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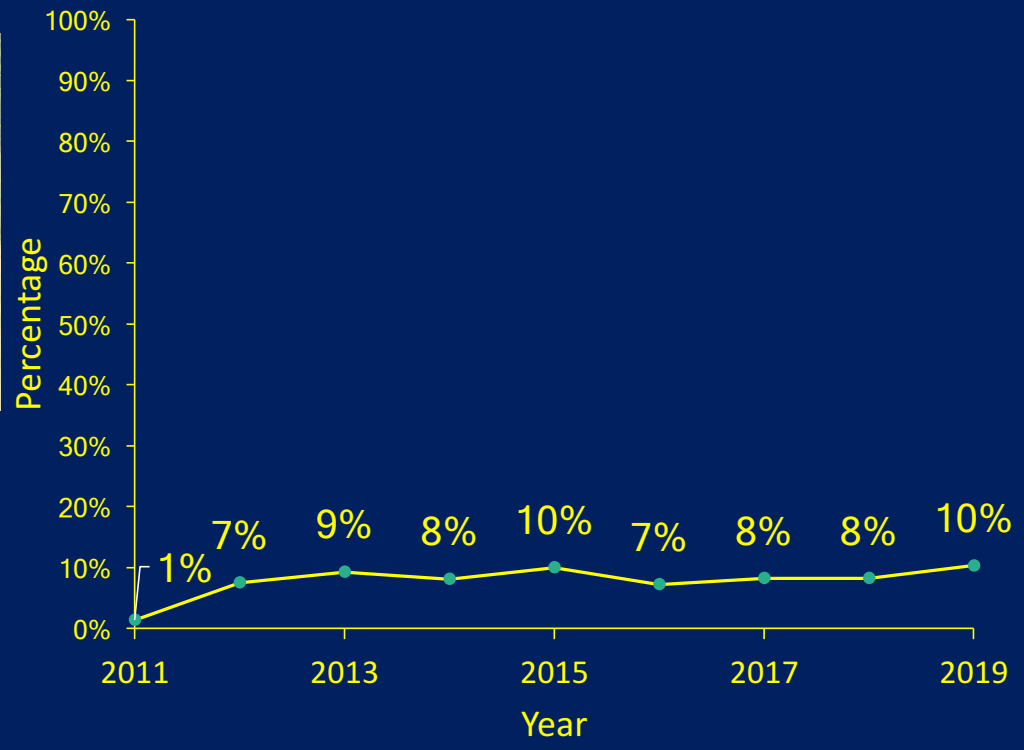
Evaluation of RI-PRF Crop Insurance Program Design

Whoi Cho and B. Wade Brorsen
Oklahoma State University

Insured Acreage Percentage of the Total Pasture and Hay land in OK

19.5 million acres in OK (2012 Census)
In 2019, 2 million acres insured (10%)



Source: USDA RMA, USDA ERS, and Noble Research Institute

Rainfall Index Insurance for Pasture, Rangeland and Forage (RI-PRF)

- Established by the Risk Management Agency(RMA) in 2007
- Protects forage and hay producers from losses due to the lack of precipitation
- Offered many choice options

RI-PRF Choice Options

- Coverage Level (5 Levels)
  - 70%, 75%, 80%, 85%, and 90%
- Productivity Factor (91 Levels)
  - 60% to 150% (1% Increment)
- Bi-Monthly Index Intervals (11 periods)
  - Jan-Feb, Feb-Mar, Mar-Apr, Apr-May, May-June, June-July, July-Aug, Aug-Sep, Sep-Oct, Oct-Nov, Nov-Dec
  - Insure at least two intervals :cannot choose overlapping periods
  - Sum of Interval weights must equal 100%
  - Each interval weight between 10% and 60%

ALWAYS WEAR THE SAME SUIT
DECISION FATIGUE?
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Research Questions

1) How much does the rainfall index match the actual precipitation?

2) Can Bayesian Kriging be used to make county base values more accurate?

3a) Find optimal choices of RI-PRF for producers?

3b) Can the choice set be reduced?

