for Climate-Smart Agriculture

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Climate Variability in the Southeast U.S.A.

Normal Conditions in the Tropical Pacific Ocean

Fig. 6 Normally, the trade winds and strong equatorial currents flow toward the west. At the same time, an intense Peruvian current causes upwelling of cold water along the west coast of South America.
El Niño - Southern Oscillation (ENSO)

The El Niño / La Niña cycle is the predominant mode of year to year climate variability in the Southeast U.S.

- Warmer than normal sea surface temperature (SST) across the eastern tropical Pacific
- Wetter and cooler winter and springs in the Southeast U.S.
- Fewer Atlantic hurricanes
AgroClimate.org

- Climate extension and applied research program.

- Dedicated to translate climate and weather data into information to help producers reduce risk.
Our Vision for AgroClimate.org

Adaptation Strategies (seasonal variability and climate change)
Resilient production systems

One Cropping Season
Multiple Cropping Seasons
One to several generations

Weather Monitoring & Forecast
Climate Change

Seasonal Climate Variability

• Weather monitoring
• Short term forecast
• Seasonal outlook
• Climate change projections

Translating weather/climate information into decisions

Monitoring & Weather Forecast

- What field can I work on this afternoon?
- When can I plant my seeds?
- Should I apply N fertilizer to my fields?
- Will it be dry enough to harvest?
- Should I cut hay today?
- Cold protection tonight?
- Should I apply fungicide today?

Flooded peanut field. Doug Mayo – August 2013.

Blueberry freeze, UF-IFAS, February 2002.

Operational decisions
Translating weather/climate information into decisions

Seasonal Climate Outlook

- Best crop/variety to plant this season?
- How much should I invest in fertilizer? How to apply N?
- Should I purchase/increase crop insurance coverage?
- Marketing decisions?
- Should I invest in winter pasture or feed?

Strategic decisions
Our top challenge is to translate climate change projections into decisions

Long-term Climate Projections

- How do I become more resilient to climate extremes?
- What cropping system will be more appropriate based on existing projections?
- Should I invest in land somewhere else?
- ?

Making *decisions based on long-term climate projections is much more difficult!

One of the main reasons for extension faculty to be reluctant about addressing climate change issues is the lack of “practical solutions”

* Decisions at the producer level, not in terms of national or regional planning
How to communicate this knowledge to producers?

- In 2005 we started creating a web-based climate information system under a project funded by the USDA - Risk Management Agency. First version of AgroClimate (AgClimate) released in January of 2005.
Examples of questions that AgroClimate.org can help answer.

1. Effects of the El Niño Southern Oscillation on rainfall/temperature in your county?

2. Current strawberry disease risk? Should I apply fungicide?
The Multivariate ENSO Index (MEI) is used to characterize ENSO phases and strength. High positive (red) values indicate El Niño, while negative (blue) values indicate La Niña phases (read more).

Strong positive (red) phases of the North Atlantic Oscillation (NAO) tend to be associated with above-average temperatures in the eastern United States while strong negative phases tend to be associated with the number of daily cold extremes during the winter (read more).
AgroClimate Tools

- **Climate Risk**: Air temperature and precipitation climatology and current observations
- ** Freeze Risk Probabilities**: Freeze probabilities based on El Niño Southern Oscillation (ENSO) phases
- **Climate Anomaly Maps**: This tool provides maps showing monthly temperature and rainfall departures from average (1981-2010 climatology).
- **NWS Forecast**: Site-specific, detailed 3-day forecast of hourly weather variables
- **ARID Monitoring and Forecast**: Agricultural Reference Index for Drought
- **LGMI Monitoring**: Lawn and Garden Moisture Index LGMI
- **County Yield Statistics**: Crop yield series, trends and residuals at the county level
- **Regional Yield Maps**: Average yield residuals (%) for El Niño, La Niña, and Neutral years

C. W. Fraisse, UF-IFAS
AgroClimate tools: Climate risk - Maps

Average - Total Rainfall (Inch) - El Niño Years 🌊 - January

Select region
- Neutral
- El Niño
- La Niña
- Average for all years
- Compare all ENSO phases

Select rainfall or temperature

Select ENSO phase

Select month

About

Data source: PRISM Climate Group, Oregon State University

*Enlarge the map on mouse roll over.

