The Use of Climate Information for Decision Making

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Thanks also to Walter Baethgen, Arthur Greene, Paula Gonzalez

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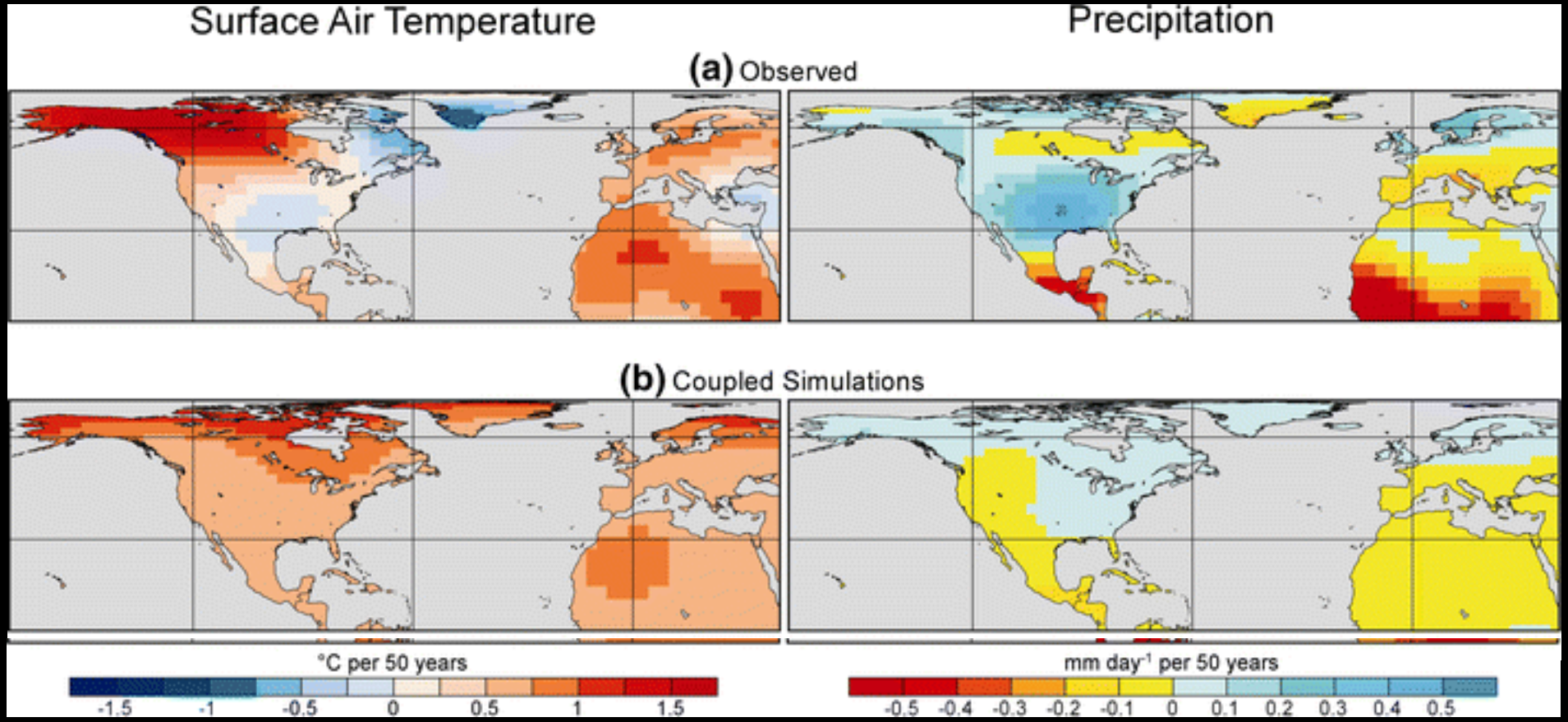
Simulation of 20th Century Climate Change?



(Shin and Sardeshmukh, Climate Dynamics, 2011)

