question**

To Gerrit Hoogenboom★

The only cherry weather I was interested in has been rain alerts.

-----Original Message-----

From: Gerrit Hoogenboom [<mailto:gerrit.hoogenboom@gmail.com>] On Behalf Of
Gerrit Hoogenboom

Sent: Sep 21, 2012 1:28 PM

To: Jason Matson

Cc: Melba Salazar

Subject: Weather and modeling question

Climate and Weather

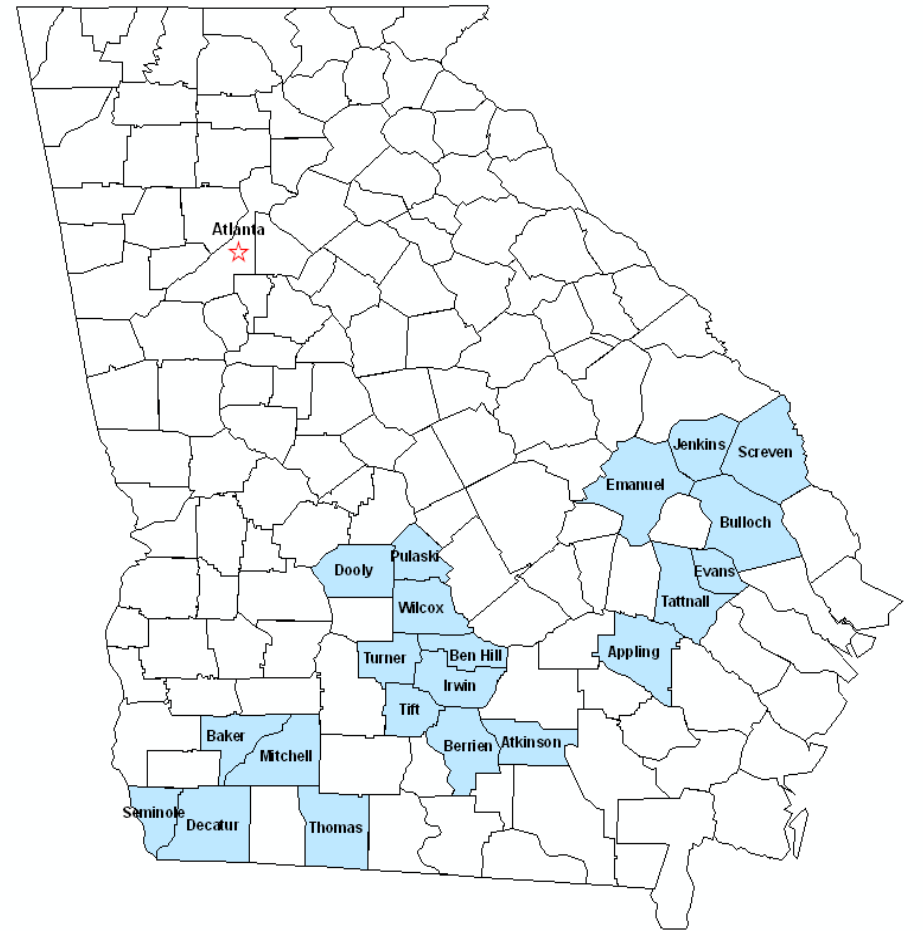
- How does a farmer make decisions?
- Can weather and climate information play a role?
- When are these decisions being made?
- Can we provide this information in a timely manner
- Is this information reliable?

Climate in the Southeast: *How do farmers make decisions?*



Farmers and Climate Interviews

- 38 farmers
- 21 counties in GA
- Semi-structured interviews
 - Risk management strategies
 - Access to weather & climate information
 - Potential uses of climate forecasts



Farmers and Climate Risk Reducing Options

Potential Use	Freq.
Crop selection	23
Planting timing	16
Input management	14
Land management	13
Variety selection	11
Marketing	8
Harvesting dates	4
Insurance	3
Herd management	2
Hog lagoon mgmt.	1

