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The Productivity of Water in Irrigated NM Pecan Production: Measurements & Policy Implications

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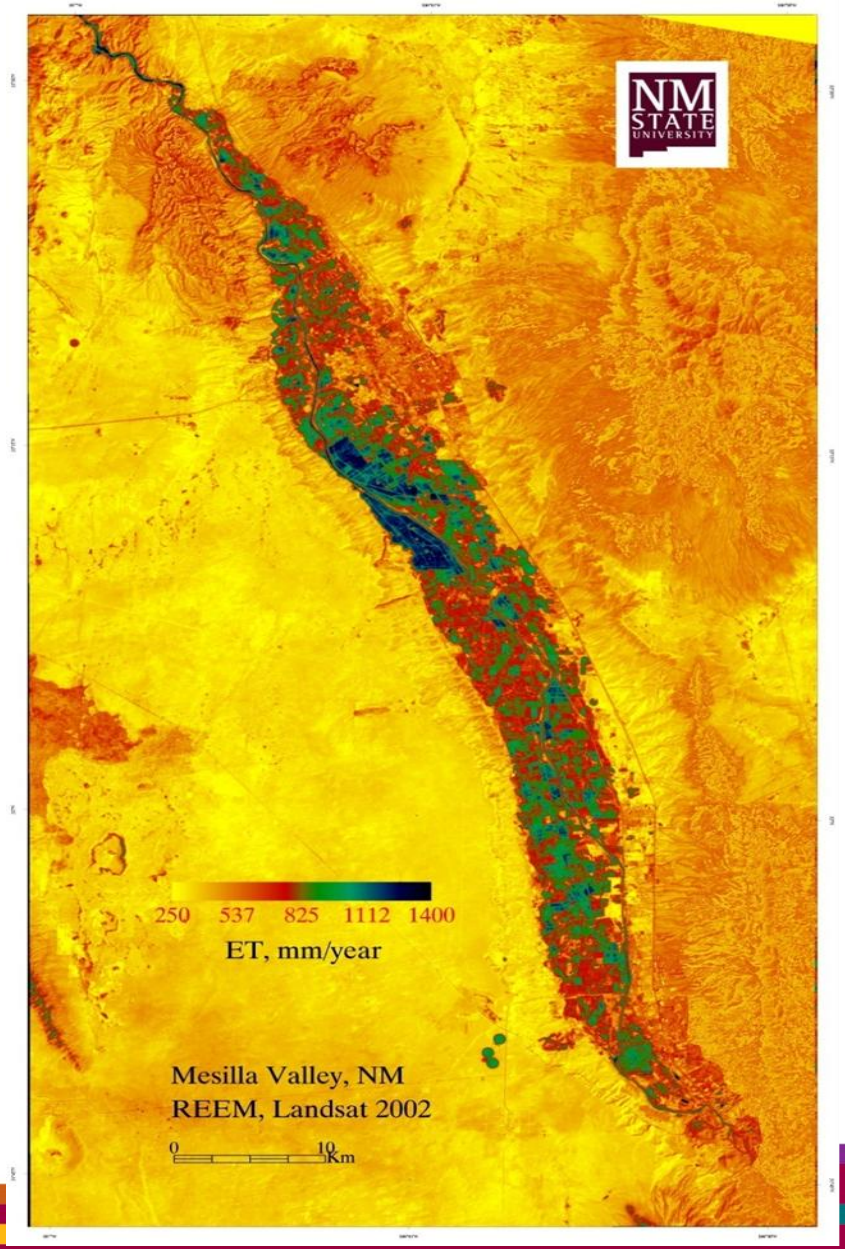
Background & Research Questions