IPCC PROJECTIONS SHOULD NOT BE USED BLINDLY,
ESPECIALLY AT LOCAL-to-REGIONAL SCALES

Climate Variability & Change in SE South America - DJF

TEMPERATURE

PRECIPITATION

~0%

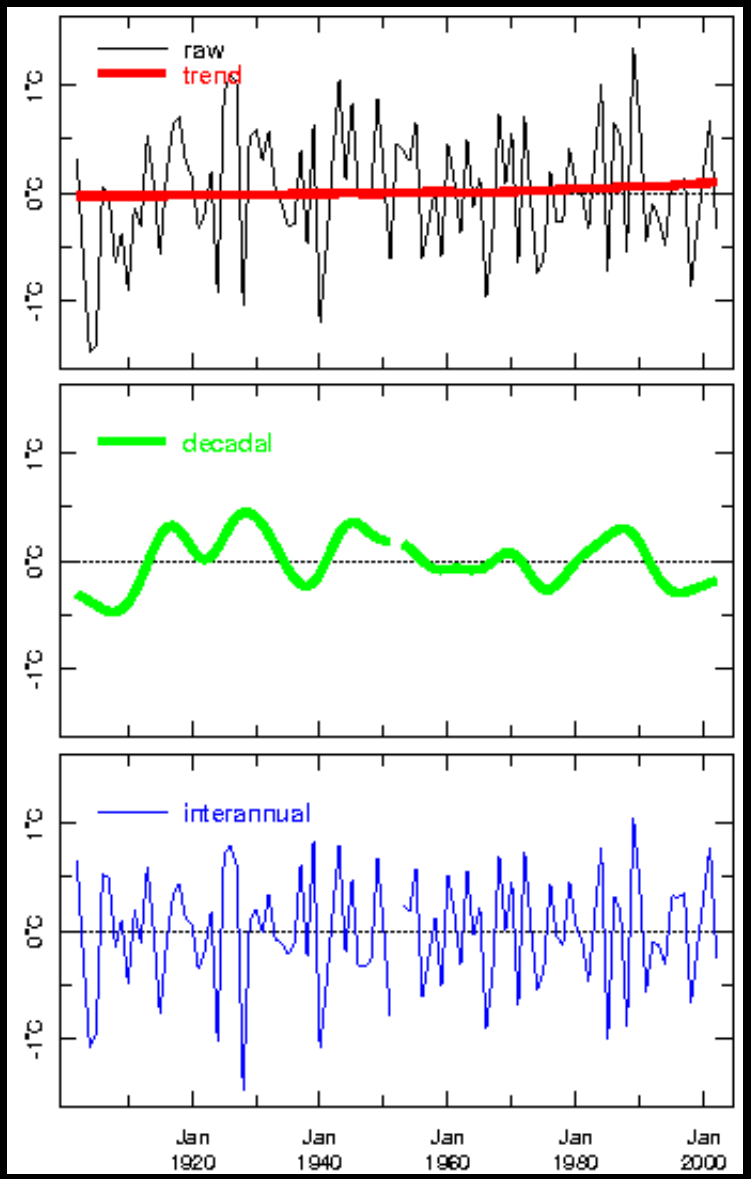
17%

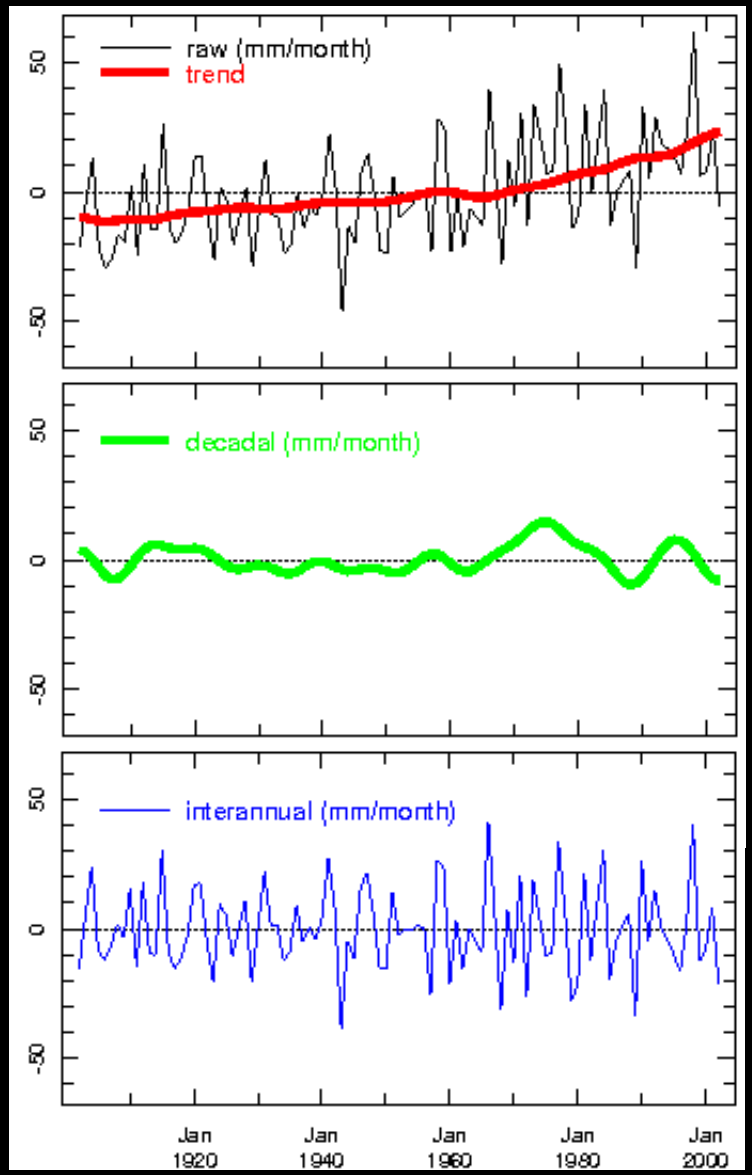
80%

21%

8%

69%





Necessary Elements of a Useful Climate Information System for Decisions

- ✓ Informed expectations of future climate change
- ✓ Awareness of the role of decadal variability in our experience of 'trends'
- ✓ Incorporation of reliable Seasonal Climate Forecasts

