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Whole Farm Management for Efficient Water Use

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THE UNIVERSITY OF ARIZONA

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Irrigated Agriculture in Arizona

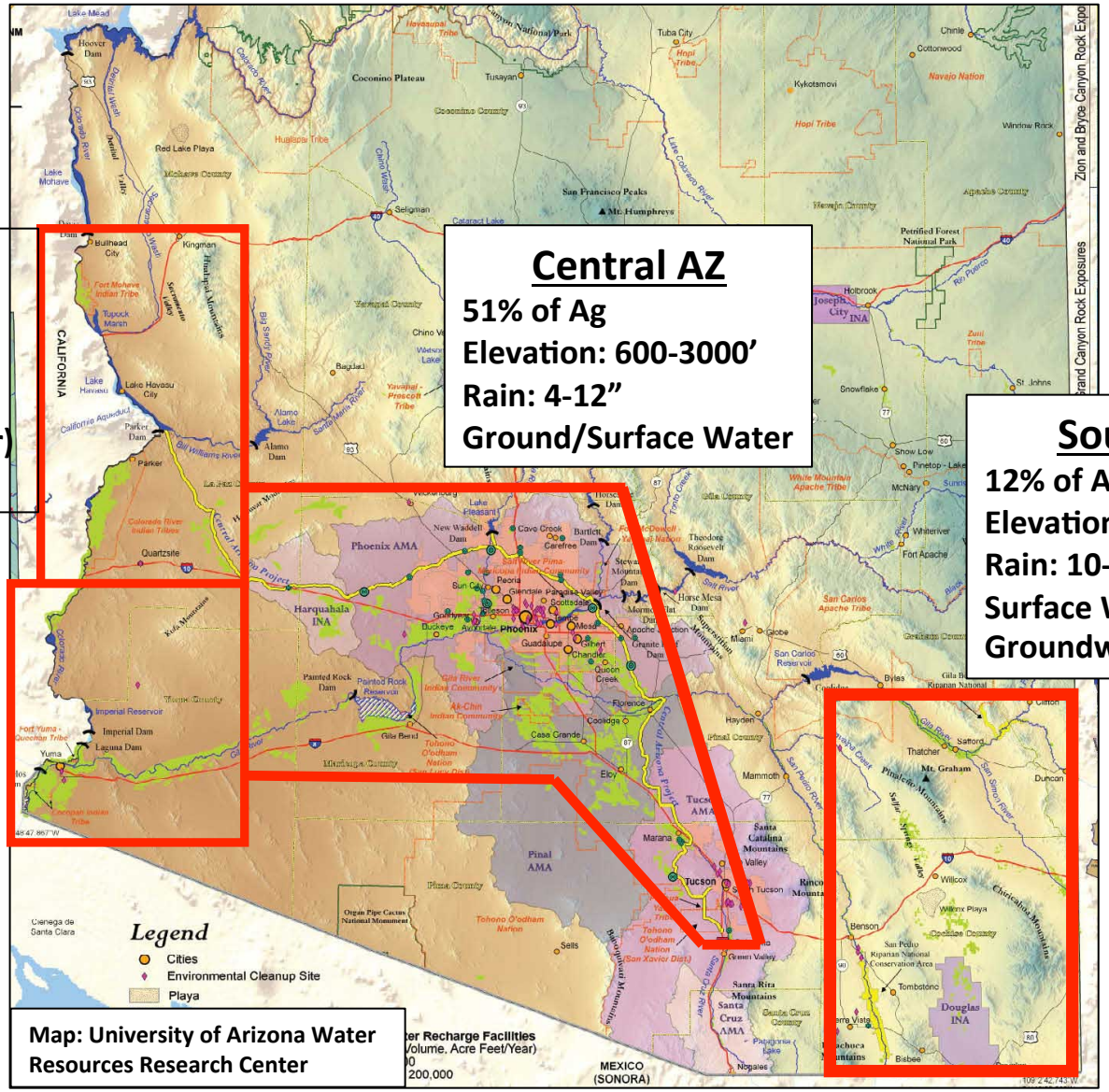
Irrigated Area: ~850,000 Acres

Northwest AZ
12% of Ag
Elevation: 400-3000’
Rain: 4-8”
Surface Water (CO River)
Groundwater (“Inland”)

Central AZ
51% of Ag
Elevation: 600-3000’
Rain: 4-12”
Ground/Surface Water

Southeast AZ
12% of Ag
Elevation: 3000-4400’
Rain: 10-16”
Surface Water (Gila V)
Groundwater (Cochise Co.)

