

Building capacity to provide useful climate information: Lessons and insights from agricultural decision-making in Argentina

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Main Points - 1

- An effective climate information system (or climate service) will *not* develop spontaneously
- A climate information system has to be informed and supported by an appropriate research program *throughout* its initial phase
- Research supporting climate information systems must evolve:

Exploratory → Pilot → (Semi)operational

Main Points - 2

- Climate information *must* include a triad of components
 - Historical data and statistics
 - Recent climate conditions
 - Forecasts of regional climate scenarios
- False antinomy between research in the natural and social sciences

Funding Sources



- Environment and Sustainable Development
- Human Dimensions of Global Change
- Regional Integrated Science & Assessments



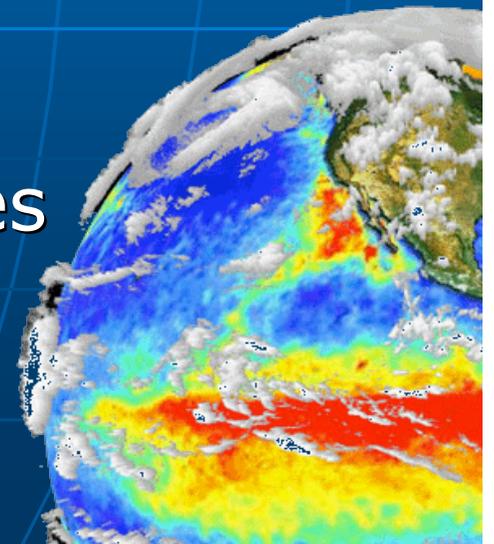
- Methods & Models for Integrated Assessment
- Biocomplexity in the Environment: Dynamics of Coupled Natural & Human Systems



- Initial Science Program – Phase 2

Motivation - 1

- Enhanced technological capabilities
 - Routine global climate observations
 - Faster computing capabilities
 - Better communications, access to data
- Better understanding of climate system
- Higher awareness of climate influence on some human activities
- **RESULT:** Increased demand for climate information



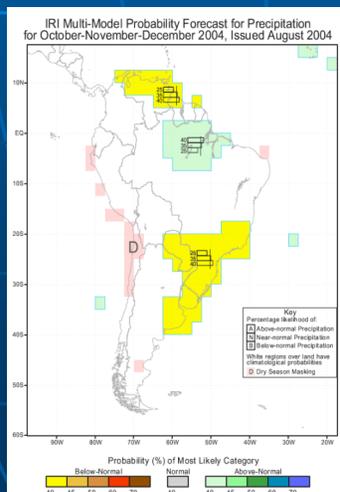
Motivation - 2

What we expected ...

**Climate
Information**



**Societal
Use**



What we got ...

What is a tercile??

It's too coarse!

Economic conditions
Technology

Climate
Information



Societal
Use

Context

How do I use this?

People

How good is this??

What can I change?

Motivation - 3

- A climate information system has to be supported by an appropriate research program *throughout* its initial phase (i.e., beyond initial design)

Supporting Research

- Projects supporting climate services should evolve through various stages



[Hansen, 2002]

Why Argentina? - 1

- Pampas are among the most important agricultural regions in the world
- Agriculture accounts for more than half of exports
- Argentina-Brazil-Paraguay have increasing weight on soybeans market
- Production systems similar to those in US



Why Argentina? - 2

- Marked climate signals
 - Interannual variability (ENSO-related)
 - Decadal variability