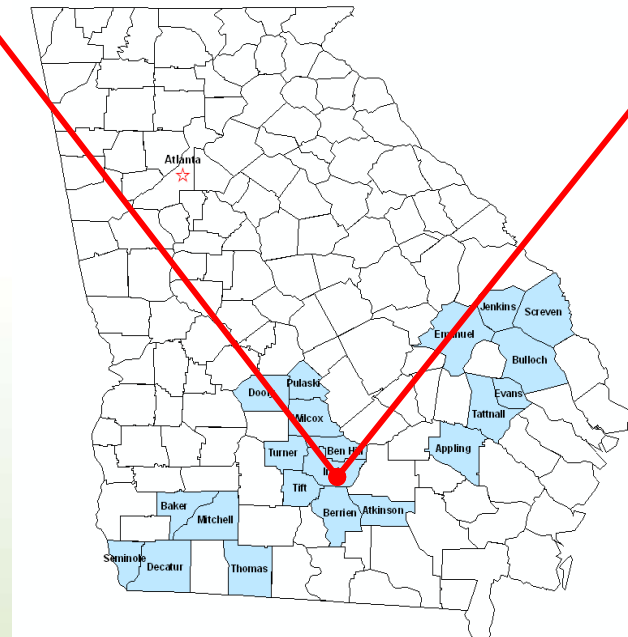


Farmers and Climate Risk Reducing Options

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Harvesting dates	4
Insurance	3
Herd management	2
Hog lagoon mgmt.	1

Forecast Use: Irwin County

Spring 2006 forecast for summer drought → widespread shift from long- to short-cycle peanut variety



Understanding Decisions

Saliency/Relevance

- Relative uncertainty of climate forecasts compared to non-climate drivers
 - Commodity prices, input prices
 - Credit, insurance, government payments
 - Trade policies, labor laws, immigration regulations
- Inflexibility of highly-capitalized operations
 - Large acreage
 - Infrastructure/equipment investments
 - Indebtedness

Understanding Decisions

Credibility/Legitimacy

- Lack of familiarity with climate forecasts
 - Absence of personal experience or a track record
 - Diffidence based on “failure” of other predictive information (i.e. hurricane warnings)
- Differences in farmers’ and scientists’ understandings of key concepts
 - Accuracy
 - Probability
 - Normal

Understanding Decisions

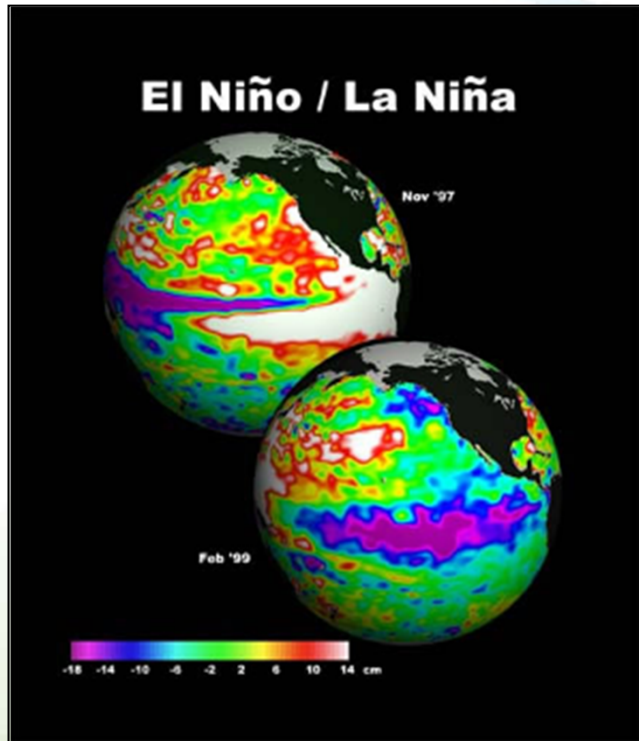
Access/Equity

- Farmers have limited time and mental energy to
 - Process additional information
 - Devise alternative strategies
- Farmers often rely on others for information management such as
 - Wives and children
 - Crop consultants
 - Buyers and suppliers