EXAMPLE: Expansion of agricultural frontier in Southeastern South America

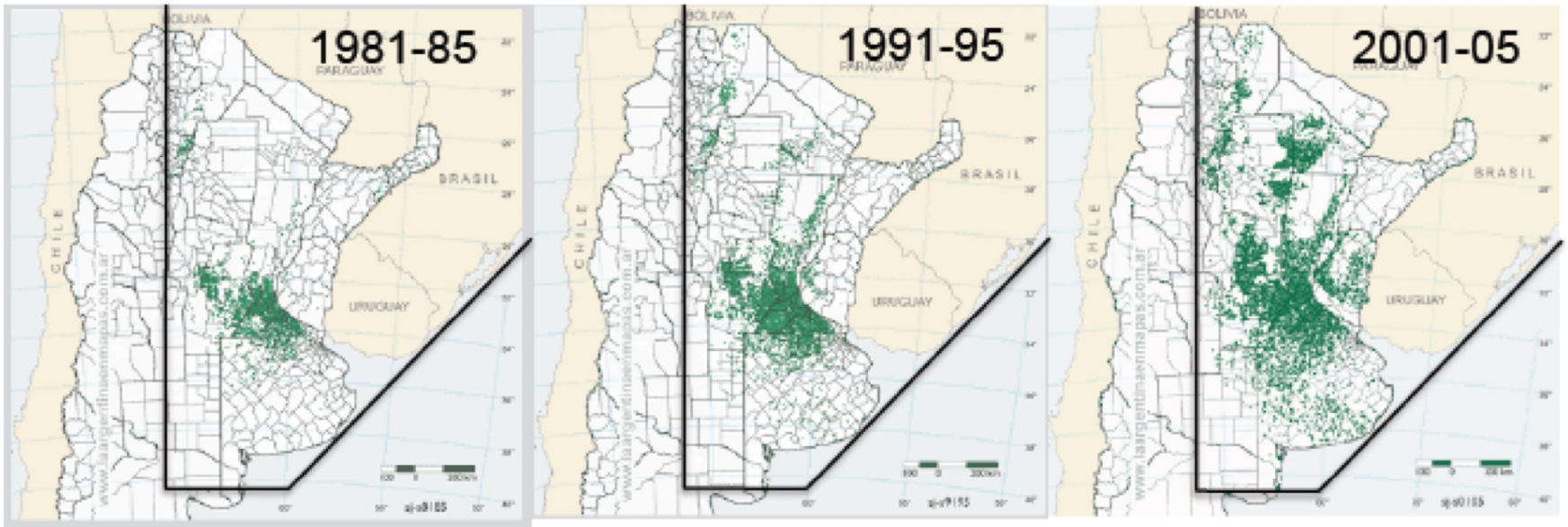
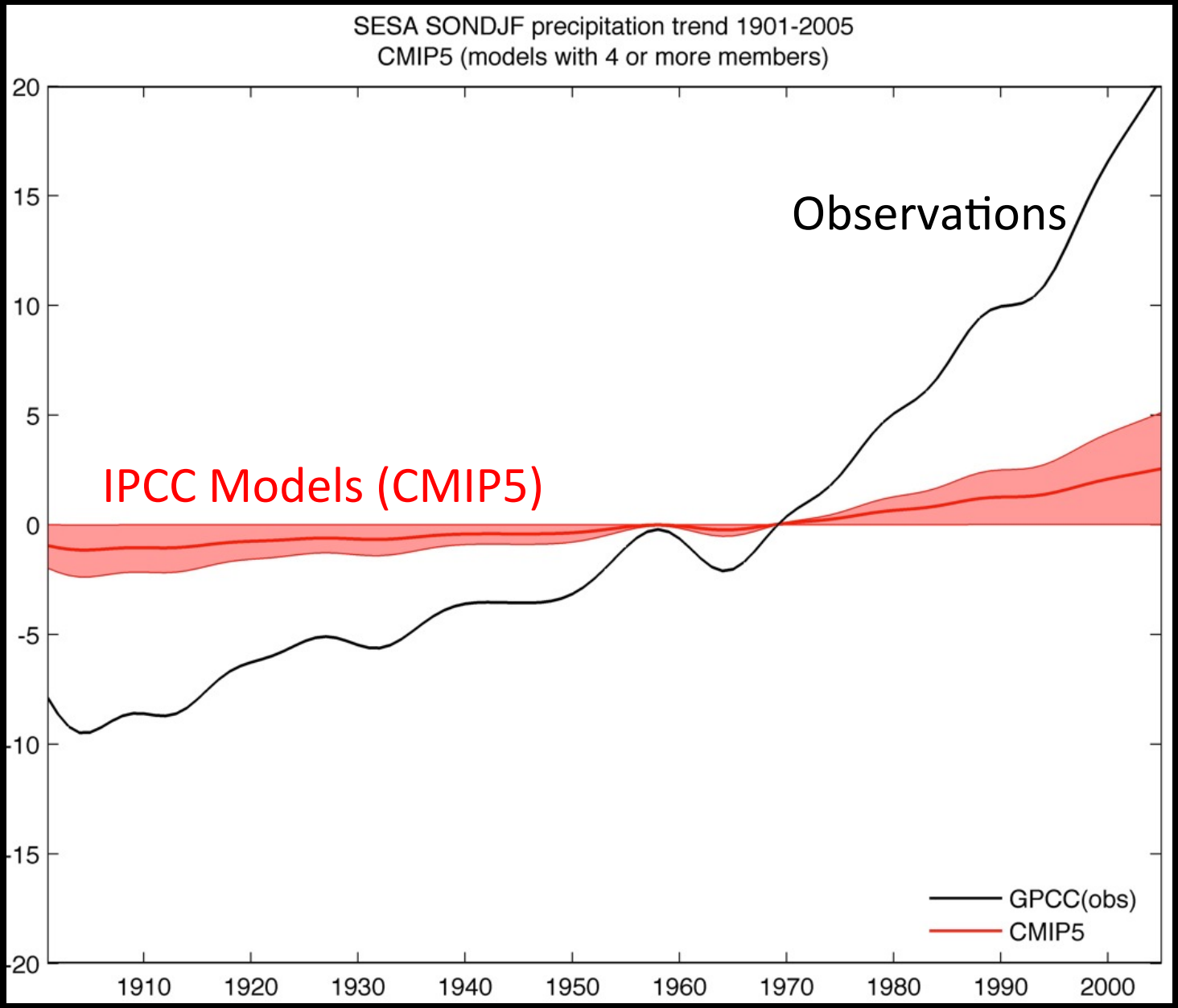