Buenos Aires harbor flooded by aquatic plants from Parana Basin

2002 flood in City of Santa Fe

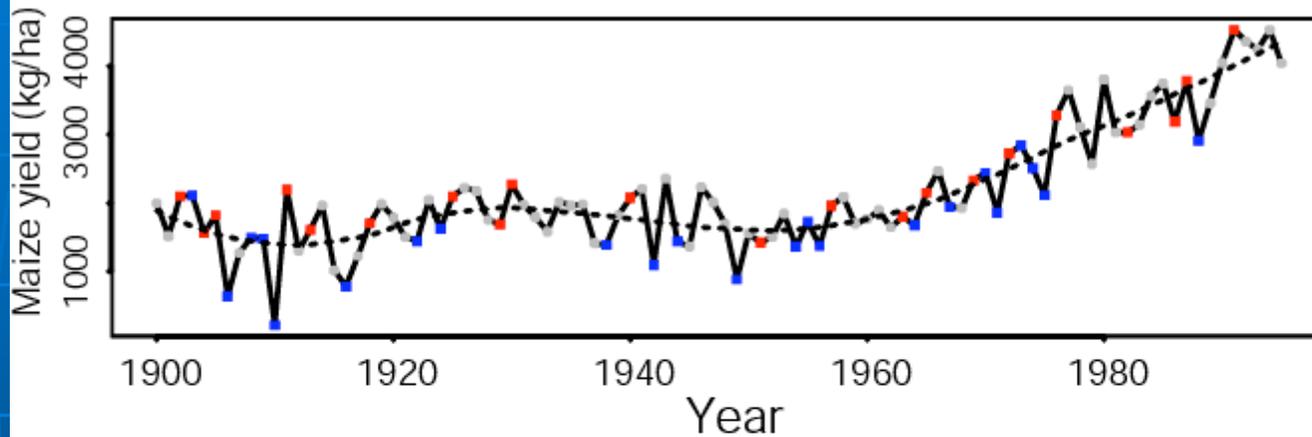
Research Stages - Exploratory



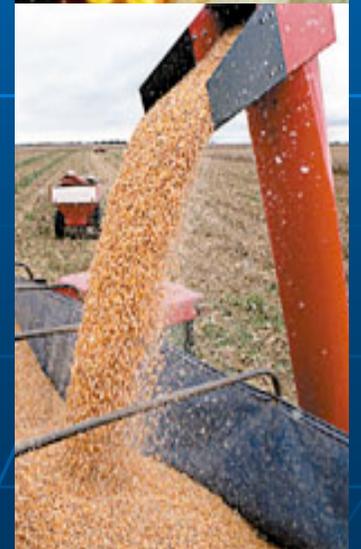
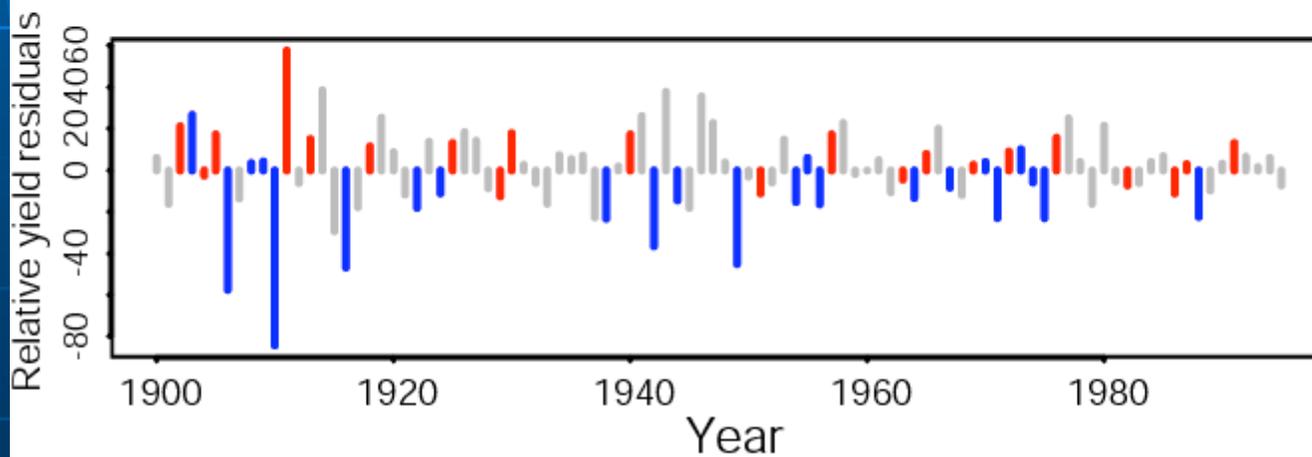
- Associations between climate and agriculture?
 - Statistical analyses of historical data
 - Simple modeling
 - Issue scoping: surveys, focus groups
- Partners: academic institutions or governmental research agencies

Historical Maize Yields & ENSO

Maize Yield & Technology Trend



Maize Relative Yield Residuals from Trend



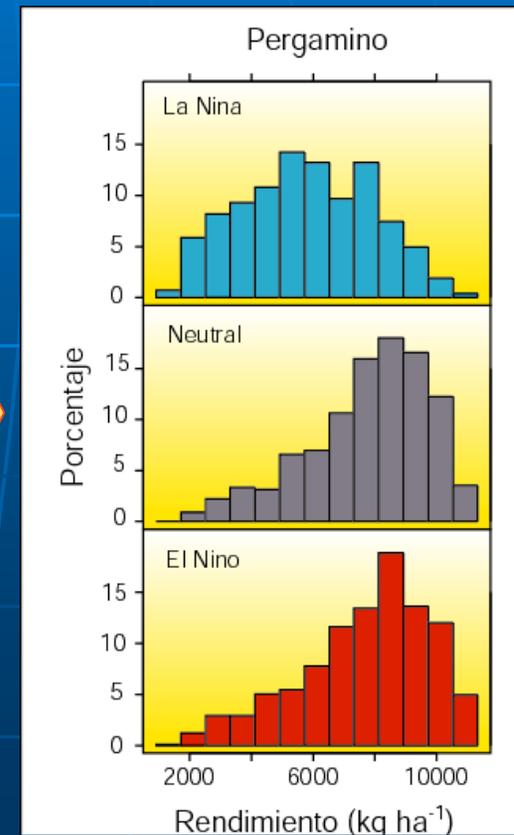
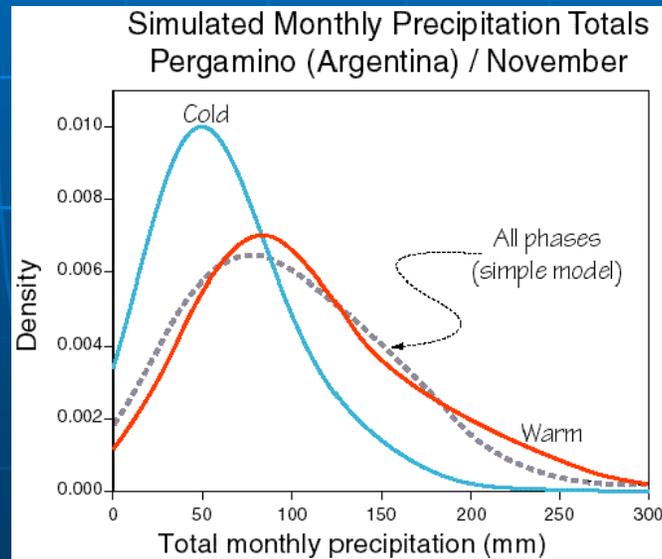
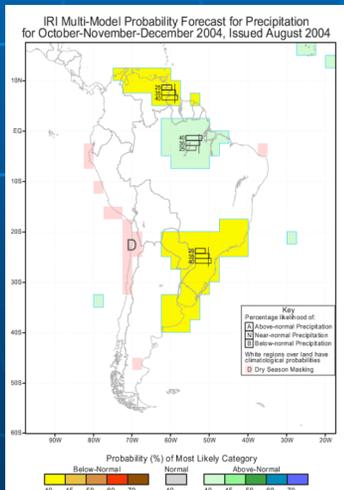
Modeled Maize Yields