Farmer Joe's Questions

La Niña

El Niño

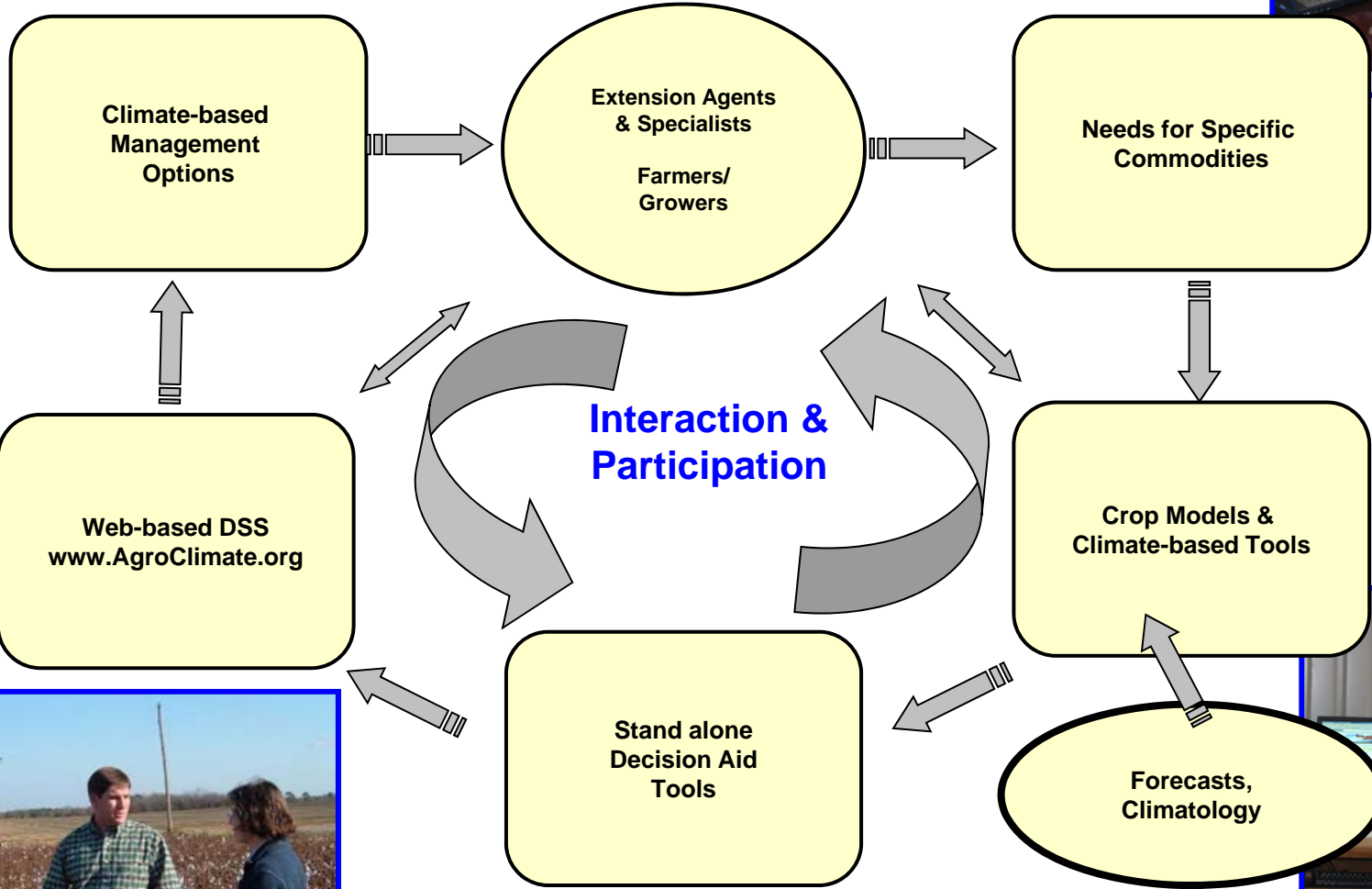


Management Decisions

- Crop selection
- Variety selection
- Planting dates
- Acreage allocation
- Pest management
- Labor
- Amount and type of crop insurance
- Investment in infrastructure and equipment (irrigation, frost protection)



Climate in the Southeast: How do farmers make decisions?