Download map
AgroClimate tools: Climate risk - Maps

Deviation from Average - Total Rainfall (Inch) - El Niño Years - January

Select region
Select rainfall or temperature
Select ENSO phase
- Neutral
- El Niño
- La Niña
- Compare all ENSO phases

Select month
About

*Enlarge the map on mouse roll over.

Download map
AgroClimate tools: Climate Risk - Stations
AgroClimate tools: Climate Risk – Average rainfall – El Niño years

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
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<th>Oct</th>
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<th>Year</th>
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<tbody>
<tr>
<td>Average</td>
<td>5.2</td>
<td>4.8</td>
<td>4.7</td>
<td>3.1</td>
<td>3.5</td>
<td>5.9</td>
<td>5.2</td>
<td>5.4</td>
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<td>2.5</td>
<td>3.3</td>
<td>4.1</td>
<td>51.9</td>
</tr>
<tr>
<td>Deviation</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>-0.3</td>
<td>0.0</td>
<td>0.2</td>
<td>-1.1</td>
<td>-0.7</td>
<td>0.1</td>
<td>-0.2</td>
<td>0.8</td>
<td>0.6</td>
<td>0.8</td>
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Total Rainfall (Inches) - Clinch County (GA)

- El Niño years

[Graph showing total rainfall for each month and year with El Niño years highlighted]
AgroClimate tools: Climate Risk – Deviation from long-term average – El Niño years

Total Rainfall (inches) - Clinch County (GA)

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El Niño years
AgroClimate tools: Climate Risk – Probability of exceedance – Rainfall La Niña years

63%
Number of days with moderate or high Botrytis risk in Plant City, FL

Chill accumulation (hours per season), Marion County, FL.
Disease Pressure
Botrytis - Plant City, FL

## Number of years with low, average, and high disease pressure
(Fraisse et al., preliminary results)

<table>
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<th>Phase</th>
<th>Low</th>
<th>Avg</th>
<th>High</th>
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<tbody>
<tr>
<td>Neutral</td>
<td>29%</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>El Niño</td>
<td>8%</td>
<td>23%</td>
<td>69%</td>
</tr>
<tr>
<td>La Niña</td>
<td>61%</td>
<td>32%</td>
<td>7%</td>
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Pre-harvest

Potential adaptation strategies?

Post-harvest
Strawberry Industry

- 15% of the U.S. production but 100% of winter strawberry
- 8,000 acres (3,250 ha)
- $250 M industry
• One of our most popular tools is the Strawberry Advisory System (SAS).
• Monitors infection risk for Anthracnose and Botrytis fruit rot
• Users receive notification messages when the model detects a potential infection risk according to observed weather conditions.
Strawberry Advisory System (SAS)

Botrytis: No Spray!
Anthracnose: Spray Contact Fungicide (Products recommended: Captan)
WHEN WAS YOUR LAST FUNGICIDE APPLICATION?
- Last seven days
- More than seven days
- None

IS IT CURRENT PEAK OF BLOOM?
- Yes
- No

ARE ANTHRACNOSE SYMPTOMS PRESENT?
- Yes

JUL/10 Infection index: 0.65

DATE
- JUN/30
- JUL/03
- JUL/06
- JUL/09
FORECAST
- FORECAST

INFECTION INDEX
- 0
- 0.25
- 0.5
- 0.75
- 1
OK, Looks Great, But What About Data Poor Environments?

• How to apply these tools in a region with no station-based weather data or field trial results widely available?
Datas de Plantio

Tipo de Mapa
- Neutro
- El Niño
- La Niña
- Todos os anos

Data de Plantio

Seleção e ENOS

Ciclo da Cultura

Cultura

Sobre

Clique no mapa para obter zoom

Anos aptos - Neutro
Ciclo: 75d - Data de plantio: 01/Abril

Anos aptos - El Niño
Ciclo: 75d - Data de plantio: 01/Abril

Anos aptos - La Niña
Ciclo: 75d - Data de plantio: 01/Abril

Anos aptos - Histórico
Ciclo: 75d - Data de plantio: 01/Abril
AgroClimate.org as an Appropriate Technology for Mozambique

• The whole website was implemented using **WordPress**, an easy content management system.

• Whole website (except the tools) can be managed by a person with no computer programming knowledge.

• Whole website structure is in **Portuguese**.

• Works well in locations with **limited internet connection**.

• All **images** can be easily **downloaded**.
Thank you!

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Video: https://www.youtube.com/watch?v=r50mZZ9hcY8