ENSO
Forecast

Forecast
Translation

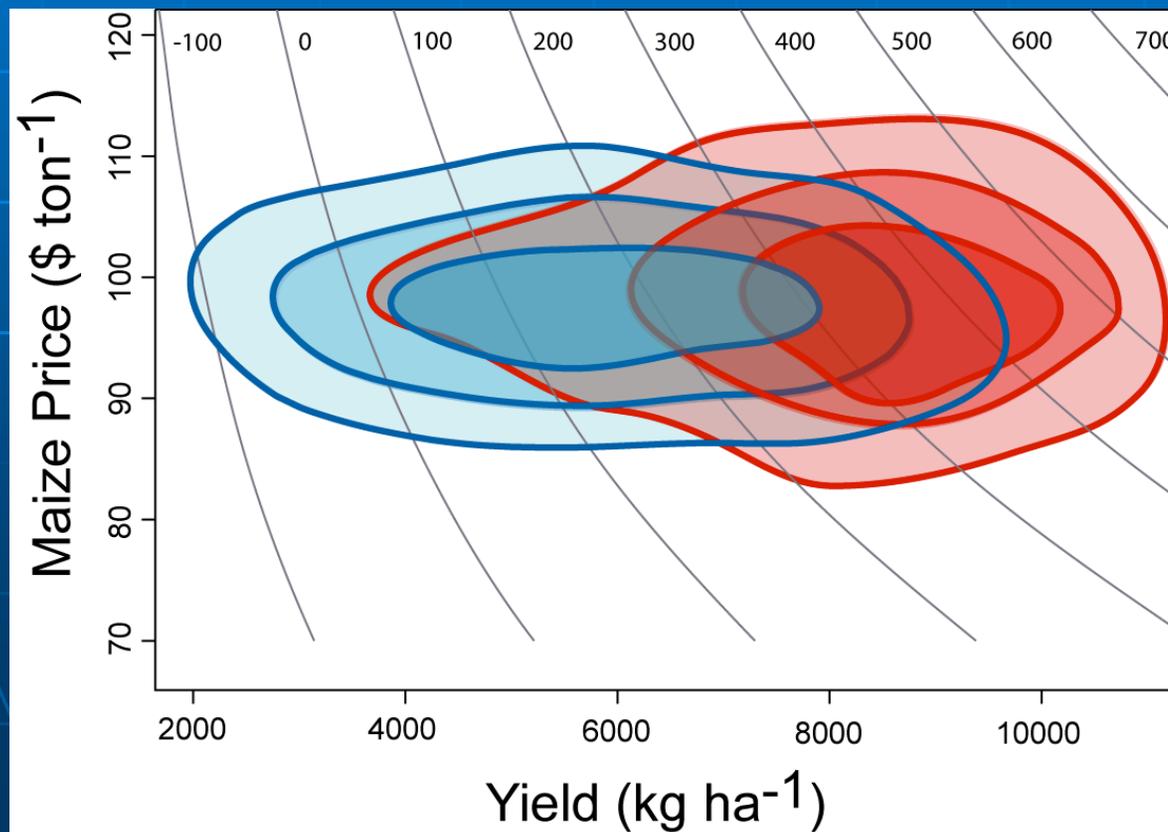
Process
Models

Distribution
of Outcomes



ENSO Risk Assessment

- What is the range of outcomes of an ENSO event on maize production, given *current* management?