Communication & Information

Africa not just a mobile-first continent -- it's mobile only

By **Toby Shapshak**, Special to CNN

October 4, 2012 -- Updated 1607 GMT (0007 HKT) | Filed under: [Mobile](#)



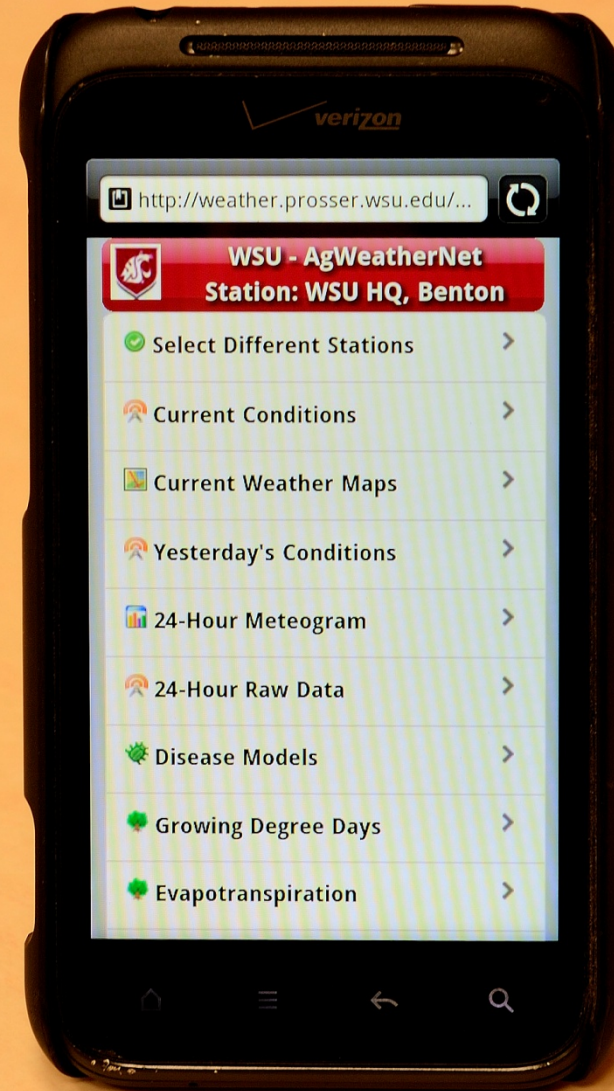
People walk while speaking on the phone in Nairobi, Kenya on October 1, 2012.

STORY HIGHLIGHTS

- The first time most Africans use the internet is on a mobile phone, says Toby Shapshak

Editor's note: *Toby Shapshak is a technology journalist based in Johannesburg where he writes about tech and innovation in Africa. He edits the South African edition of Stuff magazine and has been named by GQ as one of the top 30 men in media. Follow him on*

Communication & Information



Cell Phone Alerts

AgAlertZ

Powered By AgWeatherNet



AgAlertz

Managing undesired events is a major concern to all Growers as they work to mitigate the risks of farming... And, two of the most serious threats to a crop are undesired weather and disease events. AgAlertz is here to assist as it allows you to define your alerting needs by setting the condition that you would like monitored in real time!



This "automated assistant" monitors your preset weather concerns while you go about your farming activities and helps reduce the need to constantly check the weather. When the conditions of your alert are met, AgAlertz notifies you in the manner you have selected... our telephone voice notification, our text messaging, our email notifications, or all three if desired... And, you can also set the frequency for repeat notifications.

Sign up for real-time delivery of current weather, triggered WSU Disease Models, and weather warnings directly to you. With AgAlertz you are assisted in your need to stay ahead of potentially dangerous conditions.

Register Now! Signup is easy! Click the button to register

Try out a demo of AgAlertz by sending yourself a Disease alert or a Weather alert, and select your choice of delivery methods.

Check it out by Clicking the demo button!

Demo

AgWeatherAlert News

What is AgAlertz

AgAlertz helps manage farm risk by alerting Growers to potential weather and disease events. AgAlertz operates with AgWeatherNet to pin point user defined weather conditions like no other weather service! AgAlertz helps you personalize your weather and other crop concerns and delivers the results to your inbox, mobile phone, PDA or iPhone.

Your own personal Weather Assistant

AgAlertz helps formulate your weather information gathering strategies by allowing you to create personalized alerts covering all weather conditions and allows you to observe weather data around various crop locations, from multiple weather data gathering stations. Add an automated assistant to help your researching of weather data online. AgAlertz is easy to use and a timely alternative.

Price of Information



Please take a few minutes to respond to this request to growers for information... This information will form a substantial part of future decisions with AgAlertZ

4Qtrs, working in concert with WSU, is encouraged to improve AgAlertZ (www.agalertz.com) and move this service to the next level of performance. As we move towards a wider scope of information and notifications, we are interested in gaining your thoughts and insights into the needs of today's growers.

