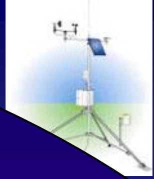

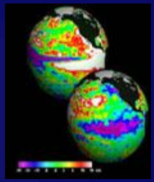

The Value of Climate Information when Farm Programs Matter

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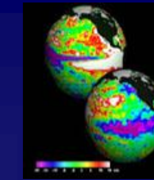
Southeast Climate Consortium

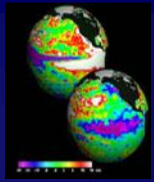
RSMAS, University of Miami

Introduction



- There is a need to estimate value of forecasts
- Agriculture can benefit from forecasts
- Farm decisions include government policies and regulations
- Few studies addressed impacts of Farm Programs to forecasts value (Mjelde et al., 1996; Bosch, 1984)
- Knowledge gap between synergies and conflicts between Farm Programs and forecasts value

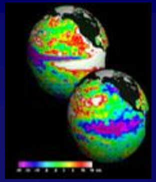
Objective/Hypothesis



- Estimate impacts of Farm Programs on the value of ENSO forecasts in a maize-cotton-peanut rainfed farm located in Jackson Co., FL

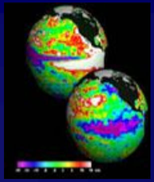
- Government interventions might enhance or limit the usefulness of the climate information

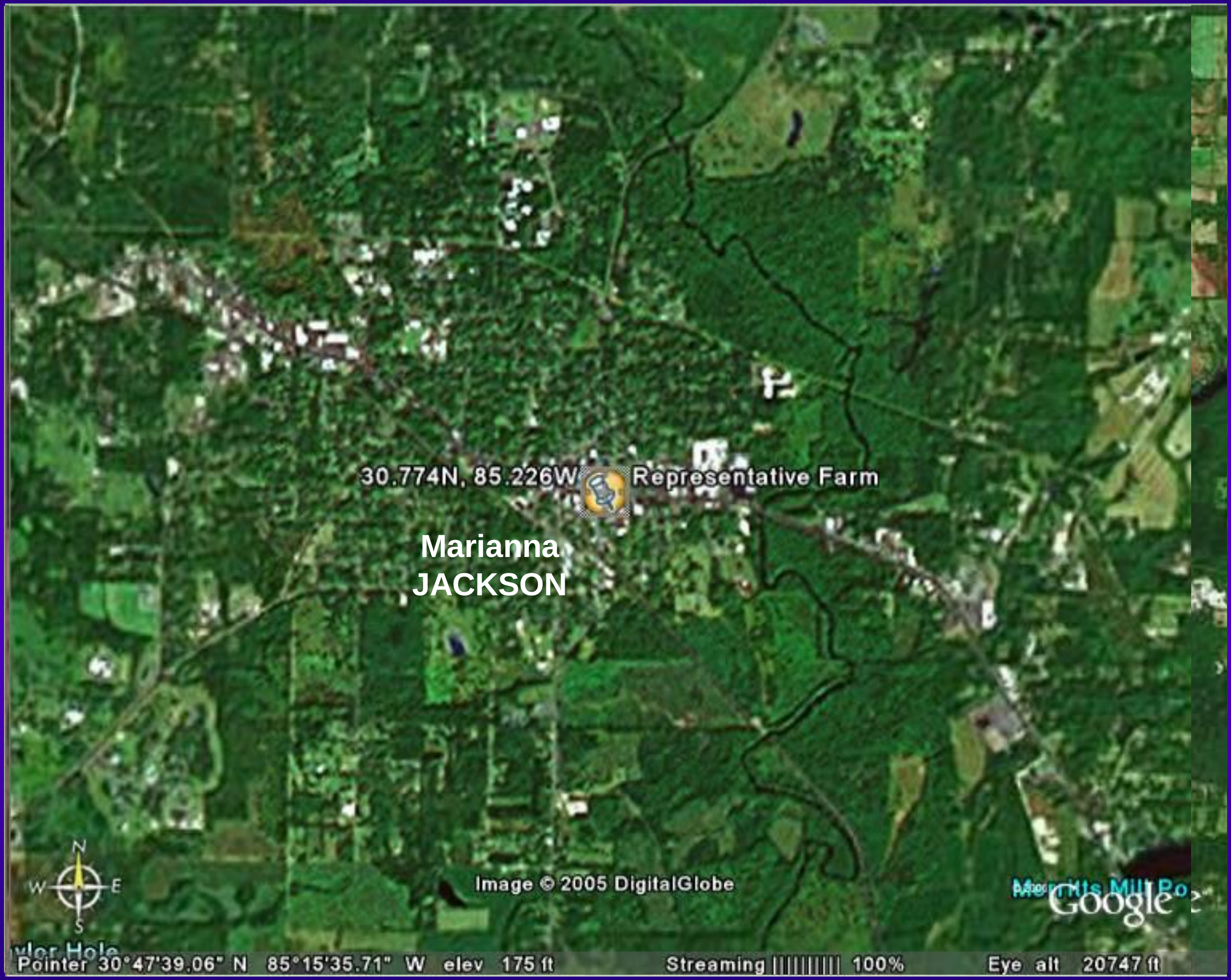
M&M Representative Farm



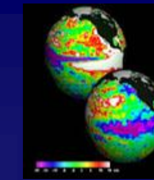
- **128.7 ha farm with soils type *Dothan Loamy Sand***
- **Rainfall = 1466 (1143) mm**
- **T = 19.3 (21.7) °C**
- **ENSO intra-phase variability impacts crop yields with considerable overlap**
- **E.g., higher peanut yields early La Niña or late El Niño plantings**

