Quantitative Assessments of Water and Salt Balance for Cropping Systems in the Lower Colorado River Region

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External Collaborations

• U.S. Bureau of Reclamation: Water Smart
• USDA-ARS: US Arid Land Agricultural Research Center
• USDA-ARS: US Salinity Lab
• University of California Riverside: USDA/Artificial Intelligence for Agriculture
• Arizona State University and Planet Labs
Summary of Yuma Studies 2016-2023

- Revised water use estimates for 14 crops
  - 5 direct comparables, 9 new
  - Broccoli, Cauliflower decreased, Lettuce increased
  - Efficiencies high, 80-90%
  - First evaluation of efficacy of current vs. drip irrigation
  - Consequences of fallowing
- Updated salt balance and salt management recommendations
  - Identified and quantified salt loading events
  - Importance of pre-irrigation
- Evaluated USBR accounting of consumptive use of water by crops
- Tested and evaluated remote sensing to monitor crop growth
- Development of irrigation and salt management App

https://desertagsolutions.org/project/quantitative-assessments-water-and-salt-balance-cropping-systems-lower-colorado-river
Consumptive Crop Water Use

Quantitative Assessments of Water

- **Irrigation**
- **ETc (Erie)**
- **ETc (Observed)**

Crop vs. ETc (mm)

- Alfalfa
- Spinach
- Spring Mix
- Iceberg
- Cantaloupe
- Romaine
- Broccoli
- Watermelon
- Celery
- Cauliflower
- Wheat
- Cotton
Consumptive Water Use: EC vs. OpenET

etdata.org
Eddy Covariance Technique

\[ R_n - G = H + LE + dQ + F \]
Eddy Covariance Errors

Energy Balance Closure

Flux Footprint

\[ b_1 \pm 0.02 \]

\[ r^2 = 0.97 \]
Water and Crop Growth 2016-2023
Alfalfa

Eddy Covariance Data

Eddy Covariance Deployment

Satellite Remote Sensing

Drone Data

Irrigation Volume

Flood vs. Drip
Predicting Water Use: Weather & Remote Sensing

1. Heat Units
2. Irrigation detection
3. Plant Emergence
4. Fractional Cover
5. Crop Growth Modeling
Predicting Water Use: Heat Unit Tool & Remote Sensing

Heat Unit Predictor for Arizona

https://thermalir.shinyapps.io/myGDDv4/

Error in Climatology Less than +/- 1 SD
Summary of Studies at YCEDA

- Launched project in 2016 to fill gaps
- Collaborative project
- Quantified crop water use for 14 crops in Yuma
- Tracked where and when soil salts moved
- Published & publishing results
- Data to be archived and accessible
- Current crop studies on alfalfa and citrus
- Prediction methods using remote sensing