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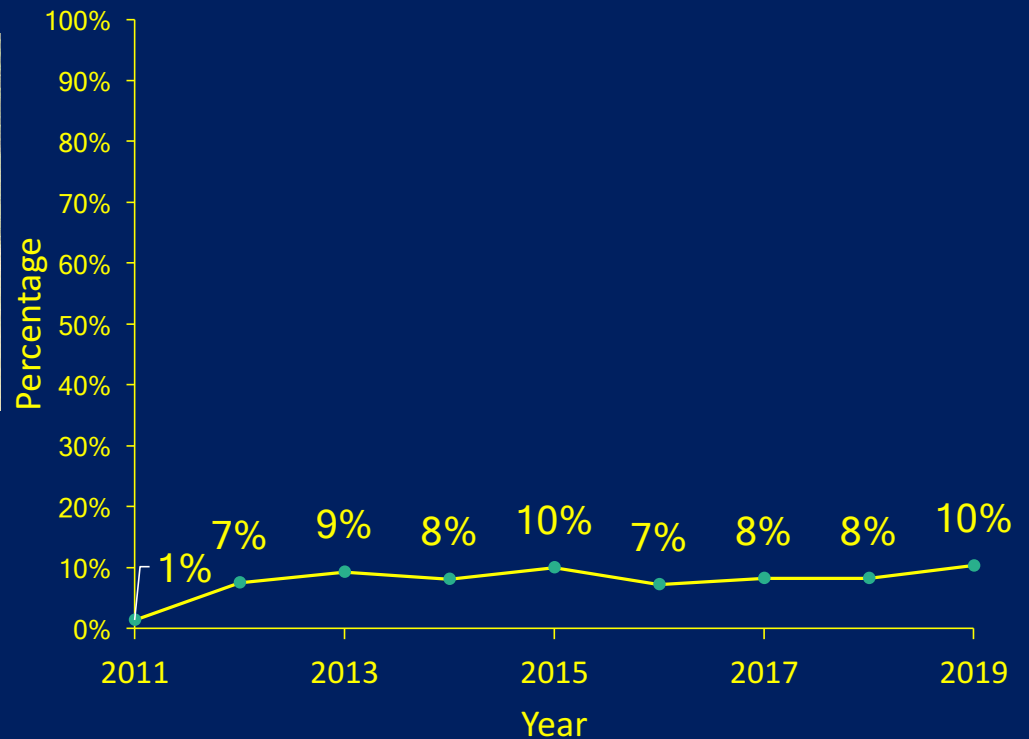
# Evaluation of RI-PRF Crop Insurance Program Design

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# 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