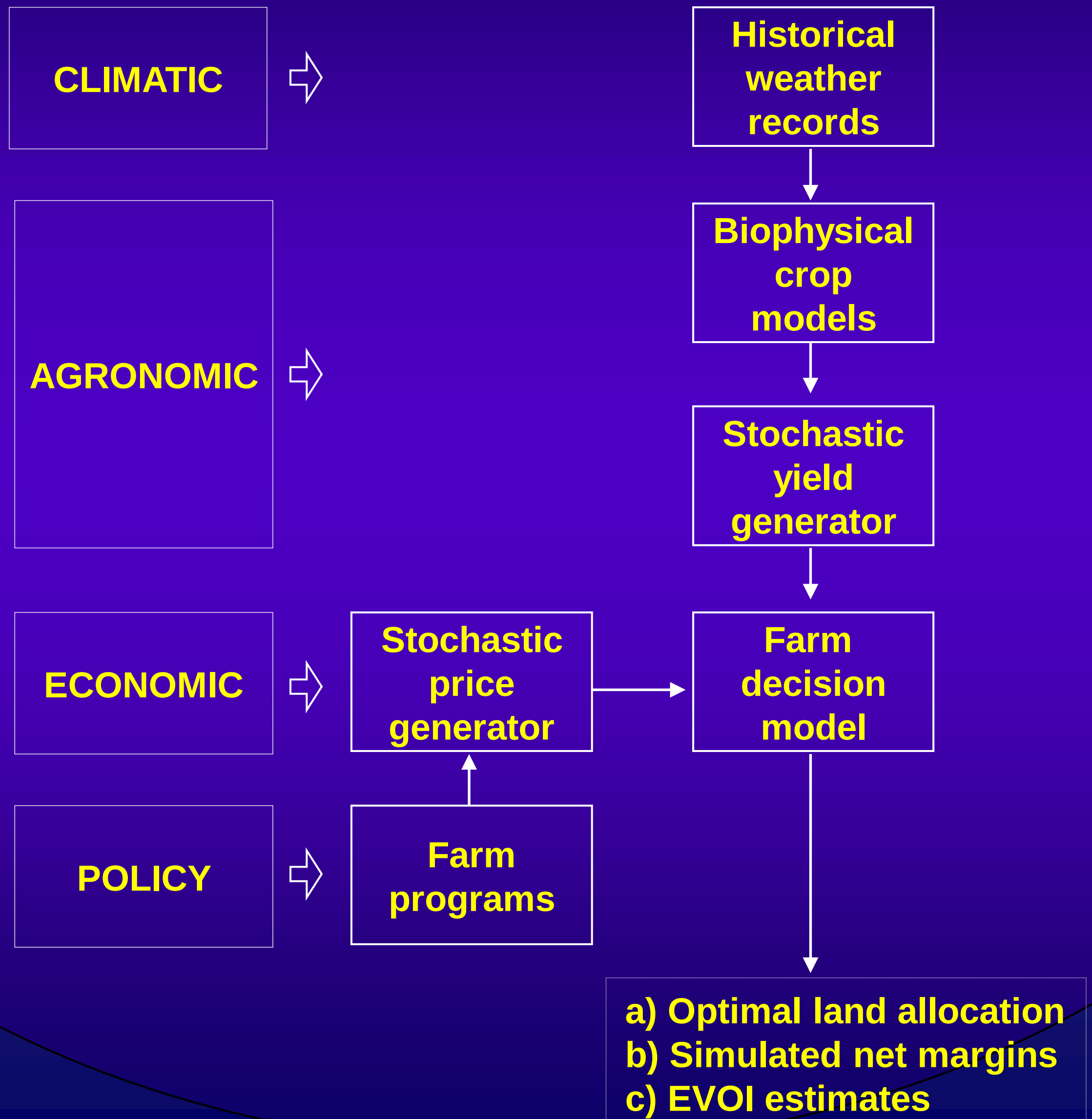
M&M Representative Farm



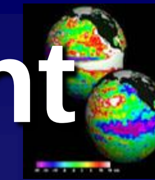


M&M The Jackson Model



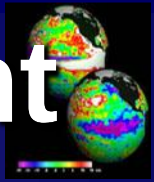


M&M Agronomic Component
Crop Yield Simulation



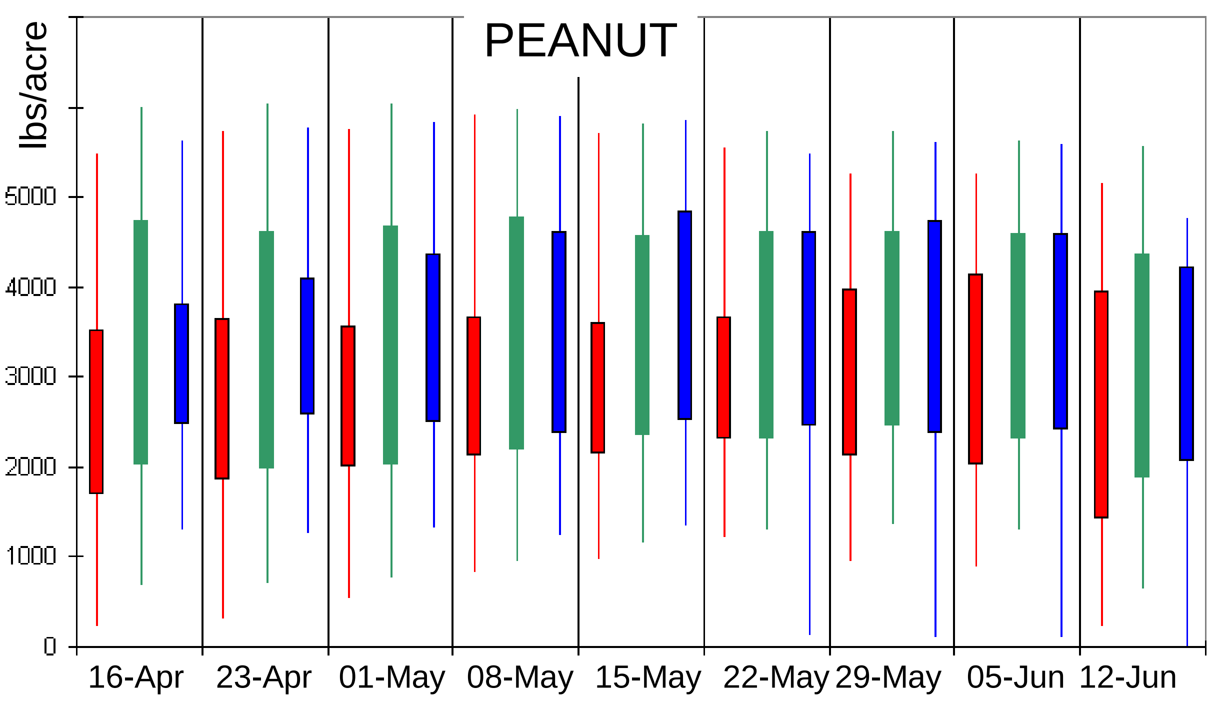
- Chipley weather station (30.783N, 85.483W)- 65 yr records (1939-2003)
- 14 El Niño, 16 La Niña phases
- DSSAT crop simulations (Jones et al., 2003)
- Contemporary and local practices of varieties, fertilization, and planting dates (H.E. Jowers, pers. comm.)