Data

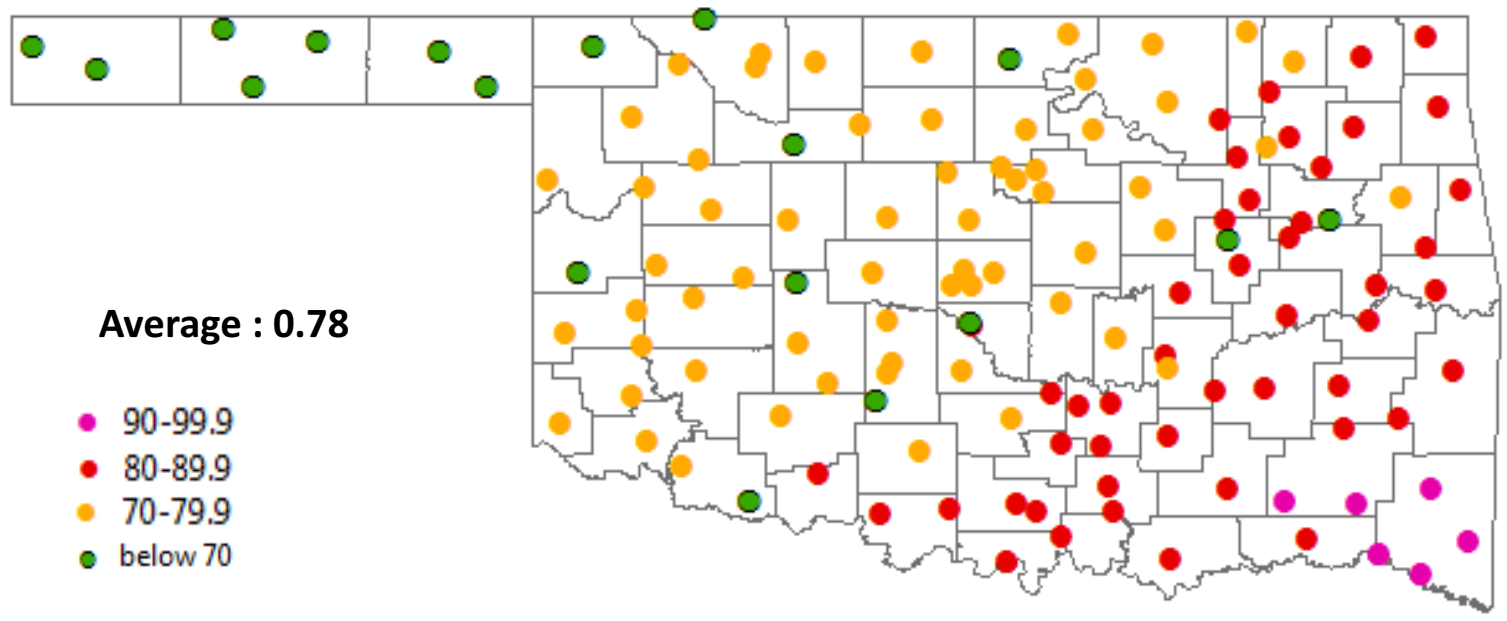
- Actual Rainfall in Oklahoma
  - Oklahoma 131 Mesonet stations
- Rainfall Index in Oklahoma
  - USDA RMA's Decision Tool
  - Mesonet station locations used to Grid ID
- Actual Hay Yield (all other hay) by each county in Oklahoma
  - USDA National Agricultural Statistics Service (NASS) Reports

Methods

1) Correlation Analysis
   - Actual Rainfall & Rainfall Index
2) Bayesian Kriging
   - RMA's 9 County base Values vs. 77 County Base Values from Bayesian Kriging
3) Expected Utility Optimization
   - Profit Maximization Strategy
   - Risk Minimization Strategy