Southwest AZ
25% of Ag
Elevation: < 600’
Rain: <4”
Surface Water



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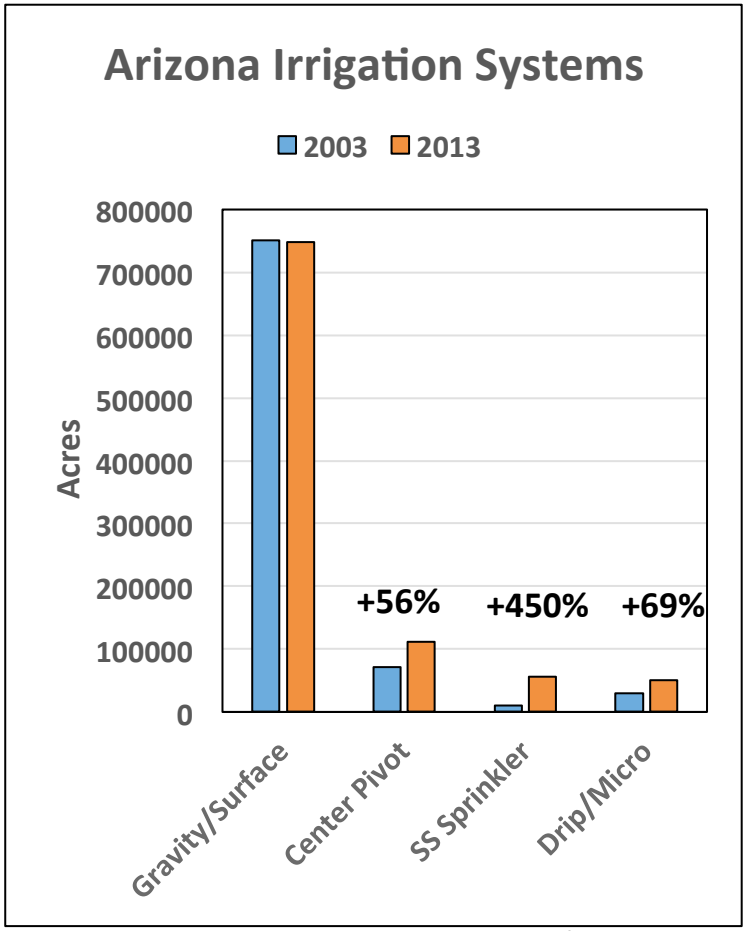
Arizona Irrigation Systems