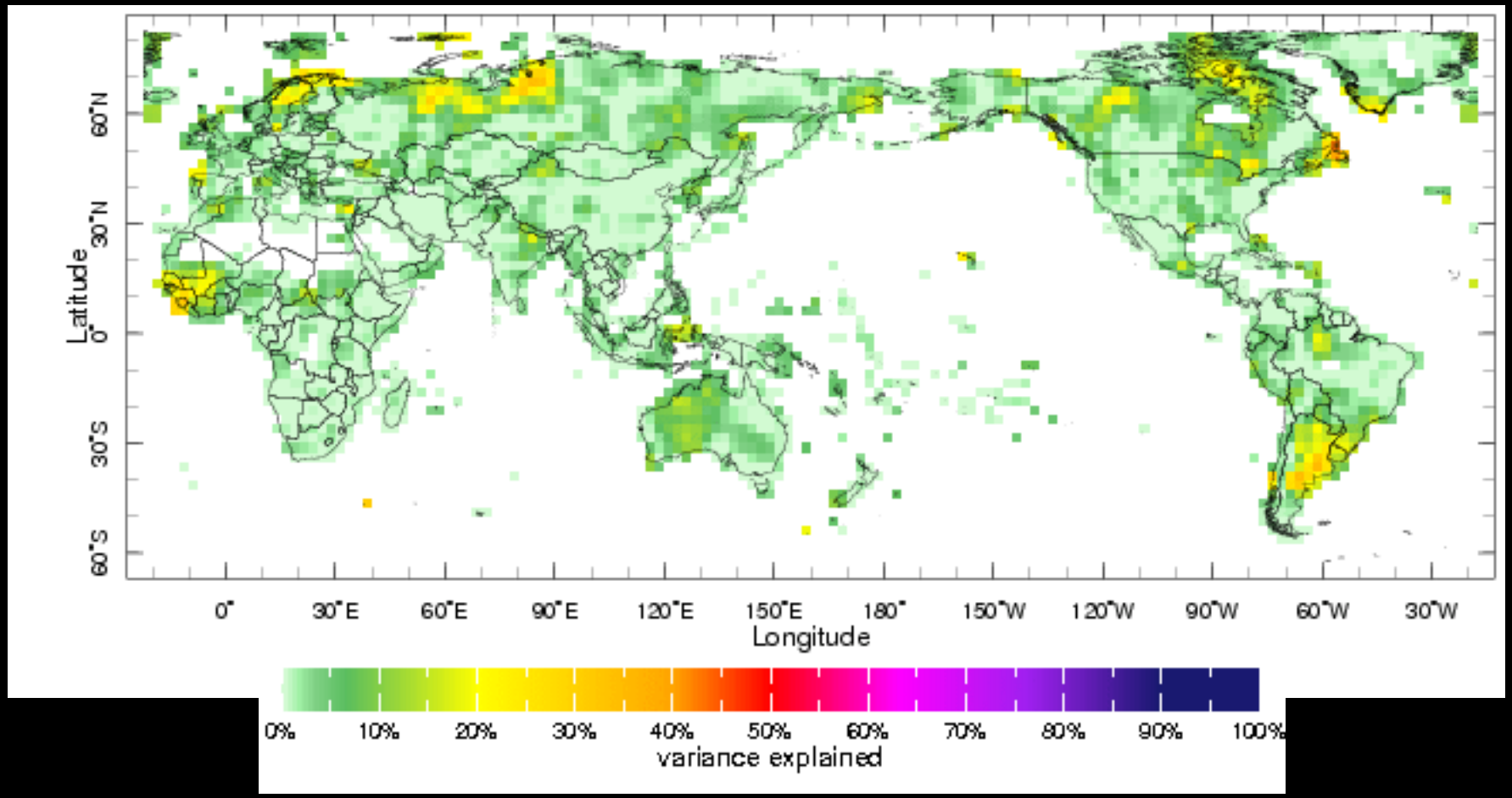
FIGURE 1. Changes in soybean cropping area over time for Argentina. One dot = 1000 ha. Lines delimit Southeastern South America region shown in Figure 2.

