# Value of Environmental Monitoring Information in Oklahoma Agriculture: A Research Perspective

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## BACKGROUND

- Agricultural production covers around 78% of Oklahoma's total state area
- The 2006 drought cost the state's economy over $500 million from lost crop production alone (Sutherland & Crawford 2006), while the 2011 drought caused an additional loss of $1.6 billion (Stotts 2011)
- With the anticipated population growth in Oklahoma, extreme weather events will be more important to address and monitor
- The statewide weather monitoring network - Oklahoma Mesonet is a valuable tool for obtaining accurate and comprehensive environmental monitoring information
- Impacts of Mesonet information on farming decision and economic and environmental savings (and prevented losses) in agriculture generated by Oklahoma Mesonet has not been studied enough
- Comprehensive quantitative evaluations on the value of information towards agriculture are missing

**Oklahoma crops – 2014 value of production**

| COMMODITY | HARVESTED ACRES | PRODUCTION VALUE |
|---|---|---|
| Hay | 3,590,000 | $629,125,000 |
| Wheat | 5,300,000 | $307,020,000 |
| Corn | 320,000 | $174,783,000 |
| Soybeans | 365,000 | $101,921,000 |
| Cotton | 240,000 | $73,649,000 |
| Sorghum | 370,000 | $64,649,000 |
| Canola | 270,000 | $14,415,000 |
| Pecans | - | $13,904,000 |
| Peanuts | 12,000 | $11,660,000 |
| Rye | 240,000 | $5,841,000 |

## RESEARCH OBJECTIVE

The main research objective is to provide a quantitative evaluation of environmental monitoring information generated by Oklahoma Mesonet to farmers in the state

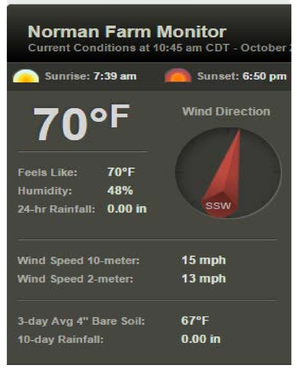
The following sub-objectives will help us achieve this goal:

- Define cognitive-motivational variables determining planting, growing, harvesting, and management decisions
- Provide a quantifiable measurement of benefits resulting from the application of environmental monitoring information generated by the Oklahoma Mesonet
- Analyze possible trends and differences and/or similarities in farmers' willingness to pay for environmental monitoring information on staple and specialty crop farms

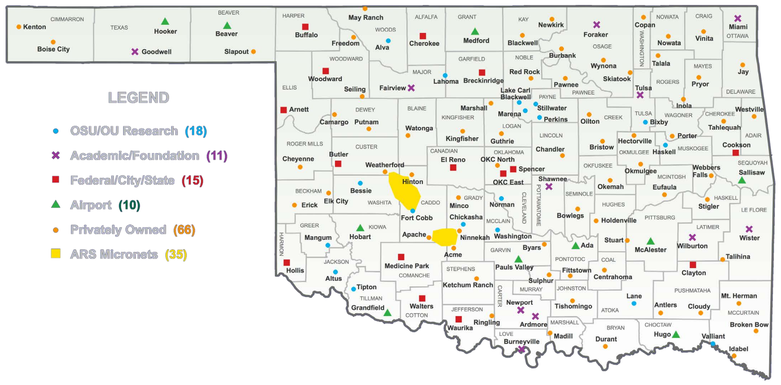
## OKLAHOMA MESONET

- The Oklahoma Mesonet consists of 120 automated stations across the state (with at least one Mesonet station in each of Oklahoma's 77 counties)
- Information provided through Mesonet observations is used by farmers to improve their decision making and generate economic benefits resulting from optimized application of production/input factors and resource conservation
- Oklahoma is the ideal location for evaluating benefits of a mesoscale network because of variability in weather and agricultural enterprises (Kenkel & Norris 1995)


| Data Collected |
|---|
| Precipitation |
| Air Temperature |
| Soil Temperature |
| Soil Moisture |
| Relative Humidity |
| Wind Direction & Speed |
| Air Pressure |




**Oklahoma Mesonet stations**



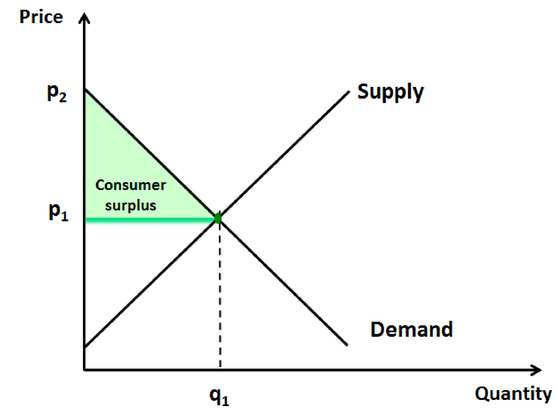

**Mesonet Network Agricultural Advisor**

- Rainfall & Accumulated Rainfall
- Cattle Comfort Advisor
- Degree-day Heat Unit Advisor
- Fire Danger Advisory
- Burning Index
- Keetch-Byram Drought Index
- Drift Risk Advisor
- Dispersion & Inversion Conditions
- Evapotranspiration & Irrigation Planner
- 4 to 16 inch Plant Available Water
- Fractional Water Index
- Depth to Groundwater
- Wheat Growth Day Counter
- Alfalfa Weivel Advisor
- Wheat First Hollow Stem Advisor
- Grape Black Rot Advisor
- Pecan Scab Advisor
- Peanut Leaf Spot Advisor
- Seed Germination

## METHODS

- Surveys with farmers of conventional crops (wheat, corn, soybeans) and specialized crops (pecans, peanuts, peaches, watermelons) will be conducted
- Crops budgets and statistical data from NASS and USDA will be used to quantify the value of Mesonet information with a time series analysis for 2004-2014
- A multivariate statistical analysis will be conducted to determine causal effects and relationships between the input and output variables
- Contingent valuation method (CVM) will be applied to estimate the willingness to pay (WTP) for the information generated by the Mesonet network

**Willingness to Pay and Consumer Surplus**




## EXPECTED RESULTS

- Farmers use Mesonet to optimize application of fertilizers, pesticides, water resources and other production input factors, as well as planting and harvesting times
- The application of Mesonet information can boost farmers economic and environmental cost savings and prevent potential losses/expenses
- A strong correlation between farmers' WTP and production outcomes, farm revenue, and production expenses can be expected
- Variations in WTP will result from the type of the specific Mesonet Agricultural Advisor Tool applied on farms, farm size, crop type, irrigation system, weather changes, socio-economic conditions in different Oklahoma regions, and demographics
- The value of Mesonet information is anticipated to be higher, the higher the reliance on the environmental monitoring information

## REFERENCES

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