Source: 2003 & 2013 Farm & Ranch Survey; USDA/NASS

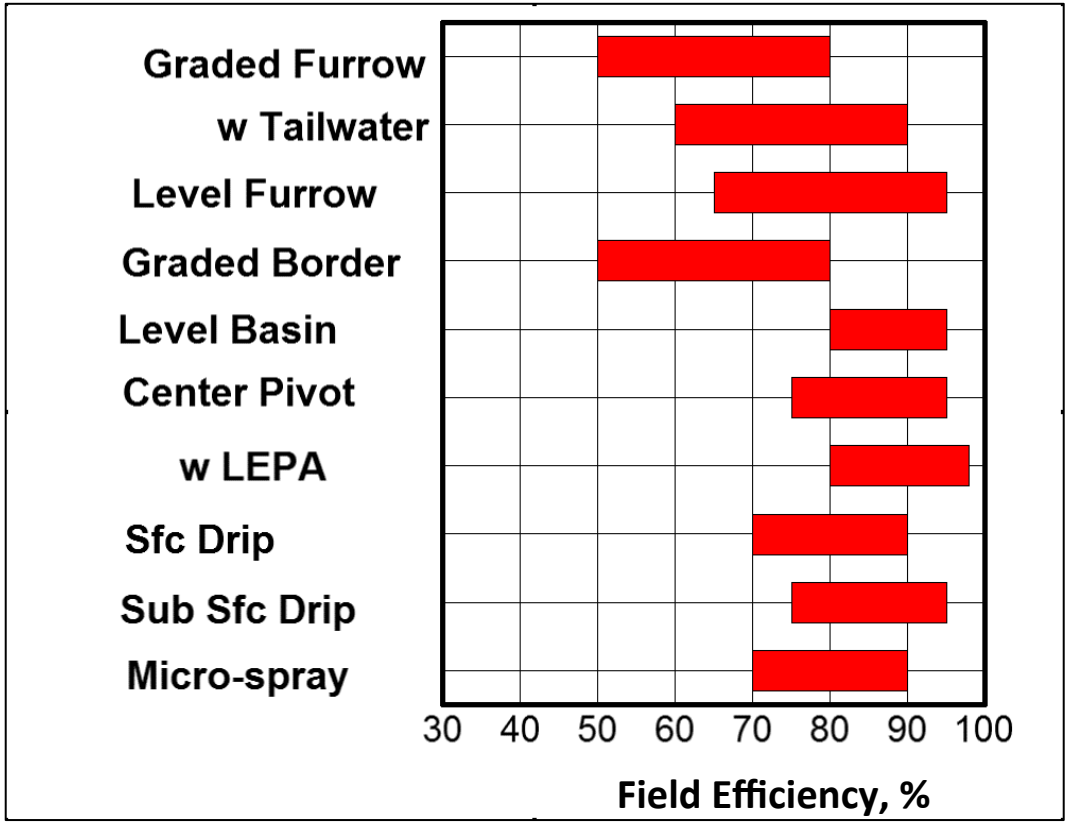
Irrigation System Efficiency

Field/Application Efficiency

$$Ea = 100*Vp/Vf$$

Where:
Vp: Crop irrigation need
Vf: Water delivered to field

Crop irrigation need may include beneficial uses such as water required for leaching, germination, cooling, etc.



Source: Howell, T. 2003. Irrigation Efficiency. In: Encyclopedia of Water Science. 2003. Marcel Dekker Inc.