… largely coincident with increases in precipitation


SESA SONDJF precipitation trend 1901-2005
CMIP5 (models with 4 or more members)
Observations
IPCC Models (CMIP5)
GPCC(obs)
CMIP5
20
15
10
5
0
-5
-10
-15
-20
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

Precipitation Trends: % of total variance

20th Century Gridded Observations -- Annual Means



http://iridl.ldeo.columbia.edu/maproom/.Global/.Time_Scales/

Climate Variability & Change in SE South America - DJF

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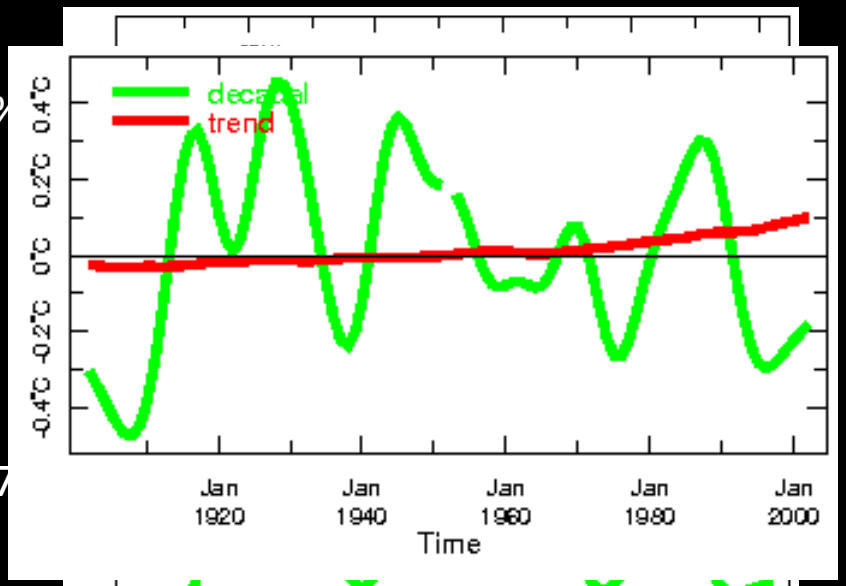
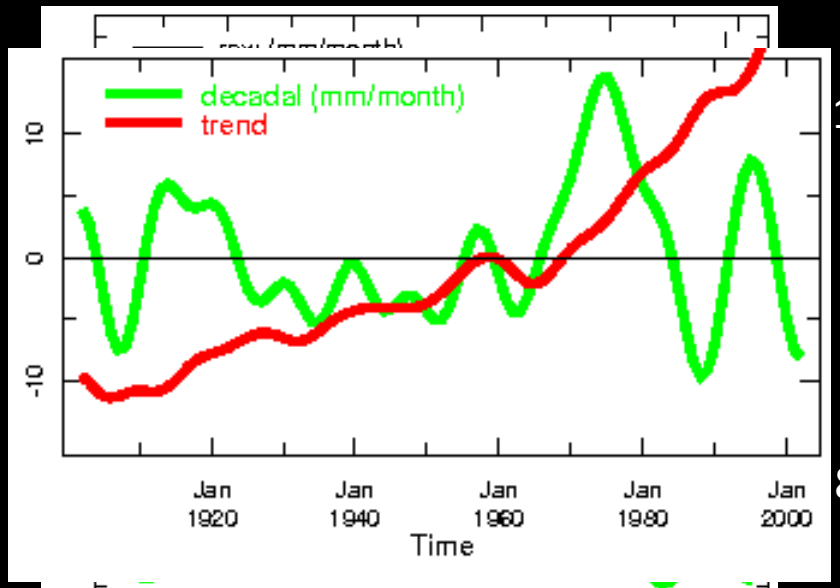
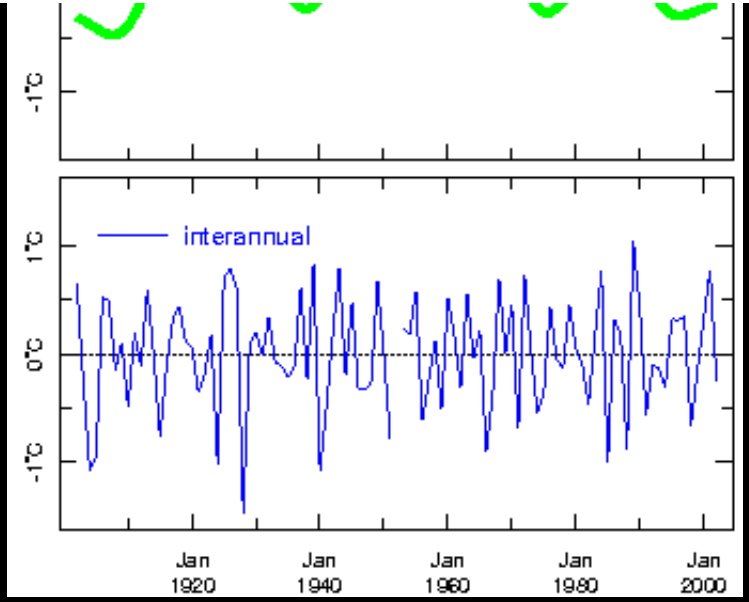
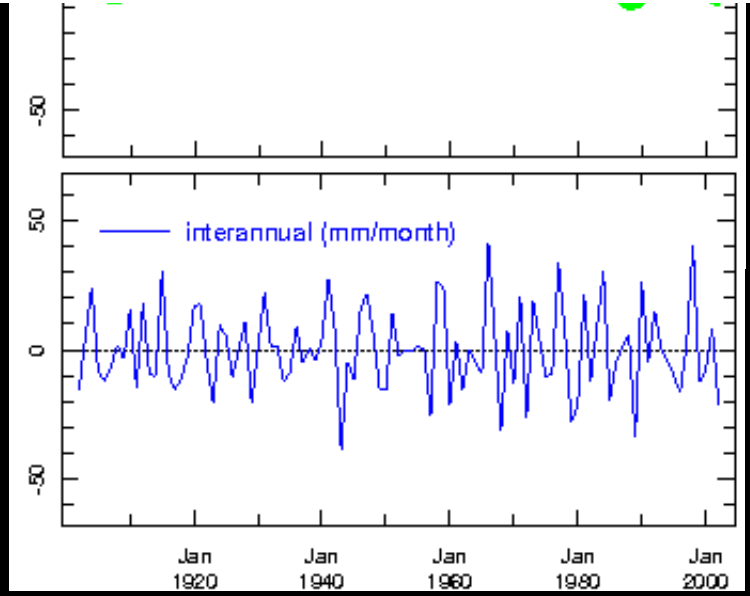
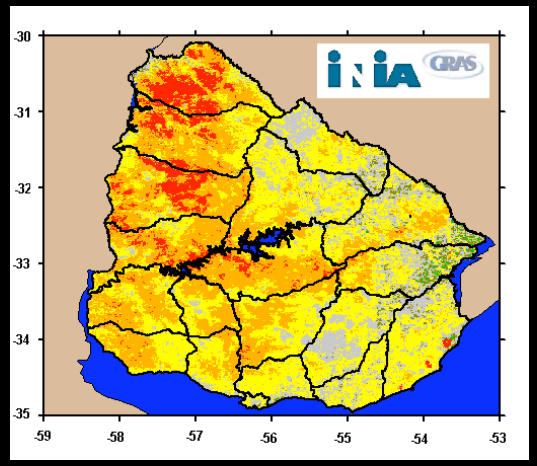




