Assessment of the AquaCrop-OSPy model in simulating crop-water productivity in a corn field (Sheridan-6 LEMA, Kansas)

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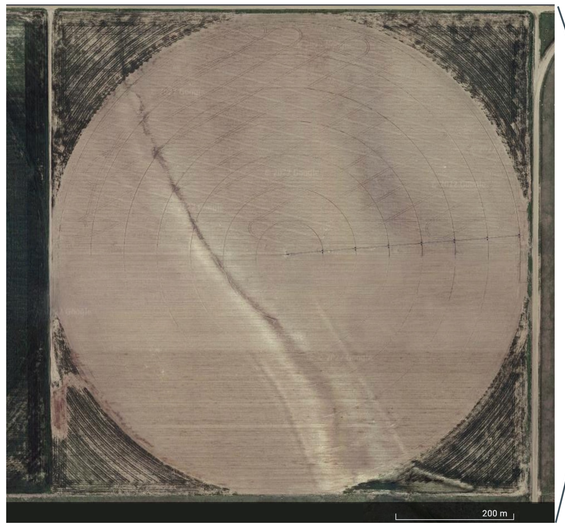
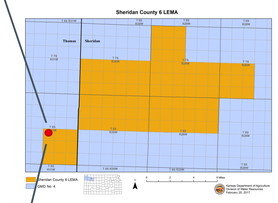
Groundwater Self Governance (Kansas)

- Unsustainable use of groundwater for irrigation is leading to groundwater depletion across the US
- In Sheridan County, KS, a Local Enhancement Management Area (**LEMA**) was established in 2013 to reduce water use
- LEMA self governance practices aimed to lower groundwater pumping rates to a five-year total (2013-2017) of 55 inches/irrigated acre
- Additional LEMAs proposed and established around KS

Preliminary analysis on an irrigated field

- Irrigated corn throughout simulation period (2000-2020)
- Selected because of simplicity: single water right, well and field





Methods

Why the AquaCrop-OSPy model?

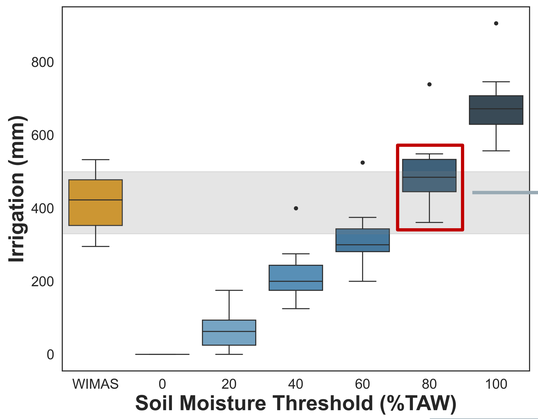
- Open source
- Requires fewer input data and variables than some other crop models

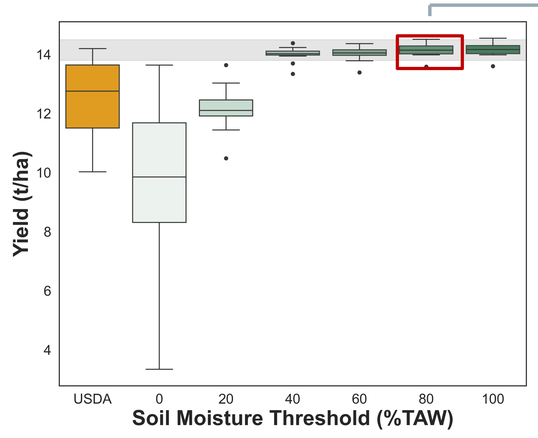
Soil type: silt loam
Crop planting date: May 1st
Meteorology: gridMET

Key Findings

- AquaCrop-OSPy model provides good estimates for irrigation, intermediate for ET, and worst for yield.
- Model over-estimates yield, and this could be due to it not accounting for stressors such as pesticides and severe water stress.
- Next steps: Develop model to simulate to GMD4 (western Kansas) and San Luis Valley (south-central Colorado) and calibrate model to improve performance