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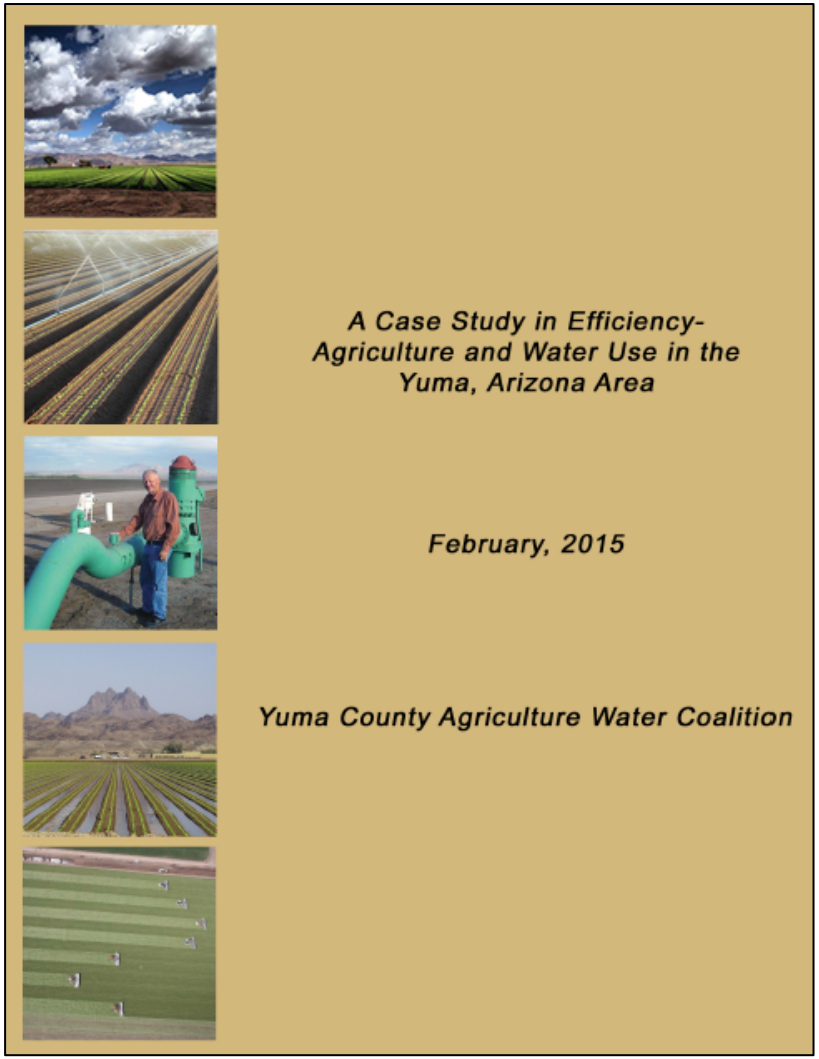
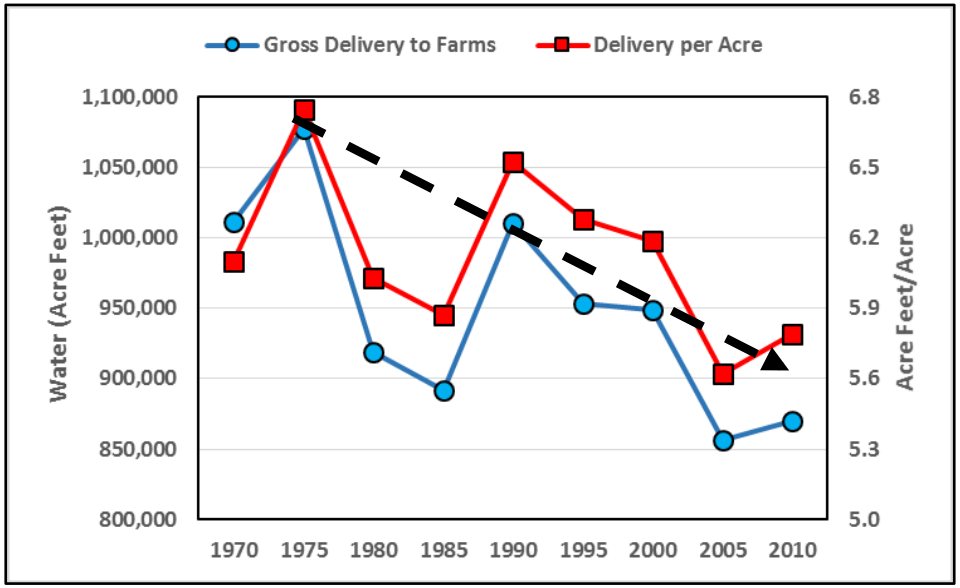
Yuma Case Study Report

