Optimal Climate Crop Insurance Strategy: Contrasting Insurer and Farmer Interests

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Farm Net Income Before Insurance

Farmer
- Gain
- Loss
  - Non protected income

Vs.

Insurer
- Same Gain
- Less Gain
  - Received premium
- Loss

Strategy: Maximize Gain
Minimize Loss
Jackson Co., FL (30.774N, 85.226W) farm
40 ha, non-irrigated, 50% peanut, 50% cotton
Dothan Loamy Sand soil type
65 (1939-2003) ENSO phases
Most popular crop insurance contracts
Premium subsidies included for insurer
Farm decision model

Historical weather records

Biophysical crop models

Stochastic yield generator

Stochastic price generator

Crop Insurance Strategy

Crop Insurance

CLIMATIC

AGRONOMIC

ECONOMIC
\[
\max_x E\{U(W_f)\} = \sum_{n=1}^N U(W_0) + \sum_{j=1}^2 Y_j P_j X_j + IY_j PB_j X_j - C_j X_j - Pr_j X_j / N
\]

\[
U(W_f) = W_f^{1-R_r} / (1 - R_r)
\]

\[
\min_x E\{L\} = \sum_{n=1}^N \sum_{j=1}^2 X_j IY_j PB_j - X_j Pr / N
\]

\[
CVaR_\alpha[L(x, \theta)] \leq \nu
\]

Peanut
\[
\sum_{m=1}^9 X_{m,j} = 0.5
\]

Cotton
\[
\sum_{m=10}^{13} X_{m,j} = 0.5
\]
\[
X_m \geq 0
\]
Farmer

Cotton-Peanut Crop Insurance Contract

Insurance: APH or MPCI, CRC, and CAT
## Farmer

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## Insurer

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Synergies 75APH-75APH, 75CRC-CAT

El Niño: 75APH-70APH

Neutral: 75APH-CAT, 80CRC-70APH, 75APH-65APH

La Niña: 75APH-CAT

All Years: 75CRC-CAT, 75APH-75APH
Frequency of loss ratio between 1 and 1.075
El Niño
Neutral
La Niña
All years

Loss Ratio Target : 1.075 Average: 0.32

2004 RMA Cotton: 0.54 Peanut: 1.29
Implications

• ENSO climate variability impacts farmer and insurer crop insurance selection
• Conflict of interest exists, but seems workable
• Premiums and/or subsidies could be decreased or better assigned
• Consistent with previous studies: Crop insurance could be privately promoted
• Further study including spatial distribution