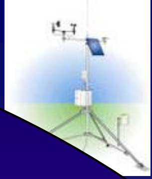
M&M Agronomic Component Synthetic Yield Generation

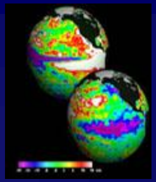


- Needed more ENSO realizations
- Stochastic yield generator (990 yr x ENSO phase)
- Re-sampling technique:
    - Sort simulated yields
    - Function to fit a curve
    - Re-sampling function
    - Repeated for each planting date, each crop, in each ENSO phase

Synthetic Yields



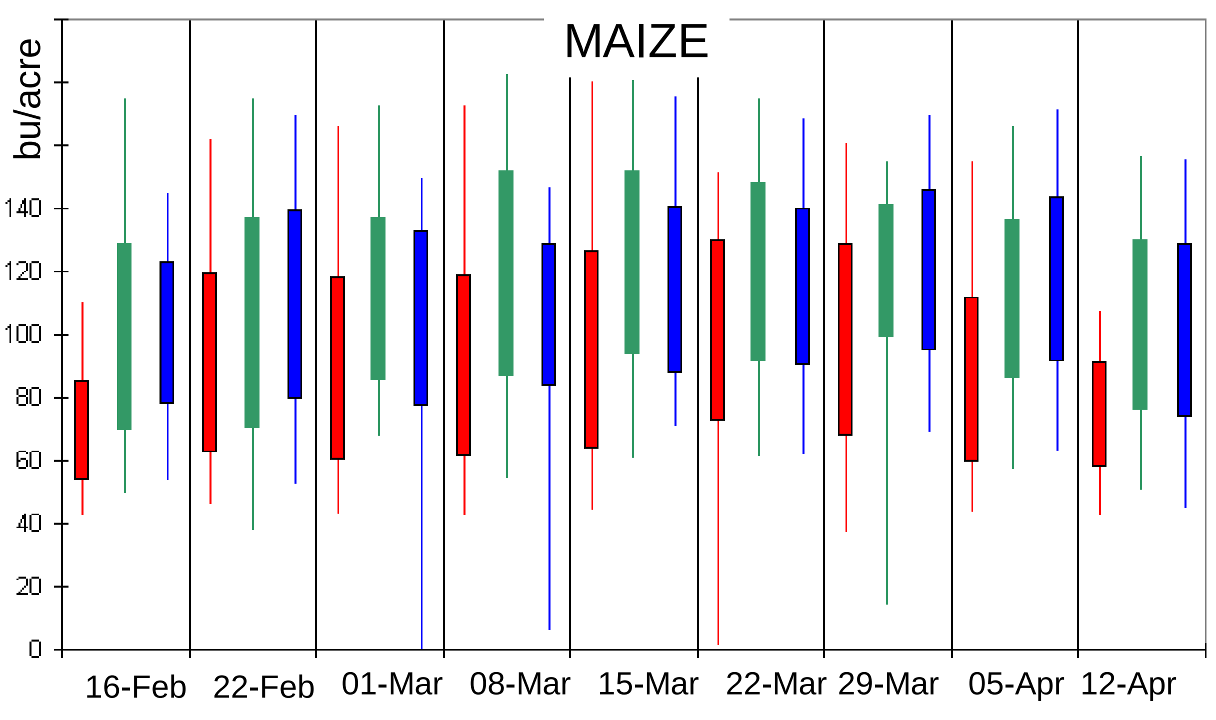




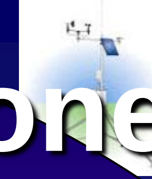
El Niño

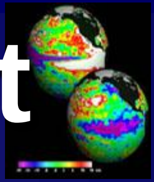
Neutral

La Niña

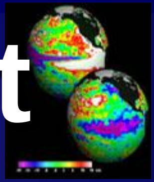


M&M Economic Component Synthetic Price Generation



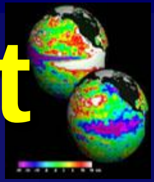


- 2970 price series to match our yields
- Multivariate distribution respecting price covariance among crops based on historical price variability
- Jan96-Jan05 USDA prices, deflated, de-trended, decomposed, separated and sampled, back transformed, validated, and seasonally adjusted


M&M Economic Component Whole Farm Model

- Stochastic non-linear optimization and simulation model
- 325 yr sample for optimizations, all 2970 yr for simulations
- MINOS5 algorithm GAMS (Gill et al. 2000)
- Constant Relative Risk of Aversion (Rr) of 0, 0.5, 1, 2, 3, 4 (Hardaker et al., 2004)



M&M Economic Component Optimization Model

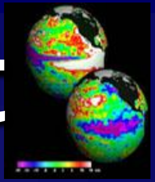
$$\max_{x} E\{U(W_f)\} = \sum_{n=1}^{N}\sum_{i=1}^{3} q_i U(W_0 + \Pi_{i,n}) / N \qquad (1)$$

$$\sum_{m=1}^{22} X_m = 1; X_m \geq 0 \qquad (2)$$

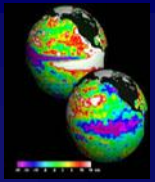
$$\sum_{j=1}^{10} X_m * L_{m,j} \leq \bar{L}_j \qquad (3)$$