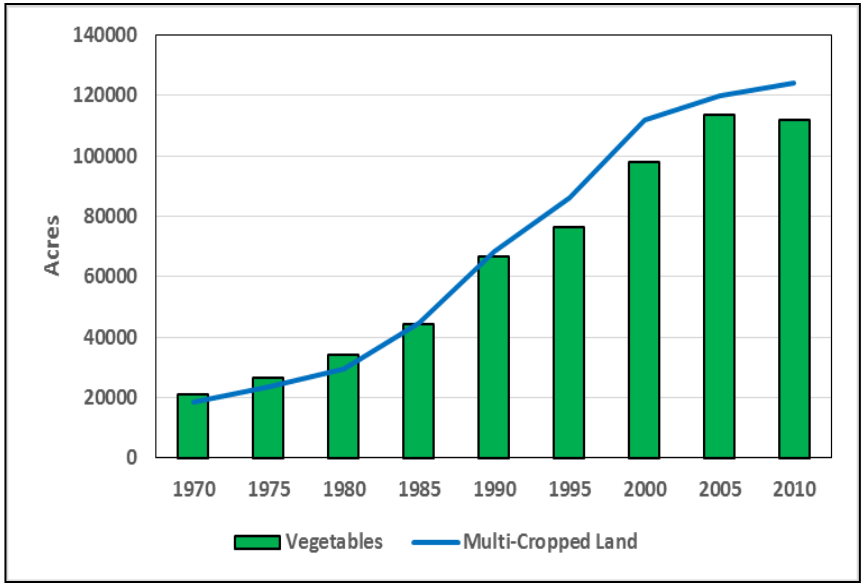


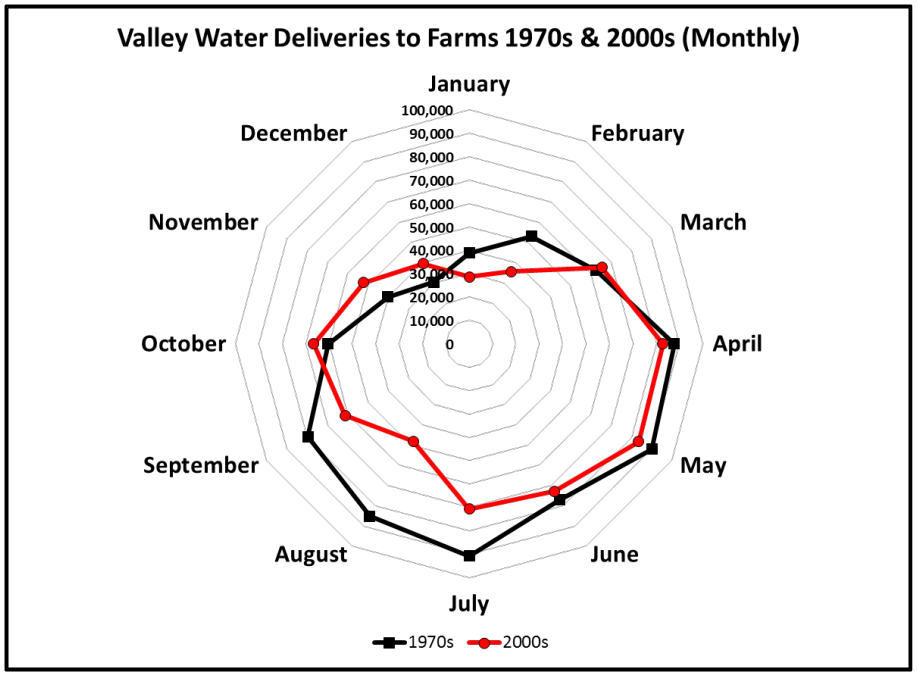
http://www.agwateryuma.com/



Agricultural water use has decline ~18 % since 1975

Transition to Vegetable/Multi-Crop Production

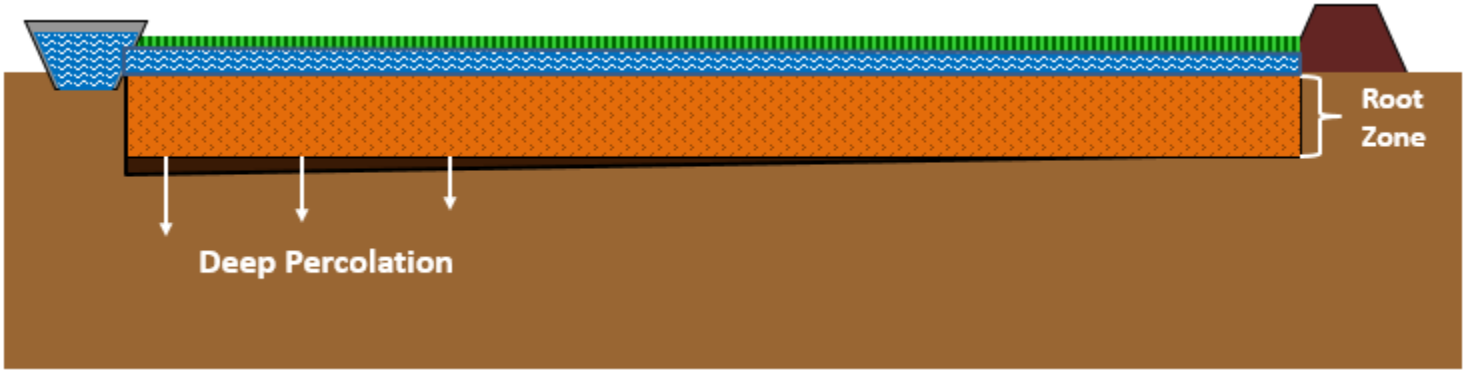




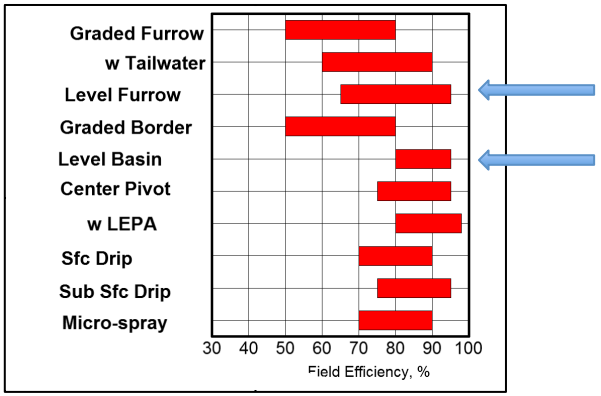
Winter-centric production systems
Second crop often wheat/melons