Exploratory Surveys and Focus Groups

- Great interest in climate information
- Ignorance about local climatology and “normal” variability
- Ignorance about capabilities / limitations of forecasts
- 1997/98 El Niño was major turning point in awareness of climate
- Importance of context

Research Stages - Pilot



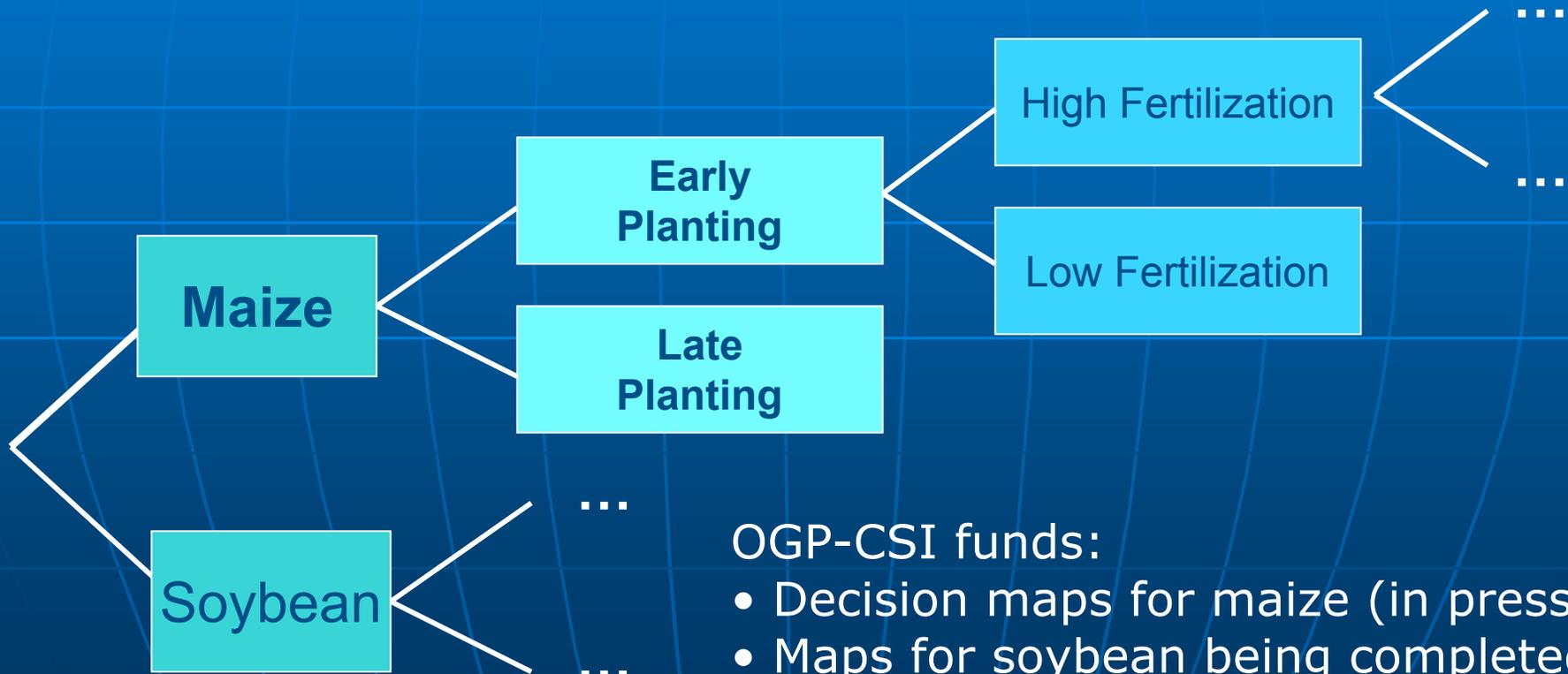
- More sophisticated, realistic modeling
- Risk management studies
 - How can we react to climate info?
- Economic, social dimensions
 - Understanding decision-making process
 - Value of climate information