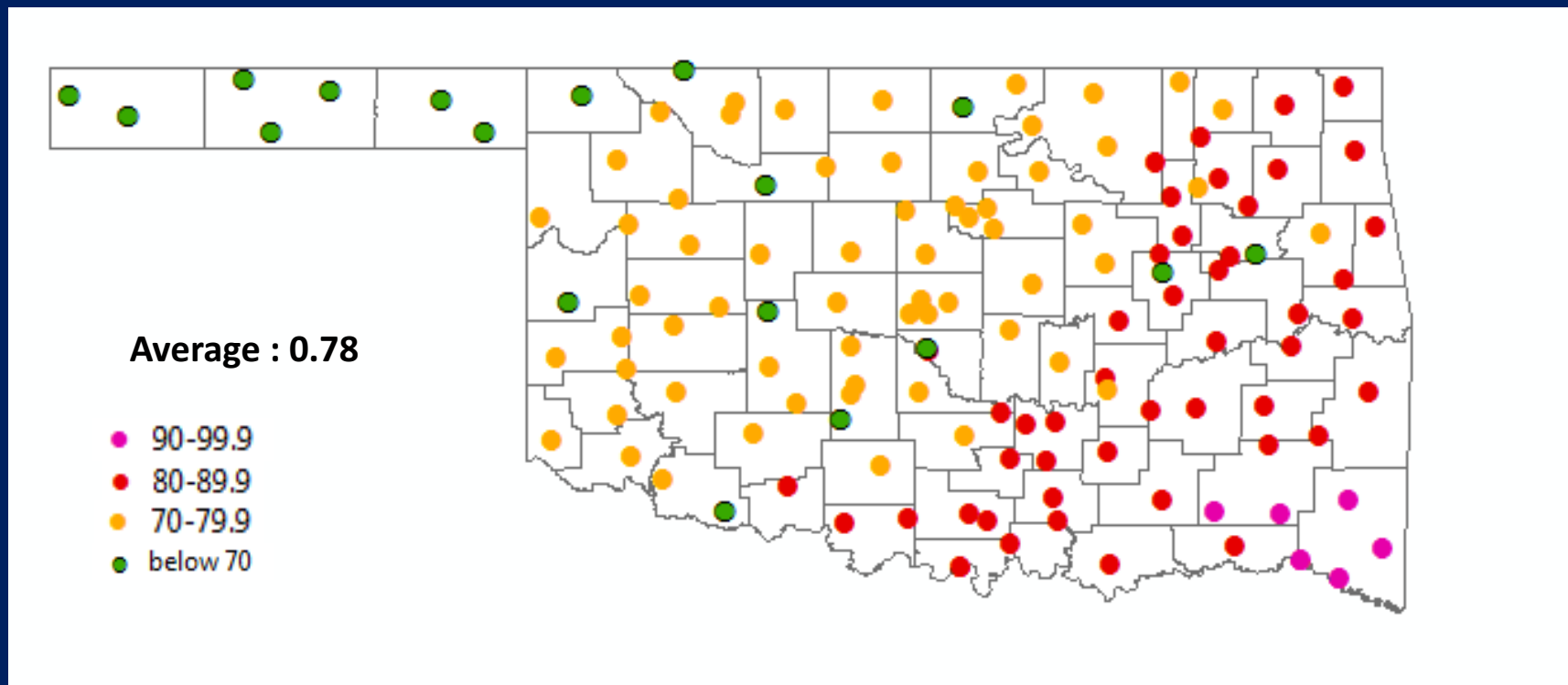
## 2) Bayesian Kriging

- 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

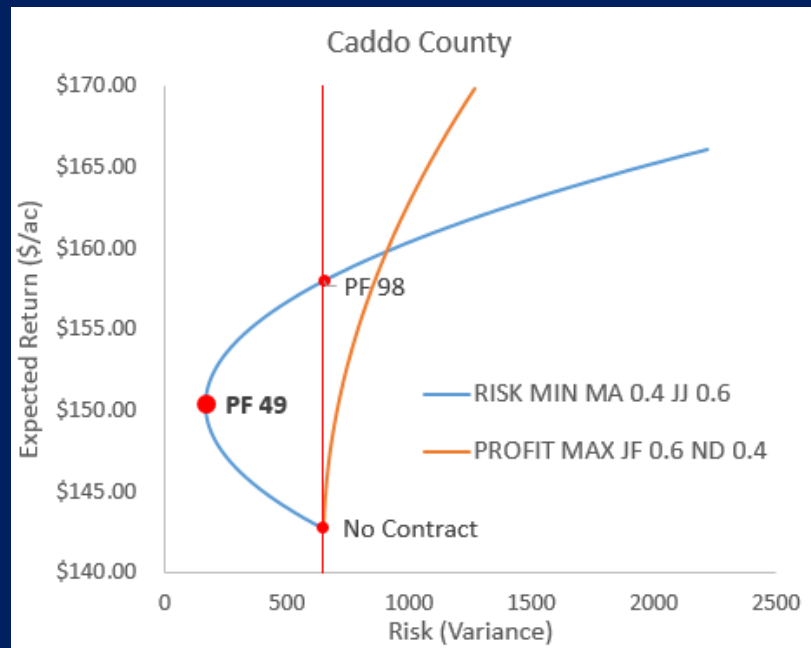
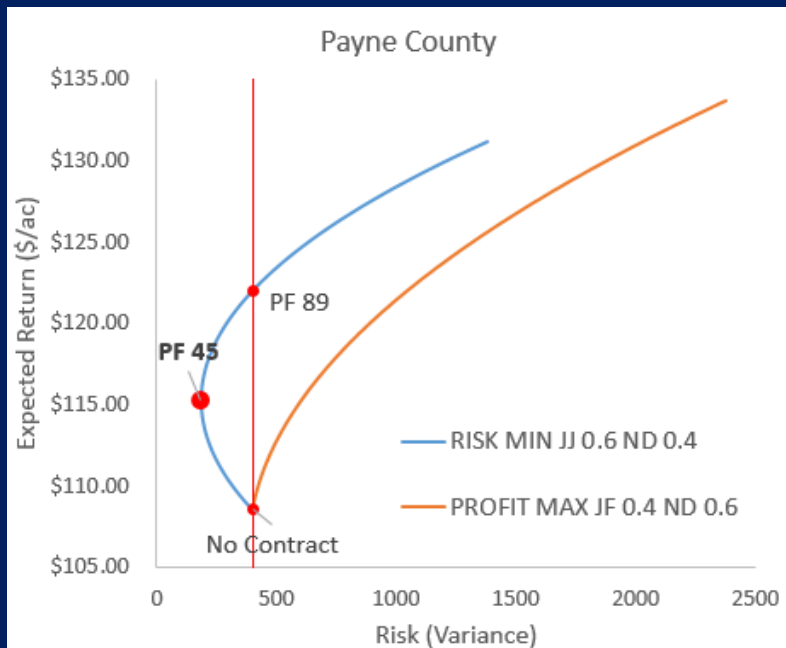
9 County Base Values vs. 77 County Base Values

$$\text{Actualyield}_i = \text{RMA}CBV_i$$

$$\text{Actualyield}_i = \text{BayesianKriging}CBV_i$$

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 :)**