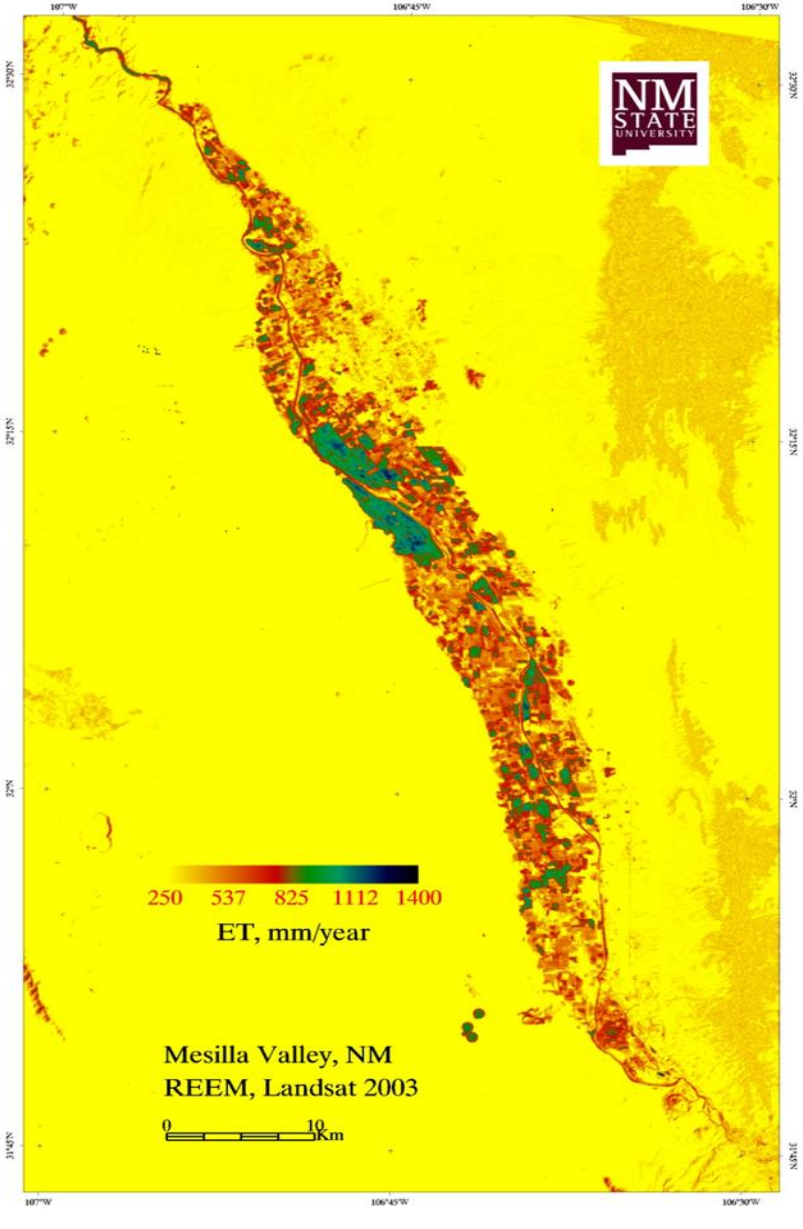
- ↑ competition for water, transfers & adjudications require accurate information on crop water use.
- Often assumed that ag irrigation “wastes” water.
- How much water ***do*** crops consume?
- Remote sensing can provide broad-scale estimates of crop ET.

Regional ET Estimation Model (REEM)

- For crop & riparian vegetation
- Energy balance basis
- Uses satellite data to calculate daily ET

- Has been applied to the Mesilla Valley
  - Parcel level estimates of total annual ET
  - Pecans, alfalfa, cotton
  - Degree of deficit irrigation?