Reduction in summer irrigation

Level Furrow/Basin Irrigation

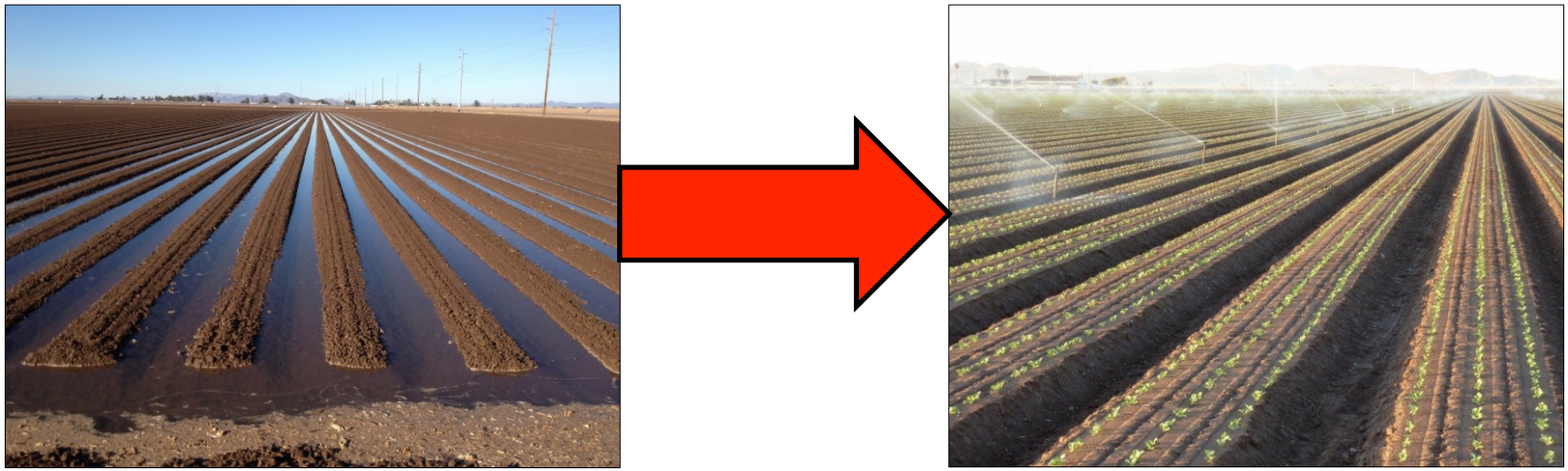


High flows, rapid advance of water limits deep percolation



Source: Howell, T. 2003. Irrigation Efficiency. In: Encyclopedia of Water Science. 2003. Marcel Dekker Inc.

Elimination of Subbing