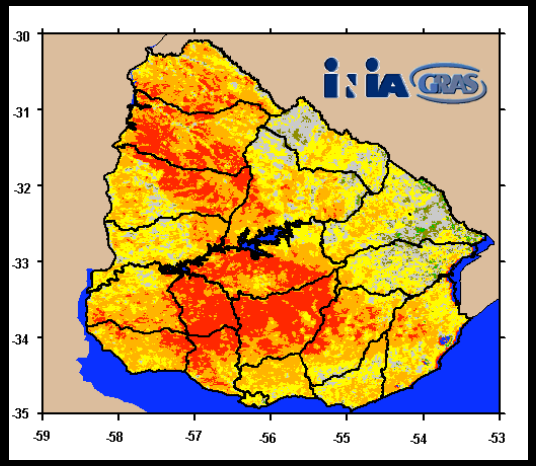




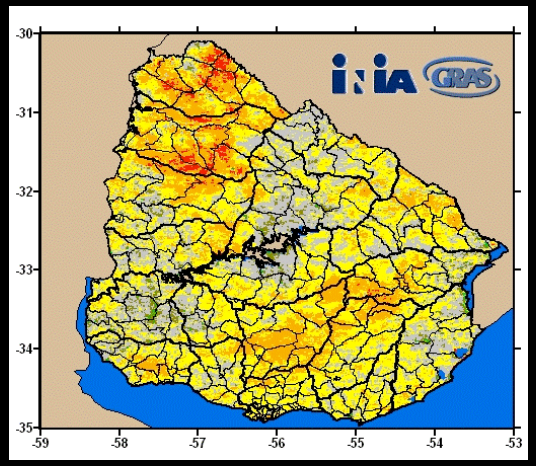
Severe Droughts in Uruguay



January 2000

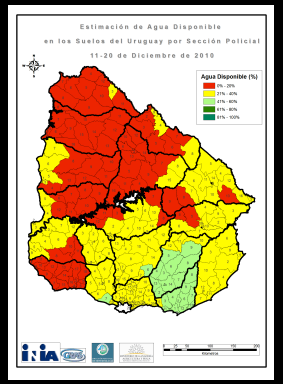


January 2009



January 2011

Drought 1999: Ministry and National Emergency System prioritized responses based on SCF and Monitoring



Drought 2008/09: Ministry declared Emergency in subregions based on NDVI and Soil Water Balance

Summer 2010: Minister asked parliament for emergency funds based on IRI's SCF

Ministry of Ag Estimation of the Cost of 2008/09 Drought:

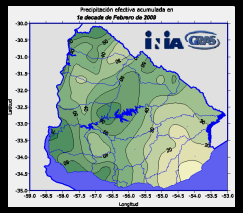
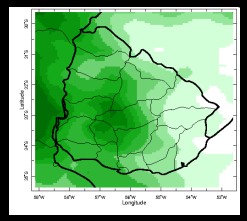
- *Direct cost in Livestock production sector: US$ 300 M*
- *Total cost on National Economy: over US$ 1,000 M*