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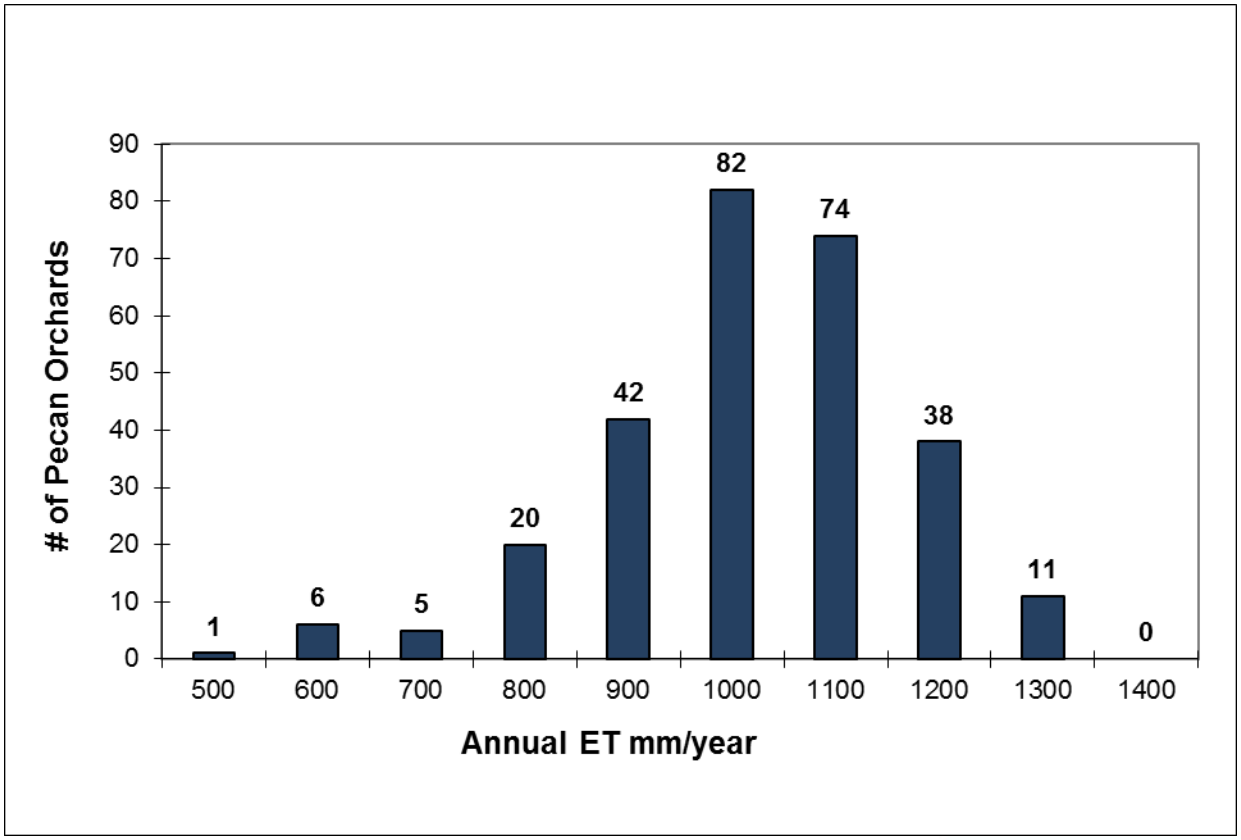
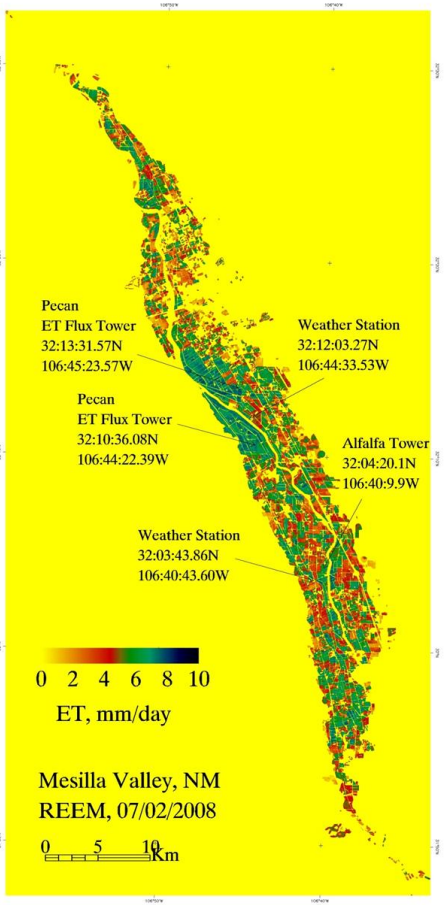