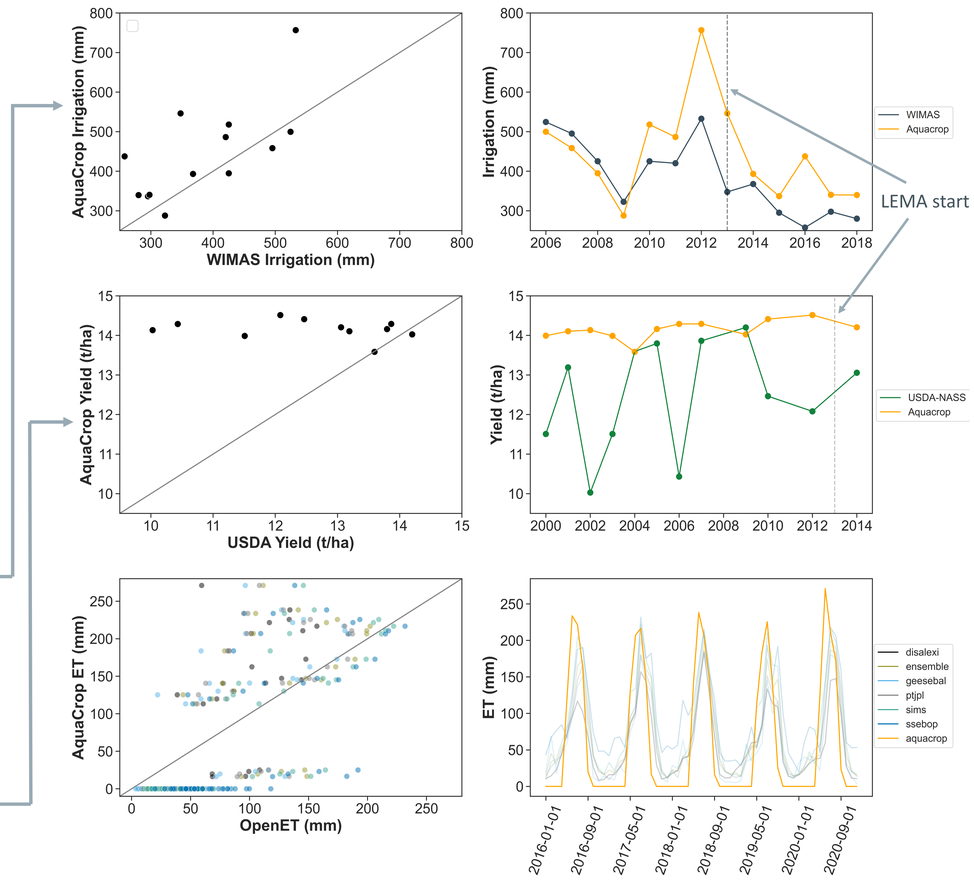
Irrigation Demands and Yield under Different Irrigation Strategies





Upper: Irrigation from the Water Information Management and Analysis System (**WIMAS**) compared to AquaCropOSPy with different soil moisture thresholds to trigger irrigation
Lower: Yield invariable at soil moisture threshold (**SMT**) ≥ 40%

AquaCrop-OSPy Assessment (irrigation triggered when soil moisture drops below 80%)



Irrigation: Similarities in WIMAS and AquaCropOSPy. Irrigation drops at the beginning of the LEMA (2013). High irrigation values and shifts from low to high values (2006, 2010, 2012) could be indicators of water stress.
Yield: Great variability in the USDA-NASS county-resolution values compared to consistently high AquaCropOSPy values.
EvapoTranspiration (ET): AquaCropOSPy tends to overestimate ET during the spring-summer months and underestimate it during the fall-winter months.

Acknowledgements

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