Managing Climate Risks - 1

Land
Allocation

Planting Date

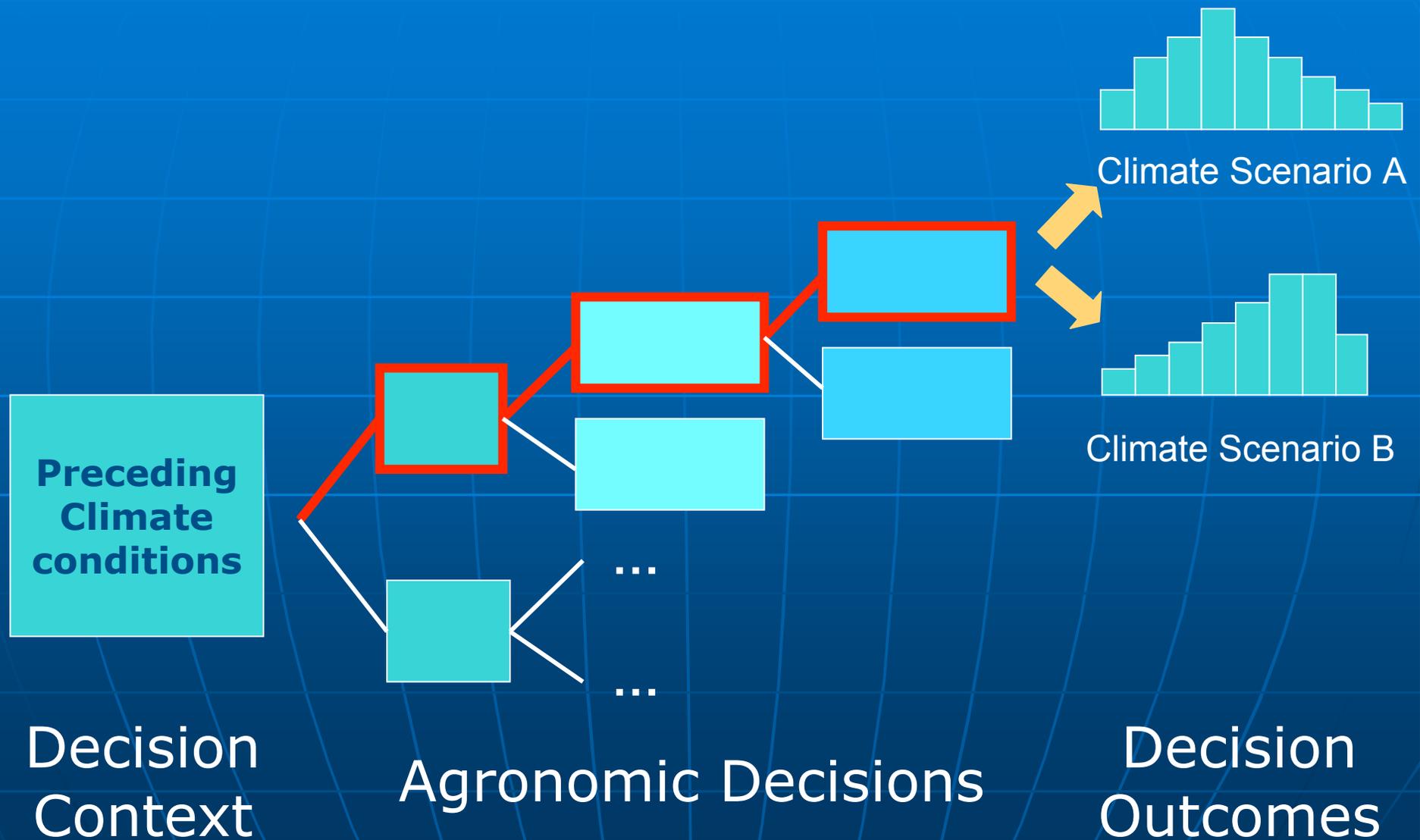
Fertilization
Rate



OGP-CSI funds:

- Decision maps for maize (in press)
- Maps for soybean being completed

Managing Climate Risks - 2



Mapping Realistic Decisions

Owned Land



Land Allocation Decisions

Almost 50%
of
agriculture
in the
Pampas is
done on
rented
land!!!

Rented Land



Mapping Realistic Decisions - 2

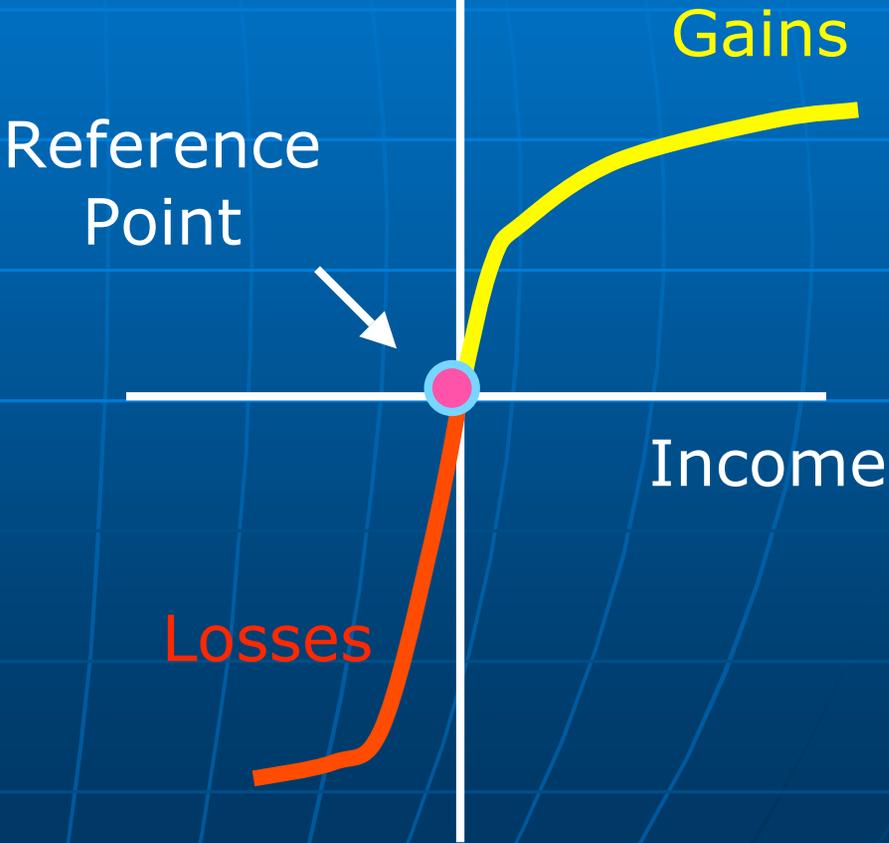
- OGP Human Dimensions funding (Weber): Exploration of alternative objective functions
- What farmers are really trying to achieve...
- Standard economic models often consider *only* maximization of utility
- Wrong assumed objective may imply wrong advice...