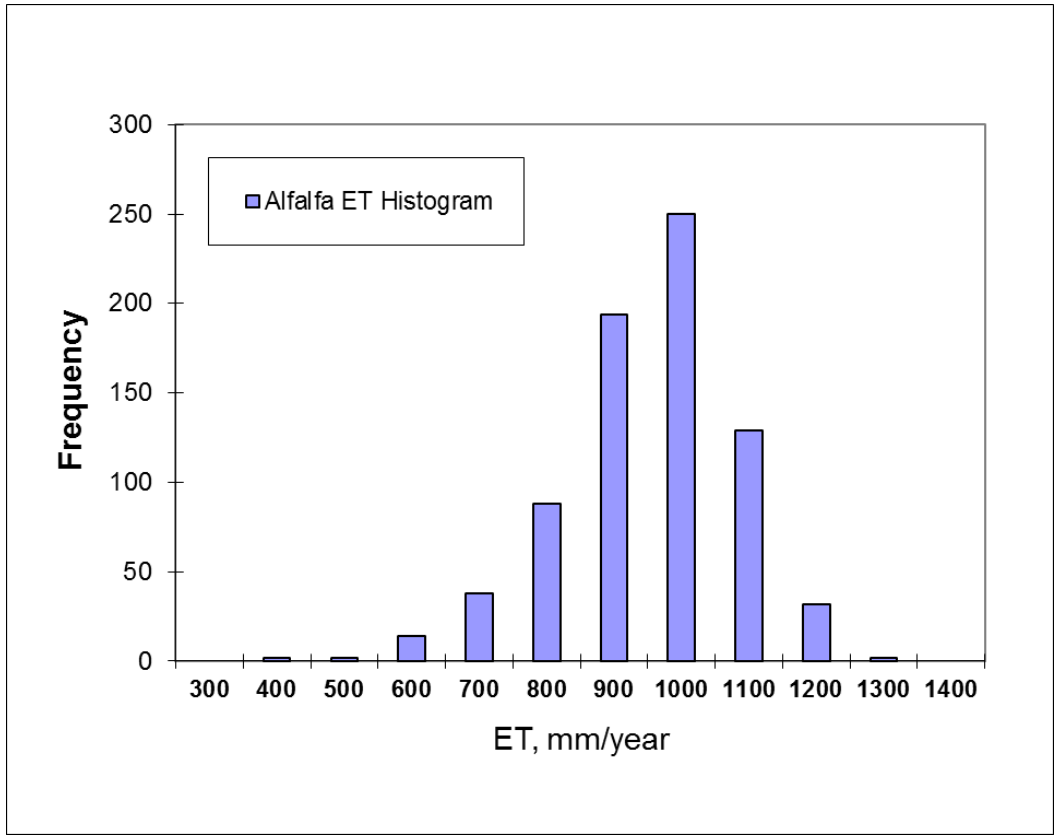
REEM Estimated Annual Average ET (mm), 2002 & 2003, for 279 Mature Mesilla Valley Pecan Orchards (> 10 ac)



