

# Optimizing Crop Insurance Strategy Using Climate Information

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## Abstract

This is a study of the interactions of different crop insurance products with ENSO-based climate information and relative levels of risk of aversion. Simulated crop yields using multiyear weather data combined with historical series of prices generated long series of stochastic income distributions in a whole farm model portfolio. Results suggested that net incomes are greater and more stable for low risk averse farmers when catastrophic (CAT) insurance for cotton and 70 or 75 actual production history (APH) for peanut are selected in all ENSO phases. For high risk averse farmers the best strategy depends on the ENSO phase: a) 70% crop revenue coverage (CRC) or CAT for cotton and 65% APH for peanut during El Niño years; b) CAT for cotton and 65, 70, or 75 APH for peanut during Neutral years; and c) 65, 70 APH, or CAT for cotton and 70% APH for peanut during La Niña years.

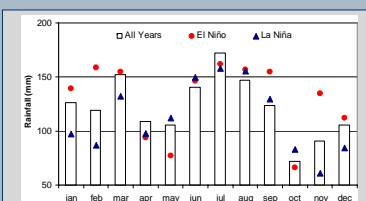
## 1 Introduction

- Objective: Explore the impacts of ENSO forecasts and risk preference on crop insurance selection.
- Hypothesis: Use of ENSO forecasts to select crop insurance products would increase or maintain net farm income stability.

## 2 Materials and Methods

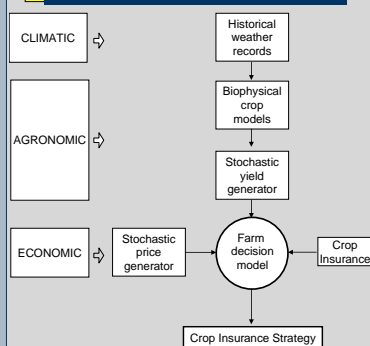
### A Representative Farm

- 40-ha Jackson Co., FL
- Non-irrigated
- ½ peanut- ½ cotton
- Dothan Loamy Sand*
- Implications SE U.S.



Historical (1950-2004) monthly rainfall in Jackson County, FL for El Niño and La Niña ENSO phases with respect to all years. Source: www.AgClimate.org.

### B The Farm Model

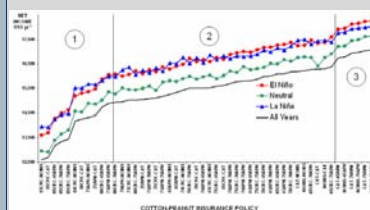


Simulation framework. Climatic, agronomic, and economic components of the farm decision model

## 3 Results and Discussion

### A Farm Net Income Under Risk Neutrality (CRRA=0)

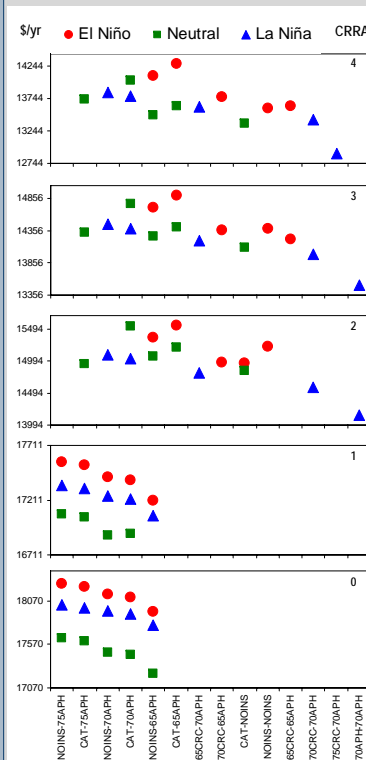
- Three well defined zones of different ( $\alpha=0.05$ ) net incomes.
- Greatest net incomes when low (CAT) or no coverage for cotton and high coverage for peanut (65 to 75% APH).



Simulated net income for 50 combinations of crop insurance products according to ENSO phases. CRC is crop revenue coverage, APH is actual production history, CAT is catastrophic coverage, and NOINS is no insurance coverage

### B Five Best Crop Insurance Combinations by Risk Aversion Levels (CRRA=0 to 4)

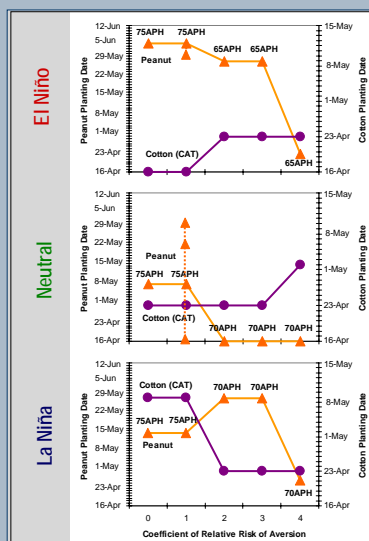
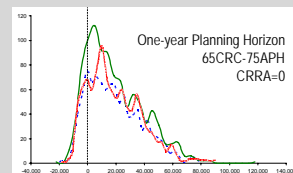
- Risk takers (CRRA=0, 1): CAT or no coverage for cotton and 65 to 75 APH for peanut.
- Risk avoiders (CRRA=2, 3, 4): Stronger ENSO impact on crop insurance selection



Five best crop insurance combinations according to net incomes by ENSO phases and relative risk of aversion

### C Shorter Planning Horizons (CRRA=0 to 4)

- Farmers would consistently decrease their risk of net income loss by purchasing some type of crop insurance rather than having no coverage.



The best crop insurance products and planting dates by ENSO phase and relative risk of aversion

## 4 Conclusions

- The best crop insurance strategy response for risk takers is CAT for cotton and 75 or 70% APH for peanut, across ENSO phases.
- The best crop insurance strategy for risk avoiders are:
  - For El Niño years, CAT or 70CRC for cotton and 65APH for peanut;
  - For Neutral years, CAT for cotton and 65 to 75APH for peanut; and
  - For La Niña years 65CRC, 70CRC, 70APH, or CAT for cotton and 70APH for peanut.
- The use of ENSO-based forecasts showed consistently better farm net incomes than the use of historical climatic information.

## 5 Acknowledgements

This work has been supported by grants from NOAA (Office of Global Programs), USDA (Risk Management Agency), and USDA (Cooperative State Research, Education, and Extension Service) through the South East Climate Consortium (a Regional Integrated Science Application Center)