$$U(W_f) = W_f^{1-R_r} / (1 - R_r) \qquad (4)$$

M&M Economic Component Estimated Value of Information

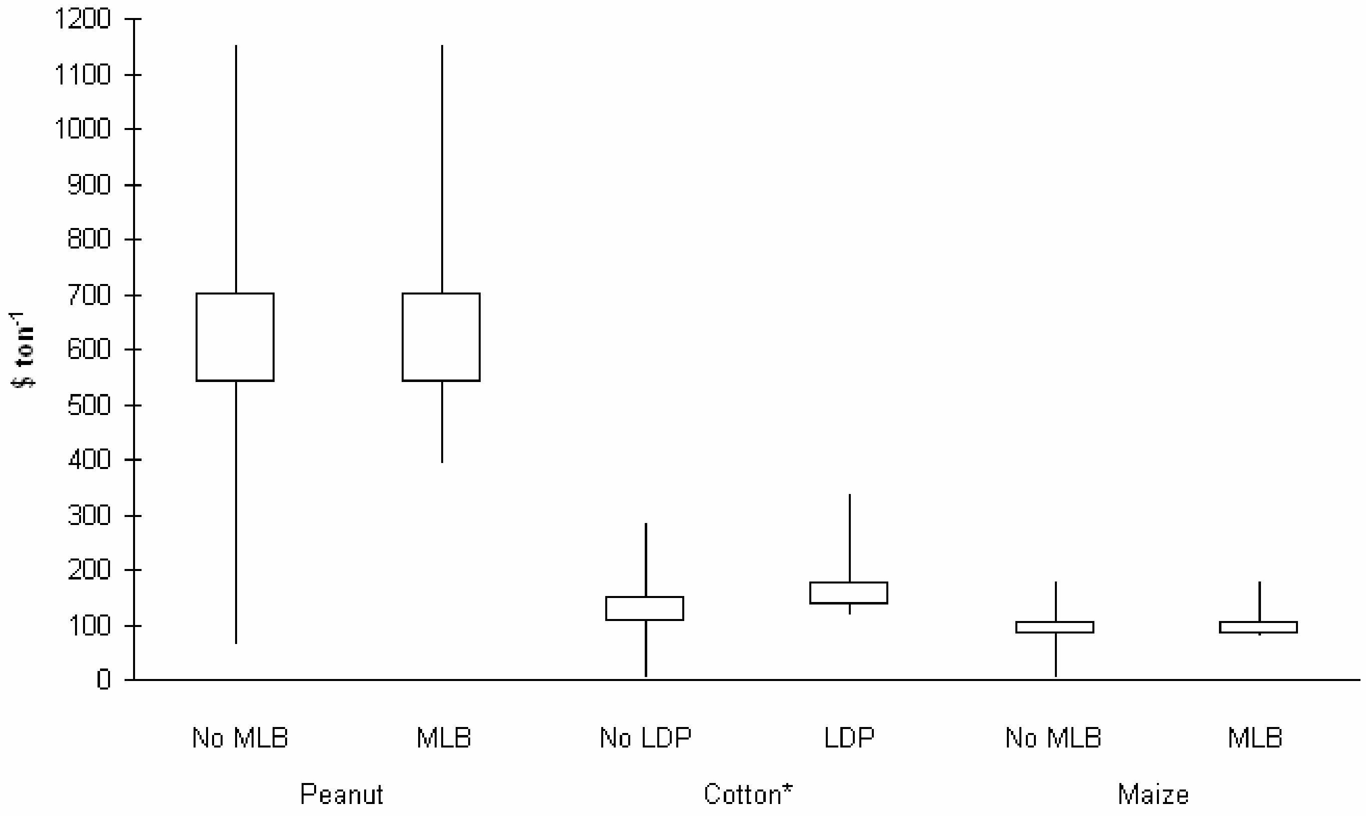

- Net margins 2970 yr (990 x ENSO phase)
- EVOI = Net Margin With Forecast
  - Net Margin Without Forecast
- EVOI = certainty equivalent units (US$)
  over different planning horizons
- Repeated for each Rr



M&M Policy Component Commodity Loan Programs

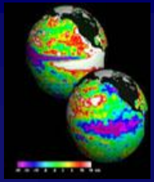
- Commodity Loan Programs are based on actual production and do not require decision before planting
- The 1996 FAIR Farm Act set LDP of \$1.14 kg^{-1} for cotton
- The 2002 FSRIA Farm Act set MLB of \$0.39 kg^{-1} for peanut and \$0.08 kg^{-1} for maize

M&M Policy Component
Synthetic Price Distribution



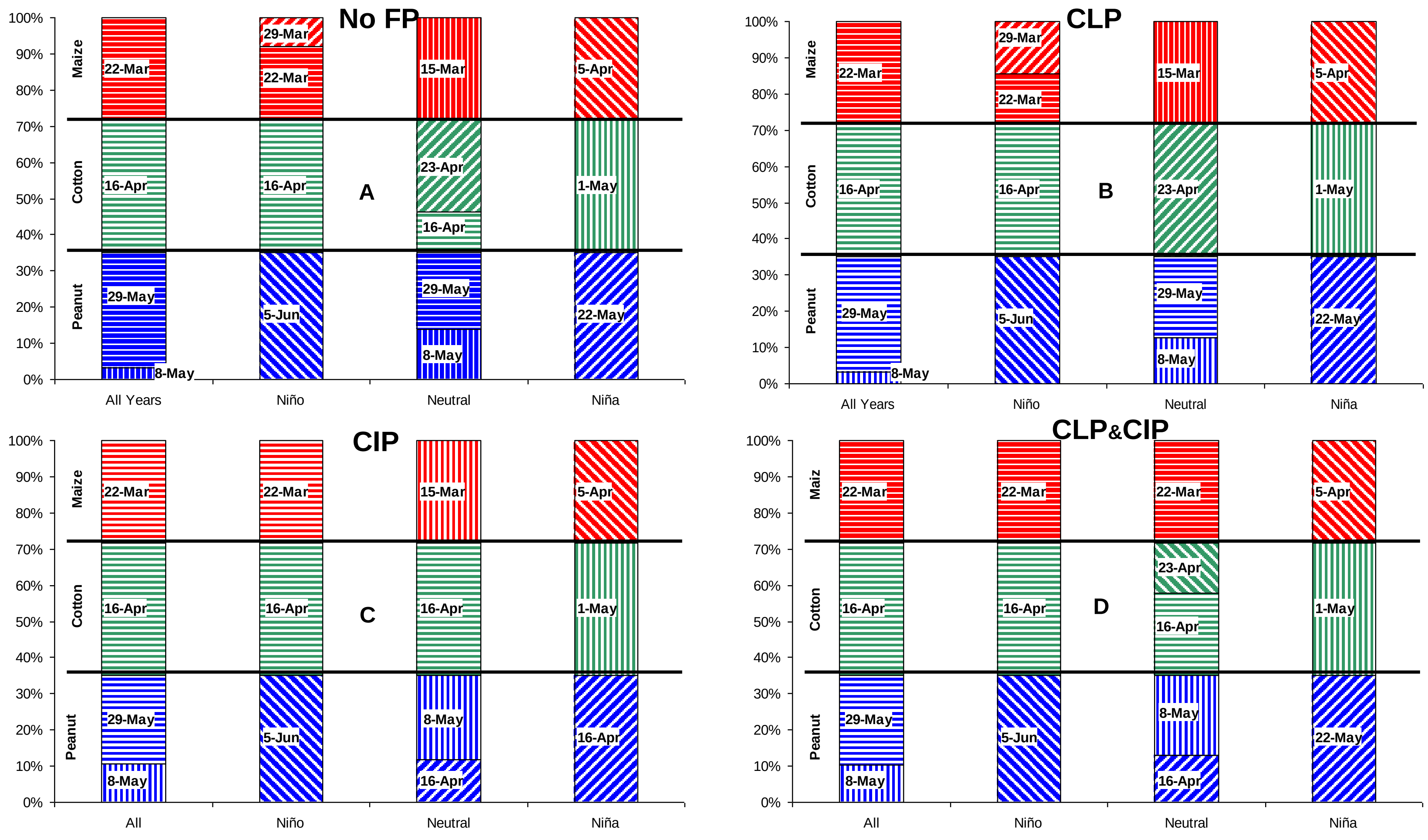
MLB is marketing loan benefit. LDP is loan deficiency payment. *Price of cotton is $100 kg^{-1}