This research for other years & other crops is in various stages of completion





Relationship between Pecan Yield & ET?

- Physical & economic outcome of pecan ET?
  - A yield-ET production function
- Parcel-level ET data (2002 & 2003) from REEM
  - n = 279 mature orchards
  - Reliable yield data difficult to obtain
- Reliable yields were obtained from a small number of pecan producers.
  - Function was estimated

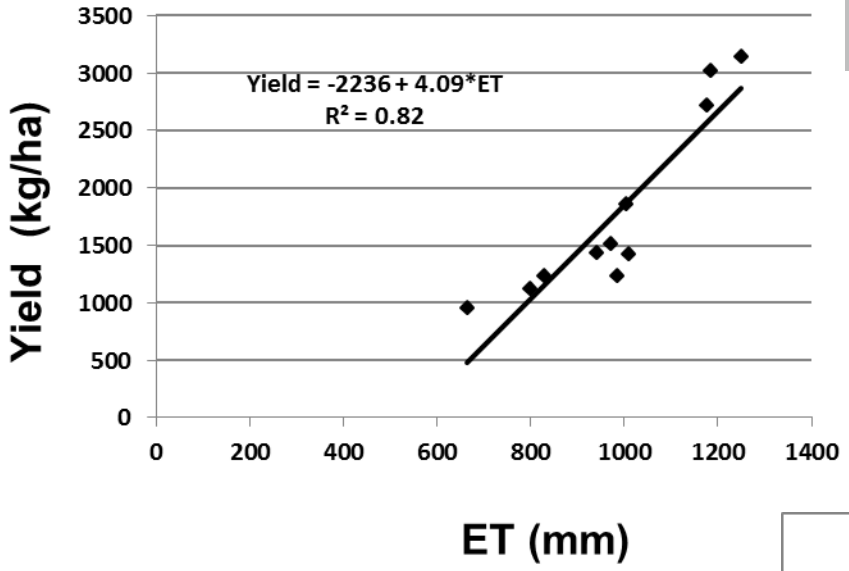


Fig. 1: Yield = f(ET)

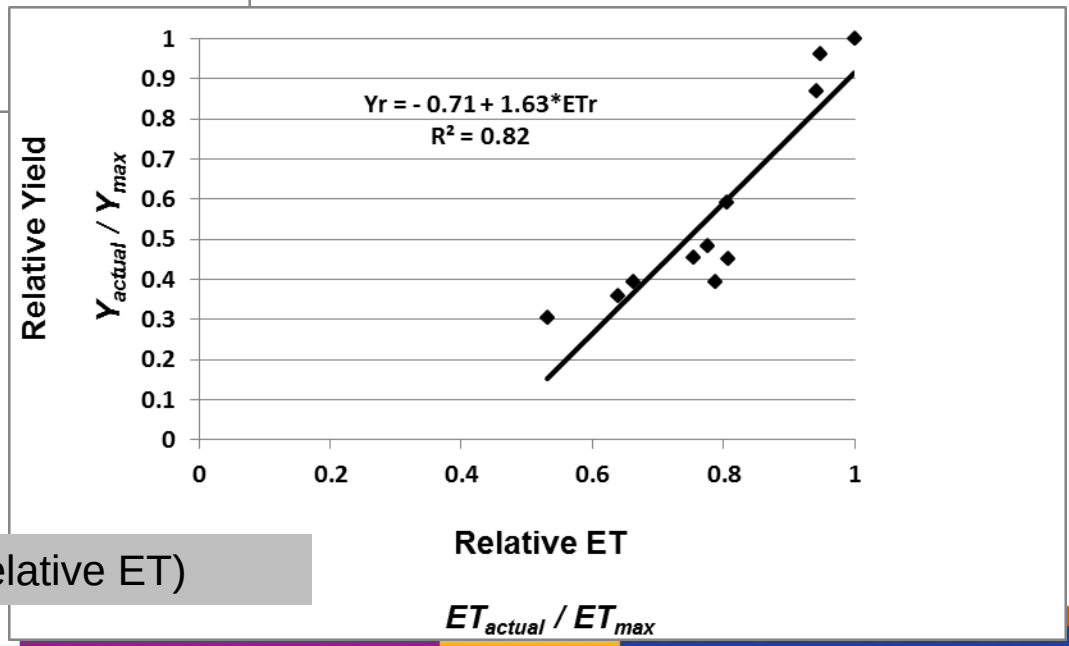


Fig. 2: Relative Yield = f(Relative ET)