Sprinklers have replaced subbing as a means of establishing vegetable crops. Water used to establish vegetable crops has decreased by 50-75%.

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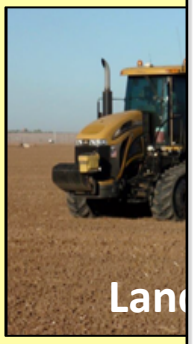
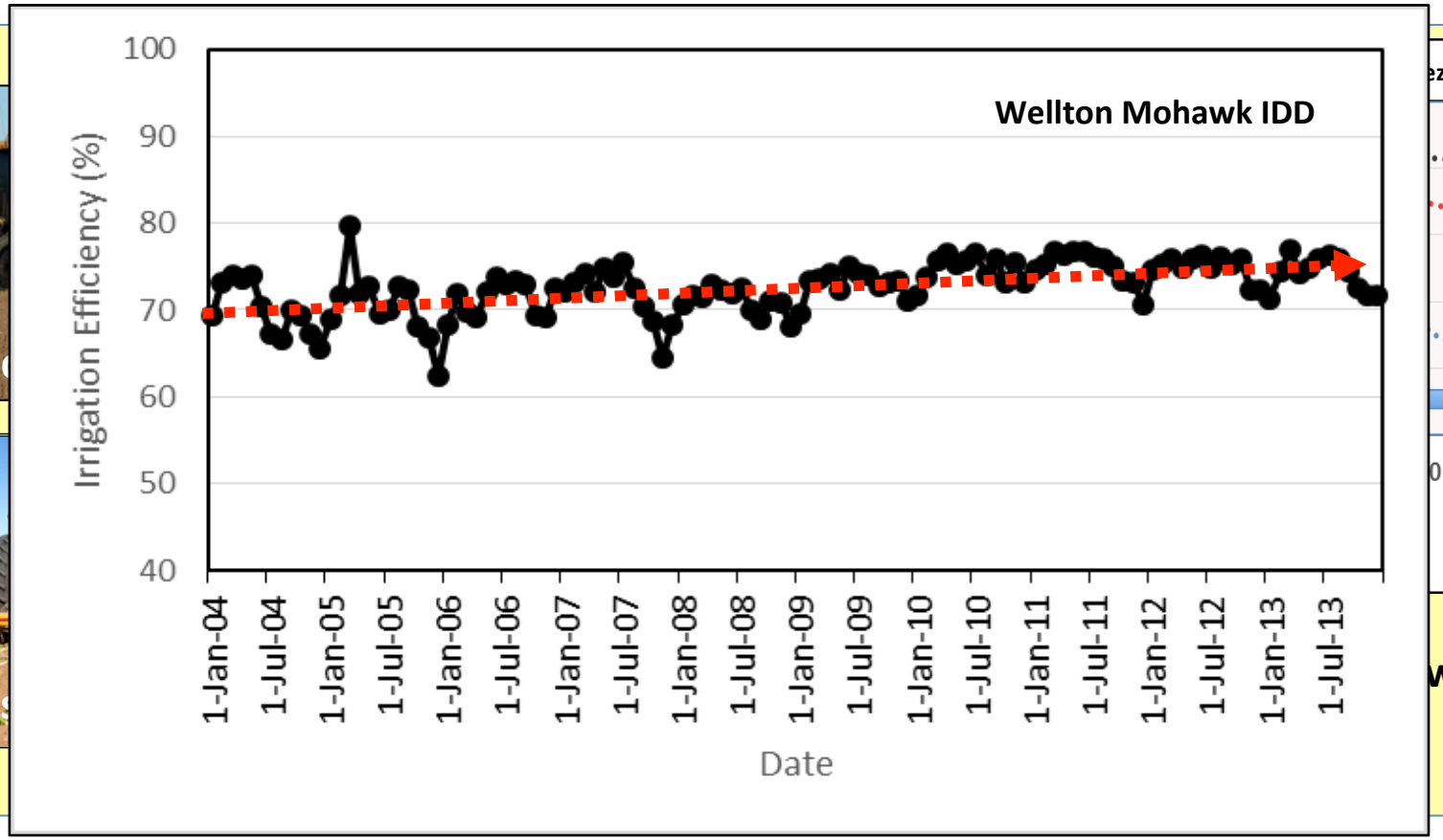
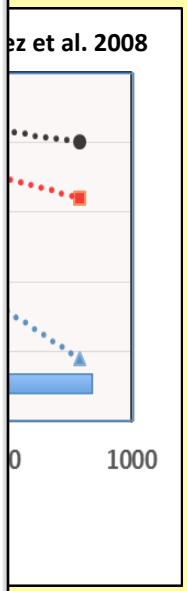
Improved Surface Irrigation Efficiency