M&M Policy Component Crop Insurance Programs

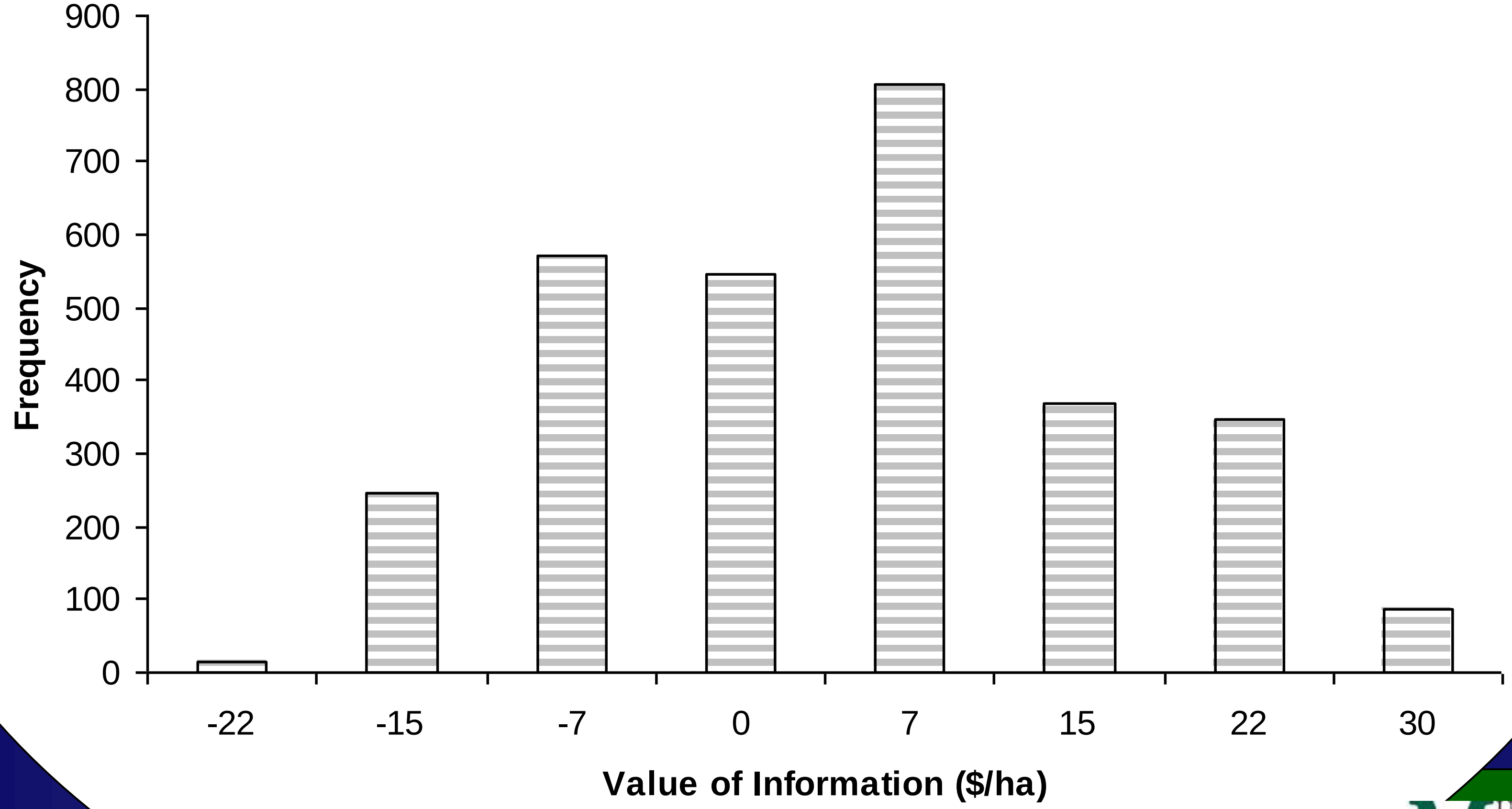


- Most common crop insurance product by crop in Jackson County (2004)
  - Peanut 70% MPCI, 0.3935 \$ kg^{-1}
  - Cotton 65% CRC, 1.4991 \$ kg^{-1}
  - Maize 50% MPCI, 0.0964 \$ kg^{-1}
- Premiums added to variable costs
- Indemnity payments added to objective function