“Learn from the Past”: Historical Analyses:

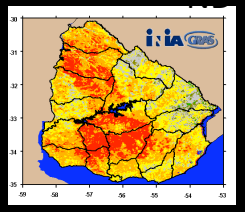
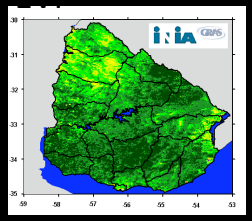
- Climate characterization: Interannual Variability, Decadal Variability, Trends
- Assess interventions with crop simulation models (e.g., combination of planting dates, crop type depending on IRI’s Seasonal Climate Forecasts/ ENSO phase)

“Present”: Environmental Monitoring:

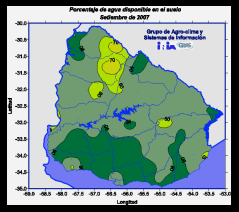
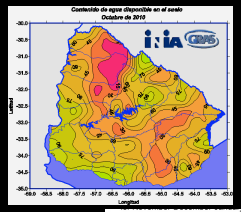
- Test CMORPH vs. Observed Rainfall

- Vegetation Indices with MODIS

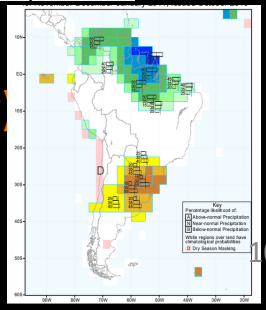



- Soil Water Balances based on Climate and Soil Types

Forecasting:

- IRI Seasonal Climate Forecasts, National SCF (Met Service + University)
- Training at Regional Level, connected to RCOFs