Interpretation of the Yield-ET Function

- Yields are reduced because of ET deficit
- Almost all orchards are deficit irrigated

- "Full" irrigation would increase total production
  - ~40%
  - Increase gross revenues

- Pecan consumptive use or depletion ↑ by ~25%

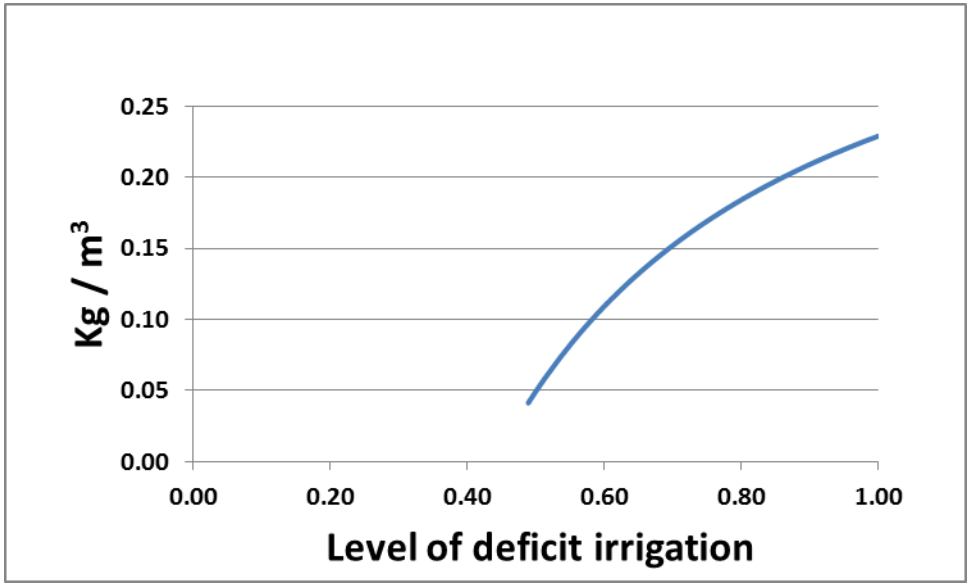
Implications

- Almost all pecan orchards are not irrigated at or near-potential ET.
- Almost all producers do not achieve potential or near-potential yields.
- Improvements in irrigation infrastructure & technology will increase depletions.
- Many reasons why production is less than potential.

Why the ET-Yield deficits?

- Current operating & structural limitations of existing irrigation system (including surface water quality)
- Many producers are not dependent upon pecan production for their livelihoods.
  - Not interested or able to change on-farm irrigation system or practices.
- Little investment in new on-farm technology
  - Land fragmentation
  - Speculation, impermanence
- Common property nature of irrigation system segments.
- Economically rational decisionmaking
  - Max yields are not economically optimal

Water Use Efficiency: Yield vs. ET



"Crop per Drop?"

Related Policy Questions

- Should policies, programs & planning be based on theoretical-potential or actual consumptive use?
- Given irrigation infrastructure limitations & pecan producers' constraints, what ET & yields are actually feasible?
- Policies & programs seek to increase depletion
  - Is that sustainable?
  - Downstream effects
- Does agriculture "waste" water?
  - Deficit irrigation vs. water use efficiency?

Acknowledgements

- This research is part of the “Efficient Irrigation for Water Conservation in the Rio Grande Basin” project (a joint project of the Texas A&M University System Agriculture Program & New Mexico State University).

- The research was also supported by the New Mexico Agricultural Experiment Station, the New Mexico Office of the State Engineer (Governor’s Water Innovation Fund), the New Mexico Interstate Stream Commission, the United States Bureau of Reclamation, the National Science Foundation New Mexico EPSCoR Project & the New Mexico Water Resources Research Institute.