Mapping Realistic Decisions - 3

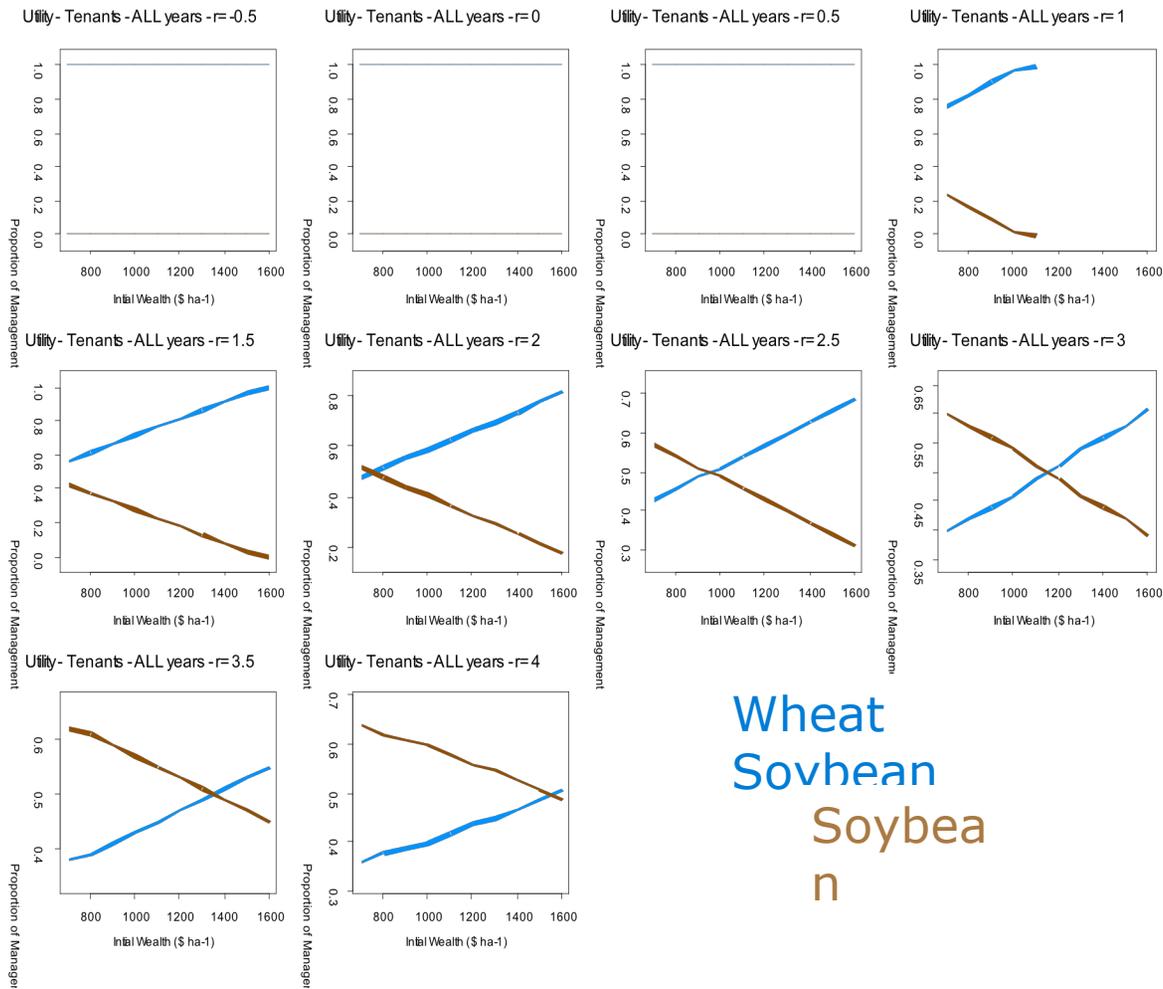
Utility Theory



Prospect Theory



Mapping Realistic Decisions - 4

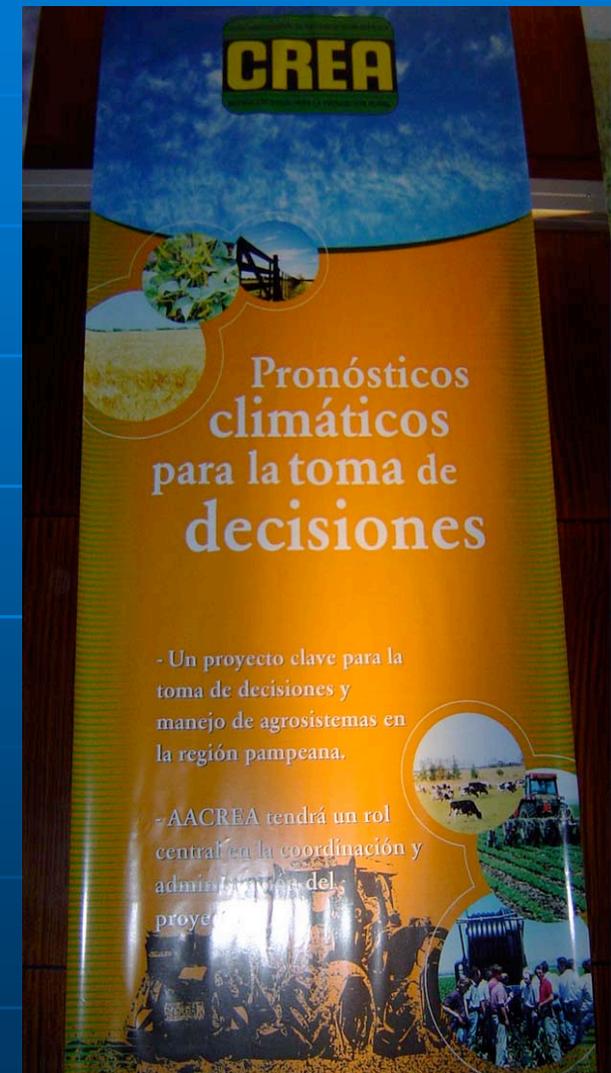


Mapping Realistic Decisions - 5

- Increasingly important role for stakeholders (e.g., farmers and their technical advisors)
- Partnerships are first step towards operational status
- Difficult to get stakeholders' "buy-in"
 - Continuity in interactions (and funding!)
 - Commitment to produce usable info/knowledge

Strategic Partnerships

- AACREA: non-profit farmers' organization
- Groups of 8-12 farmers
- About 150 groups in Argentina
- "Early adopters"
- "De facto" extension functions
- Large multiplicative effect



Research Stages – Operational (?)



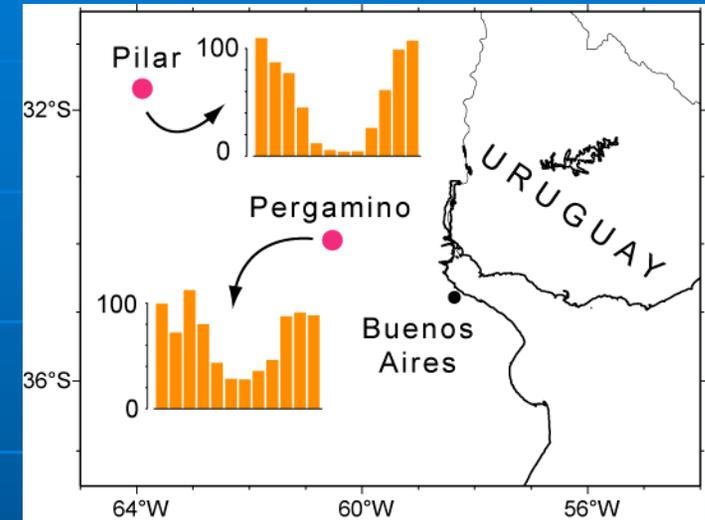
- Research topics: broad spectrum, but highly specific issues
- Strategic partnerships crucial: with BOTH operational agencies AND stakeholder groups

Communicating Climate Info

- New information is interpreted in the context of existing knowledge and beliefs
- Before communicating new information, find out what people know...
 - What they *already* know
 - What they *do not* know
 - What they *think* they know, but is incorrect

“Mental Models” of Climate