Findings Optimal Land Allocation

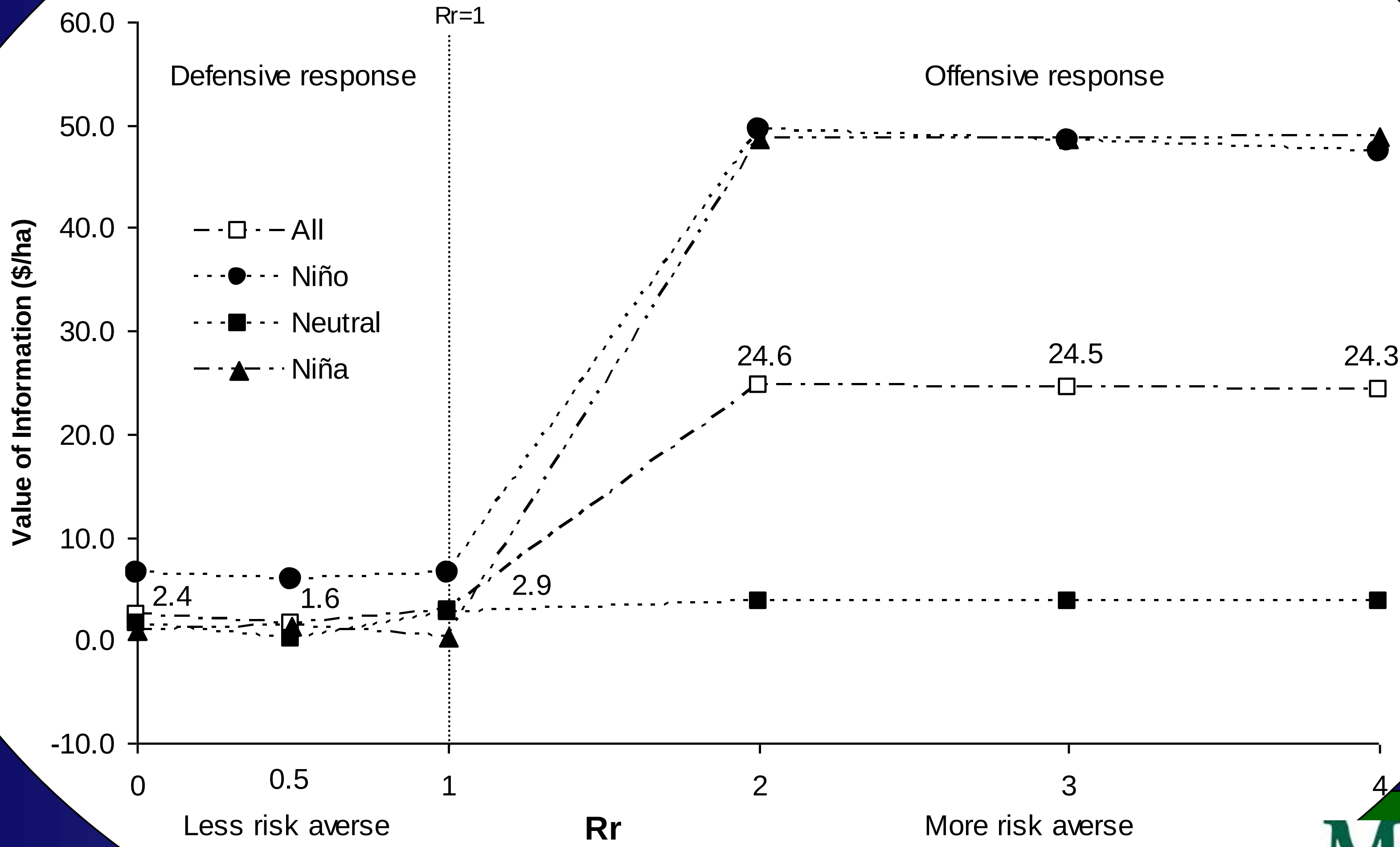


Findings Distribution of EVOI

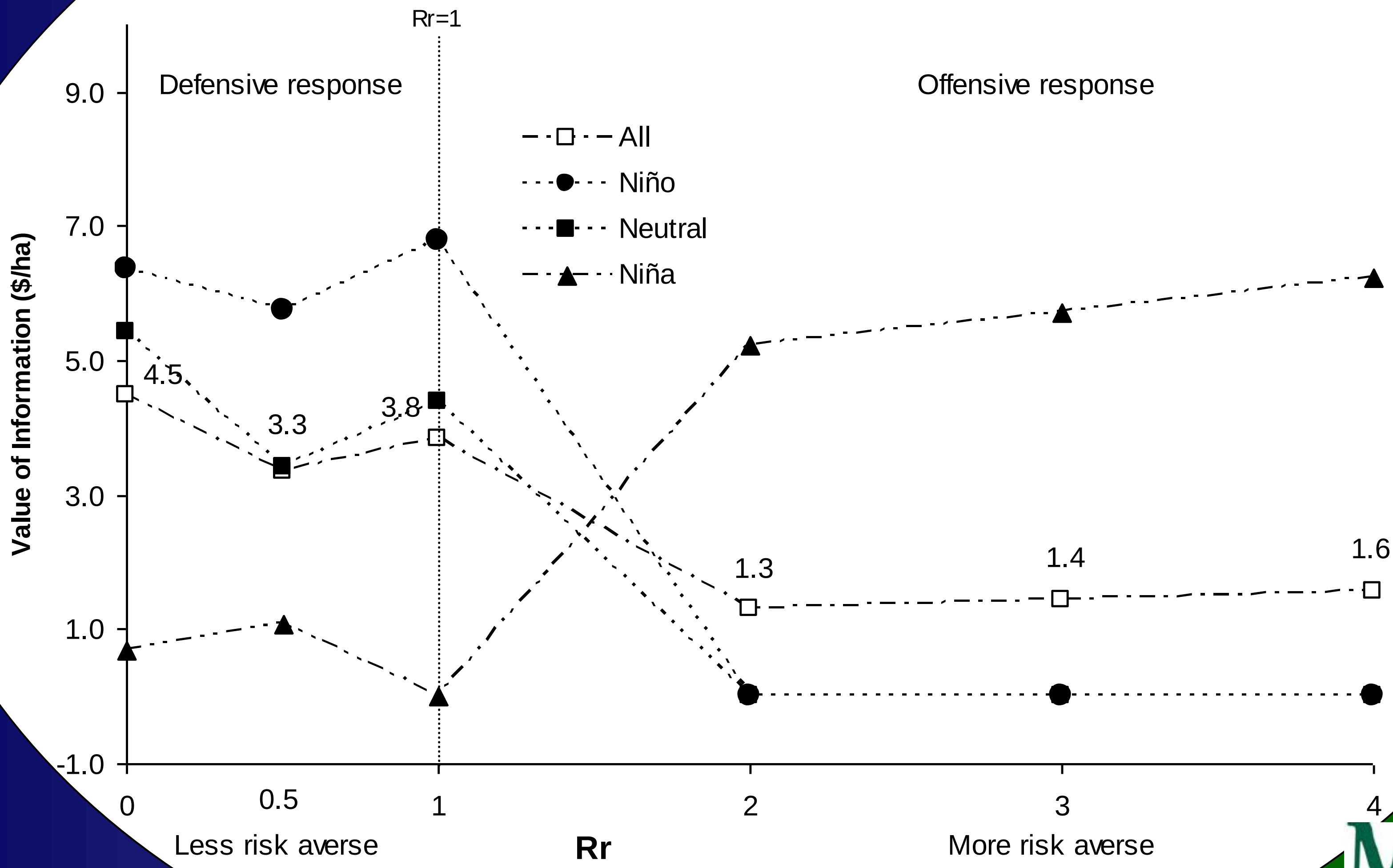


100-year horizons, R_r =1, Mean=4.39, 95%CI=[3.48, 5.30]