Climate Risk Management Approach and Tools

Information and DECISION SUPPORT SYSTEMS

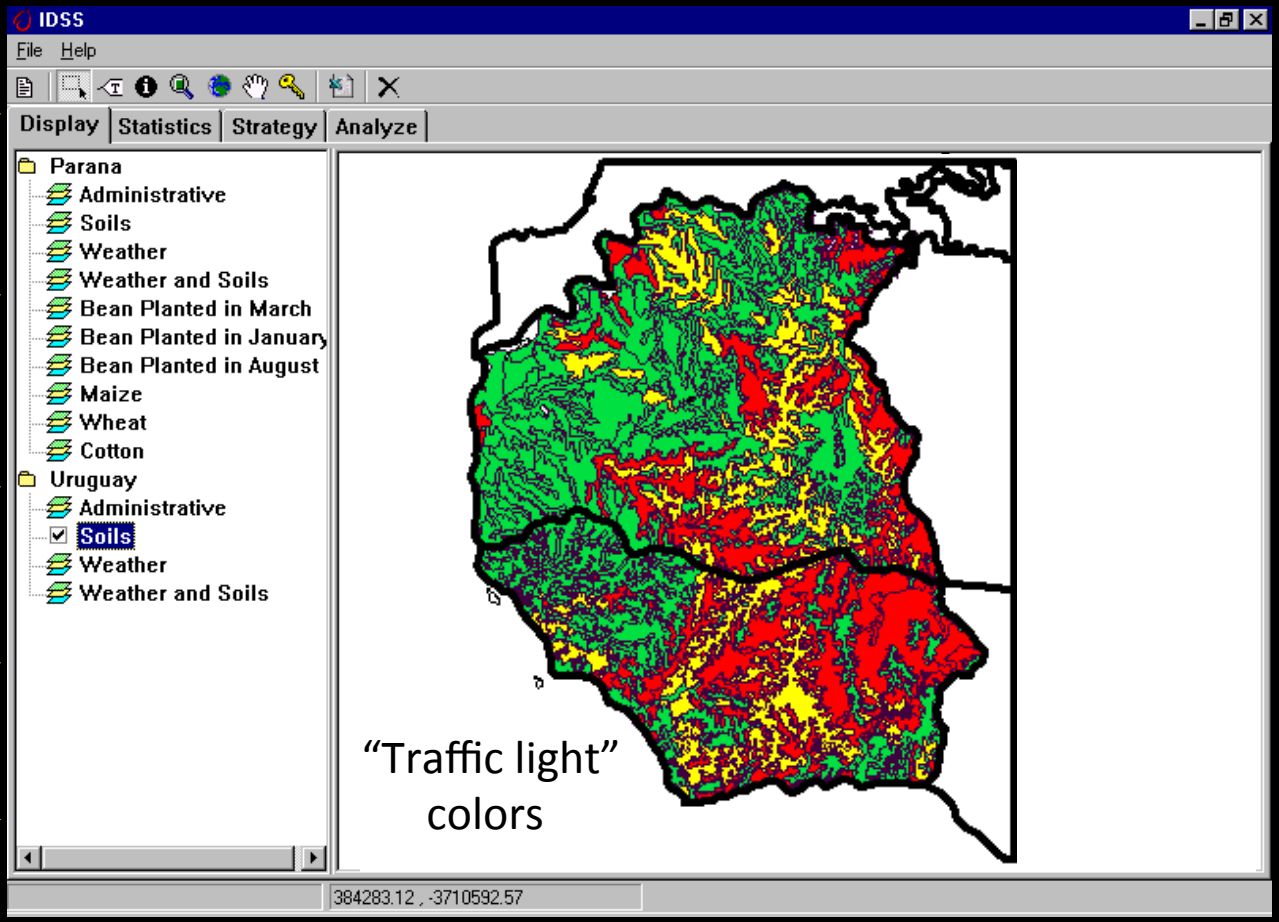
CLIMATE INFORMATION

REMOTE SENSING

EXISTING DATABASES

SIMULATION MODELS

GIS



Different Spatial Resolutions: Region → Country → Provinces, counties → Users

Different Temporal Resolutions: Seasons → Decades → Climate Change

Easily Understandable: Inform Decisions, Planning, Development

IDSS: Integrate Sciences to Inform Decisions

CLIMATE INFORMATION

REMOTE SENSING

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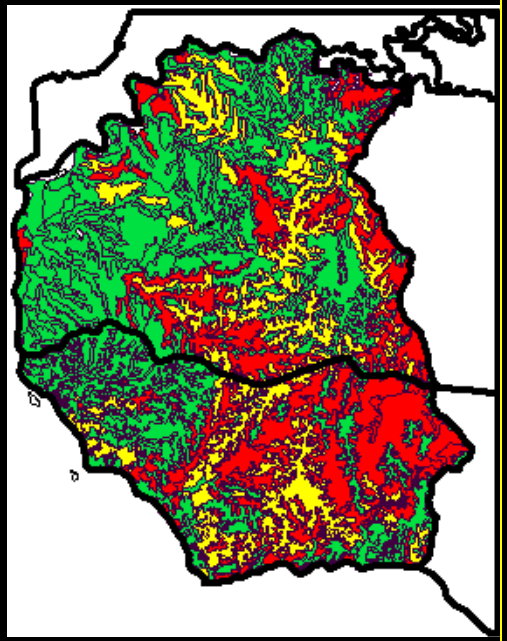


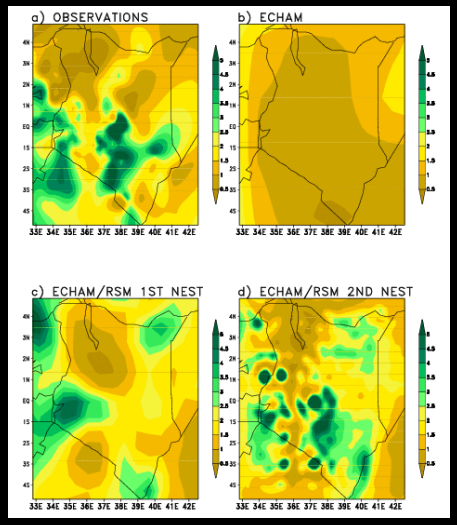
Examples "IDSS Approach"

- Early Warning Systems
- Reservoir Optimization
- Crop Forecasts / Food Avail.
- Crop Disease/Pest Outlooks
- Climate Index Insurance
- Energy Generation (Biomass)
- Early Response to Emergencies

State of the Art Science → Understandable Products (Decisions, Policies)

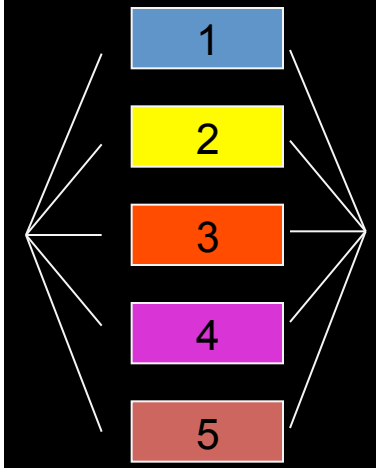
Analyze possible impacts and responses:
(Information and Decision Support Systems -IDSS)

Climate Information, Scenarios



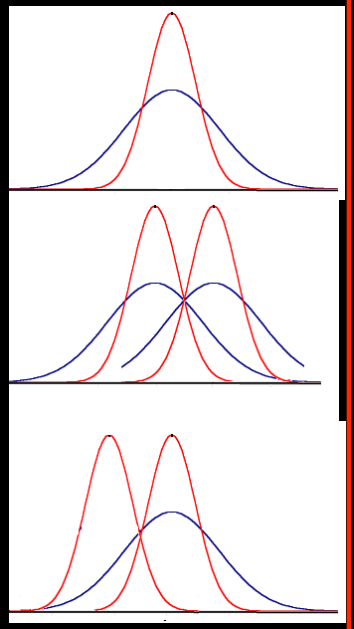
Interventions

- *Technologies*
- *Management*
- *Policies*



Simulation Model
(Crop, Livestock, Energy)

Possible Outcomes
(Probabilistic)



Analyze a wide range of alternatives and Possible impacts under different climate scenarios:

Inform Planning and Decision Making Including UNCERTAINTIES!

Take Away Points

1 – Climate related decisions must consider more than just climate

2 – Models contain useful information, but are not yet ready to be applied “off the shelf”

3 – In the absence of ‘accurate’ predictions, knowing the range of possibilities can support robust decision making

4 - Incorporation of reliable Seasonal Climate Forecasts is key to management of climate-related risk