- Support from OGP-ESD program
- Open-ended, free-flowing interview (CMU methodology)
- About 60 farmers
 - Climatically optimal region (Pergamino), long ag history
 - Climatically marginal region (Pilar), recent ag history



“Mental Models” Results

- Local climate is different from that of nearby (50 km) areas
- Good yields in better soils are confused with better climate conditions
- “Reverse” association between climate experienced and ENSO phase
 - “If it is a dry year, a Niña must be occurring...”
- Opposite ENSO phases occurring simultaneously in different regions
- Personal delivery of climate information induces higher trust

Institutional Issues

- Support from OGP-ESD program
- Role of “boundary organizations” in production/dissemination of climate info
 - Communication between producers/users
 - Translation of info (relevance)
 - Mediation (transparency, legitimacy, credibility)

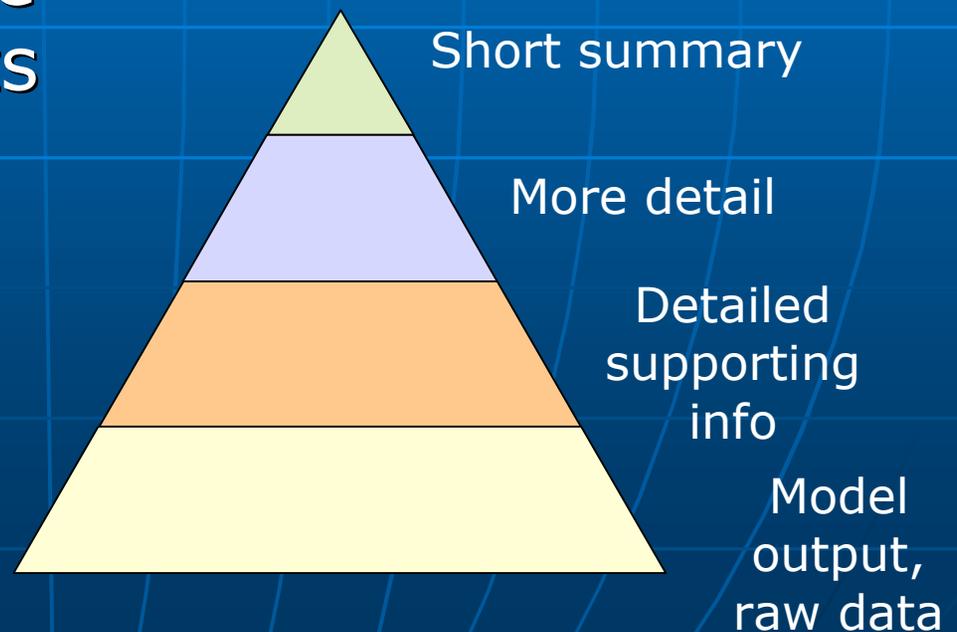
[Cash et al PNAS 2003]

Institutional Issues - 2

- Argentine Meteorological Service
 - Focused on weather prediction
 - Lack of links with users (no feedback!)
 - Unprepared/unfunded to provide climate services
 - Compartmentalized structure
 - Multiple bulletins, data products

What we are proposing...