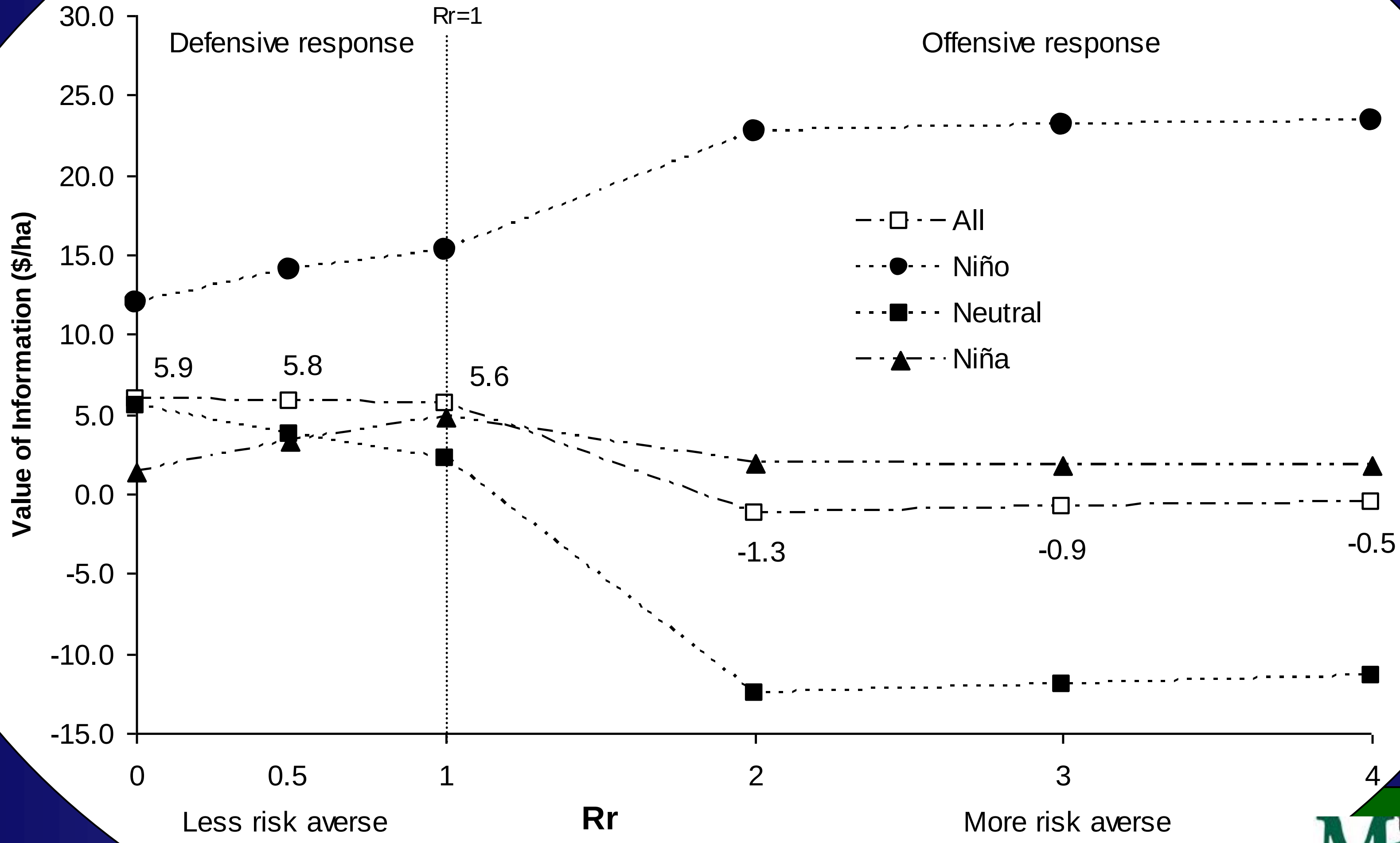
Findings EVOI without FP



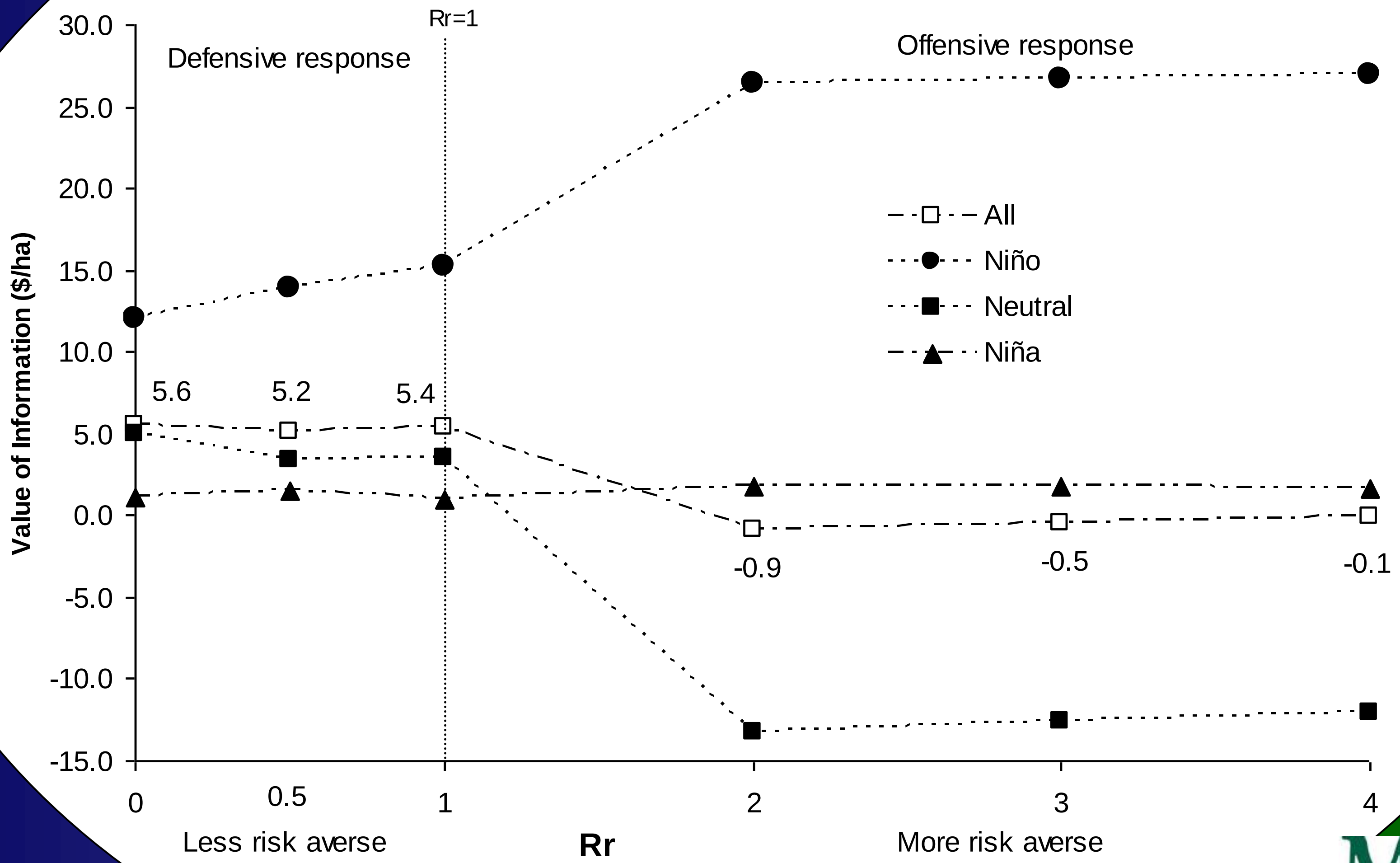
Findings EVOI with CLP

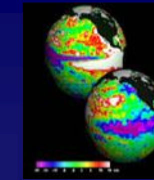


Findings EVOI with CIP



Findings EVOI with CLP & CIP

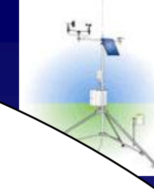


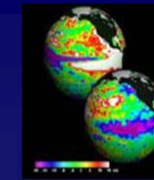


Conclusions

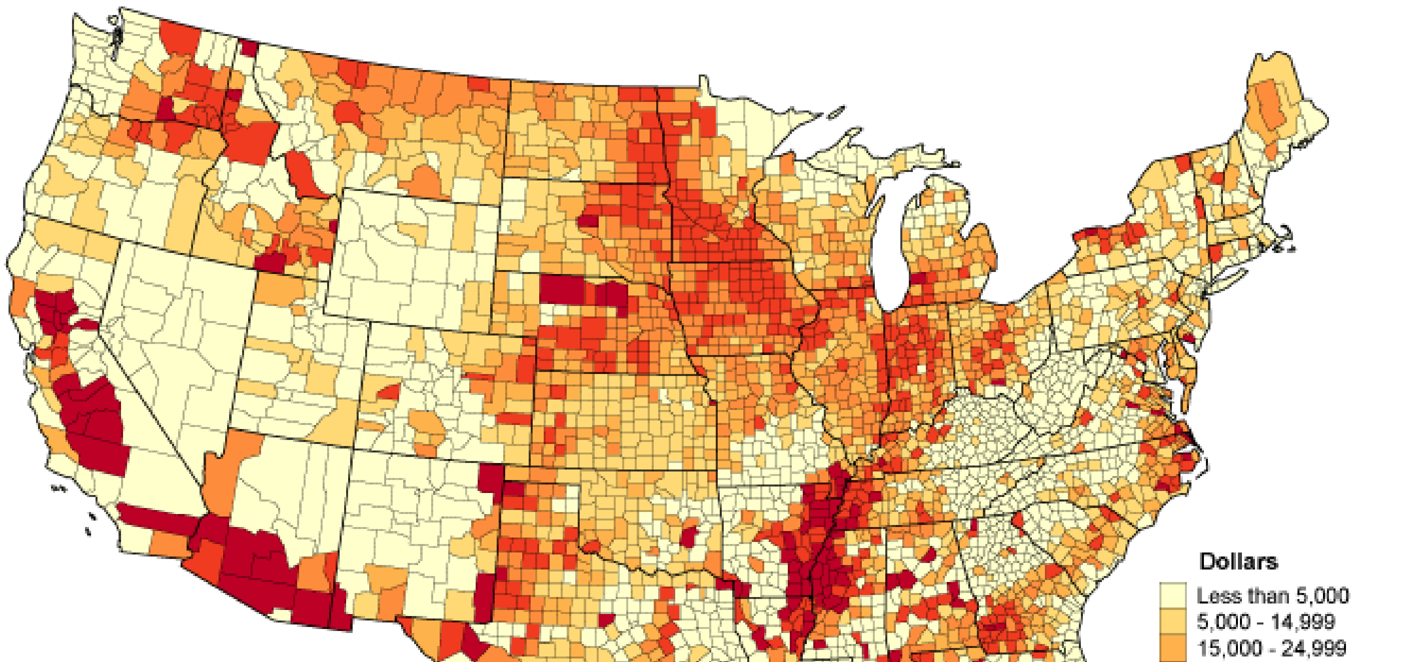
- Forecast value is inherently probabilistic
- Negative value of information exists and is not negligible
- As hypothesized, Farm Programs impact substantially EVOI
- CLP & CIP decrease EVOI
- Further research: synthetic weather generator, other locations: AL, GA

SOUTHEAST CLIMATE CONSORTIUM
AGRICULTURE CLIMATE WATER





Thanks



Total Amount Received from Government Commodity Credit Corporation Loans, Average per Farm 2002

02-M45 USDA, NASS 2002

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