Result-1) Correlation Analysis

Between Actual Rainfall and Rainfall Index



Result-2) Compare with Actual Hay Yield

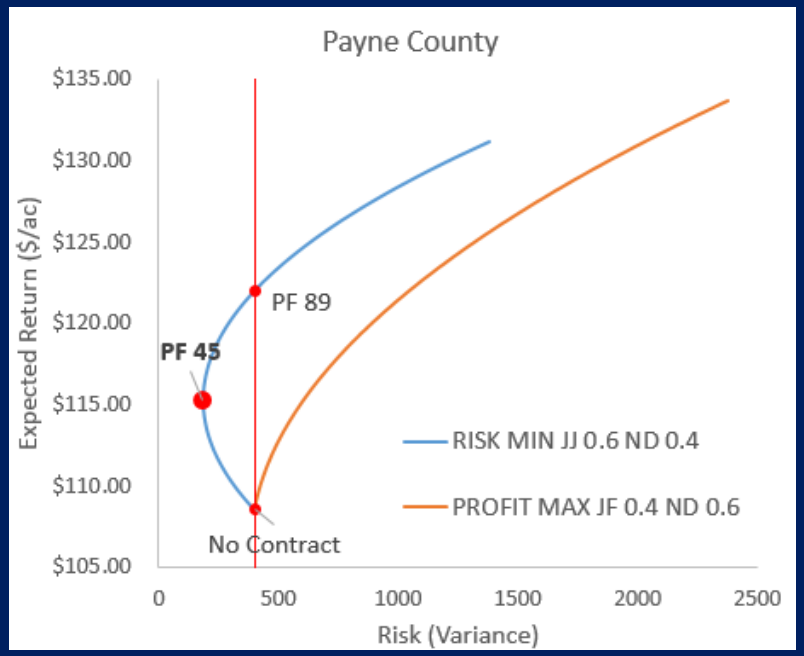
9 County Base Values vs. 77 County Base Values

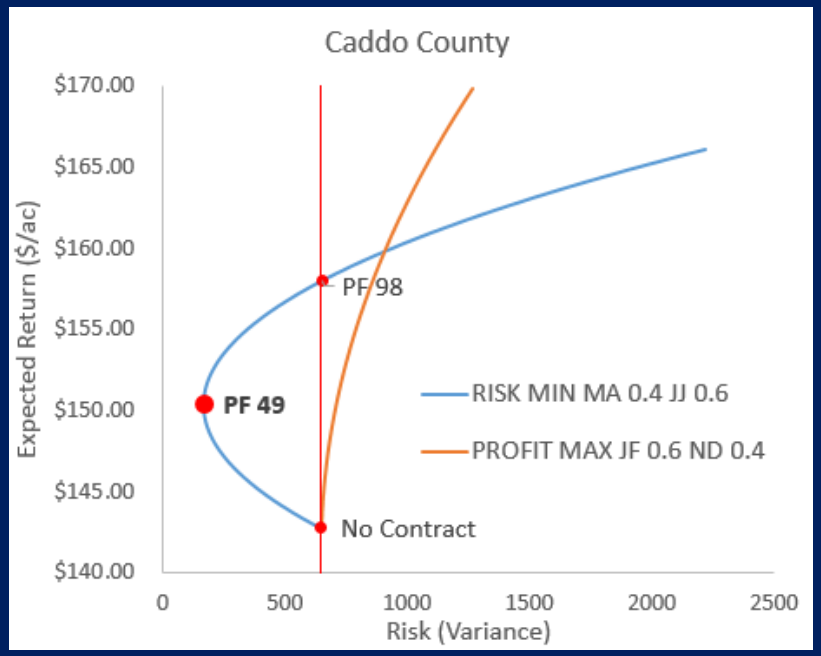
$$Actualyield_i = RMACBV_i$$

$$Actualyield_i = BayesianKrigingCBV_i$$

County Base Values	RMA	Bayesian Kriging
R squared	0.9780	0.9881
Mean Squared Errors	0.2864	0.2133

Result-3) Optimal Productivity Factor





Conclusion

1) Correlation Analysis between Actual Rainfall and Rainfall Index
   - Overall, rainfall index is designed well.

2) Compare with Actual Hay Yield (9 County Base Values vs. 77 County Base Values)
   - Bayesian Kriging approach offers a moderate advantage
   - RMA county base values are working well

Conclusion

3) Optimal Productivity Factor

- Restrict the productivity factor to 25%-70%
- Fix coverage level at 90%
- Restrict bi-monthly index intervals to growth periods

***** Recommended selections**

- 90% Coverage Level and 45% Productivity Factor

- Apr-May 0.4 and June-July 0.6

Thank you :)