As a user of AgAlertZ, please share with us the areas of information, data, or tools that you would like to see added to or modified within the AgAlertZ website.

Please take a moment to complete the three questions below and thank you for your time and assistance as we pursue better tools for our farming community...

- a. Please describe what you would like to see improved with AgAlertZ.

- b. Please describe any items of concern with the current site.

- c. WSU and 4Qtrs have sponsored the site for several years and costs are coming under scrutiny. If this were a fee for service site, what would you be willing to pay on a monthly basis?
 - a. I would be willing to pay a monthly fee of \$ _____
 - b. I will not use the site if it has a cost associated

Weather Insurance



FOR GROWERS

FOR AGENTS

Total Weather Insurance

Protect Your Profits From Bad Weather



1
Get Your Weather Risk Report



2
Get Custom Weather Insurance Plan



3
Weather Happens



4
Get Paid Automatically

Start Here

Get your FREE WEATHER RISK ANALYSIS

County or Zip Code

Corn

Get Started

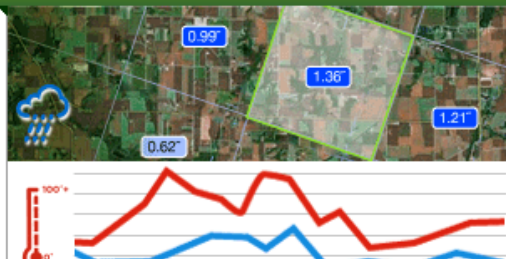
BRENT B., ILLINOIS
TWI 2012 INSURED

Featured Grower

"TWI gives me a cushion so I can guarantee my livelihood for another year."

ROBERT J., INDIANA
TWI 2012 INSURED

Interactive Weather History



TWI Overview

TOTAL WEATHER INSURANCE (TWI) enables you to lock in profits by insuring against bad weather that can cause yield shortfalls.

PEACE OF MIND

- Profit Protection
- Complements Federal Crop Insurance

The Climate Corporation

- ““We like to tackle and solve some of the world’s most challenging problems,” Friedberg says, on what’s next for The Climate Corporation beyond insuring farmers, “A farmer is about as analog as it gets. To be able tell a farmer this is what’s going to happen at the end of a season, that’s mind-blowing.”
TechCrunch, June 14, 2012

Rainfall Insurance

Kilimo Salama

[About Kilimo Salama](#)

[Press Room](#)

[Media Center](#)

since we cannot control the weather



About Kilimo Salama

Kilimo Salama ("Safe Agriculture") is an insurance designed for Kenyan farmers so they may insure their farm inputs against drought and excess rain. The project, which is a partnership between Syngenta Foundation for Sustainable Agriculture, UAP Insurance, and telecoms operator Safaricom, will offer farmers who plant on as little as one acre insurance policies to shield them from significant financial losses when drought or excess rain are expected to wreak havoc on their harvests.

Recent Posts

- ▮ [First M-PESA Payouts](#)
- ▮ [Kilimo Salama Video](#)
- ▮ [Kilimo Salama Online Press Room](#)

Archives

Why do we need a model?



Temperature & Rainfall



Weather/Climate and Modeling: Crop and Pest

Social scientists/agronomists/atmospheric scientists & engineers



Crop/Livestock/Pest/Disease Model

Bud Break

Flowering

Harvest Maturity

Information delivery to producers

Summary

- Climate and Agriculture: Bridging the Information gap
- Forecasts
 - Timely
 - Relevant
 - Reliable
 - Easy to obtain
 - User-friendly
 - Easy to implement
 - Cost effective

Weather conditions and weather-based decision support tools

[**www.weather.wsu.edu**](http://www.weather.wsu.edu)

[**www.georgiaweather.net**](http://www.georgiaweather.net)

Southeast climate information and tools:

[**www.agroclimate.org**](http://www.agroclimate.org)

For crop model information:

[**www.DSSAT.net**](http://www.DSSAT.net)

[**www.GerritHoogenboom.com**](http://www.GerritHoogenboom.com)

[**Gerrit.Hoogenboom@wsu.edu**](mailto:Gerrit.Hoogenboom@wsu.edu)

Thank you