- Strategic partnerships with sectoral boundary organizations
- Consolidated climate information products
 - Climatological info
 - Recent conditions
 - Seasonal forecasts
- “Pyramidal” organization of info



Climate Information Components

Historical data
and statistics

Recent
climate conditions

Seasonal
climate forecasts

Also: "plausible" decadal scenarios, longer scales?

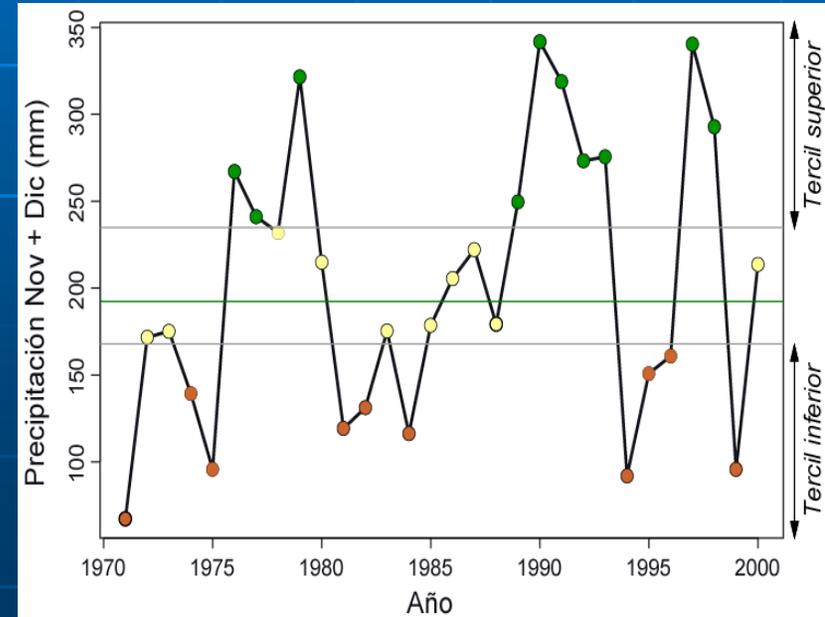
Why historical information?

- Lack of knowledge about local climatology

- What is “normal”?
- Recent arrivals to agriculture
- Greater memory of recent events

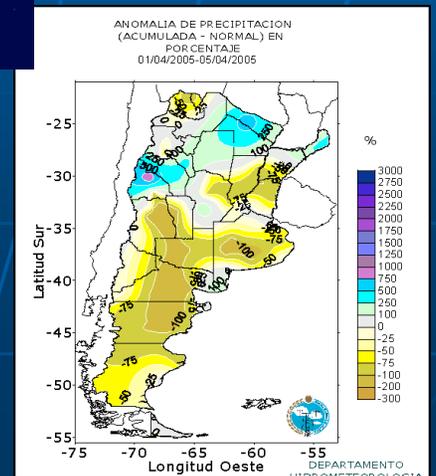
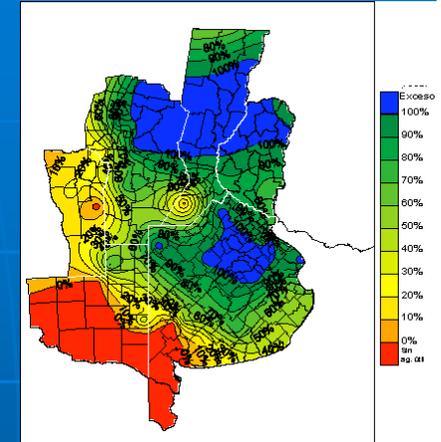
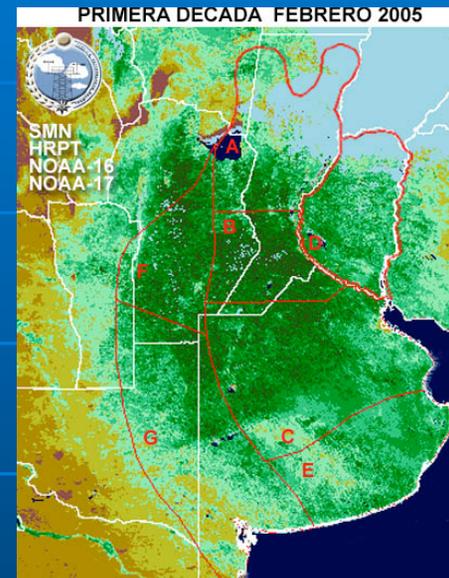
- How to interpret seasonal forecasts

- Boundaries between terciles?



Why diagnostic information?

- Provides context for decision-making
 - Refine previously-made decisions
 - Helps interpret forecasts
- Relevant span is sector-dependent



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