Yuma County

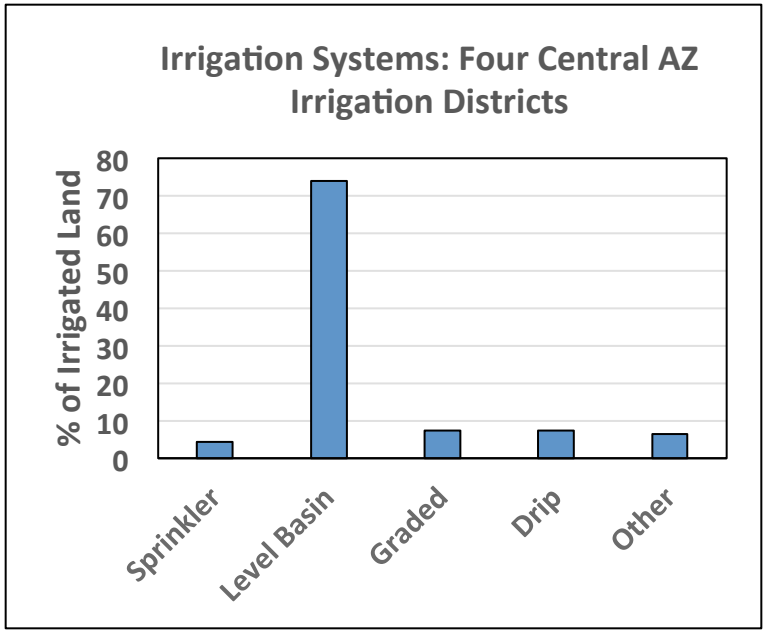






with

Surface Irrigation Statewide



Source: HDR Engineering Tech Memorandum to Central AZ Project

Practice	Farms	Acres
Lined Ditches/Pipes*	1558	688,502
Laser Leveling**	579	391,499
Diking**	397	155,510
Reduced Set Times**	469	97,039
Tailwater Systems**	147	59,545
Alternate Row	87	46,096

2008 Farm & Ranch Survey; USDA, NASS
***Total Farms: 2064; Acres = 764655**
****Total: Farms = 1167; Acres = 621,190**

Sprinkler Irrigation Trends

- Center Pivots
  - Improved efficiency
    - Automation, nozzle improvement
    - LEPA; LESA; LPIC
    - Precision technologies
  - Most popular in SE Arizona

- Solid Set
  - Growing popularity in SW Arizona
    - Crop establishment
    - Wide bed produce
    - Wheat production

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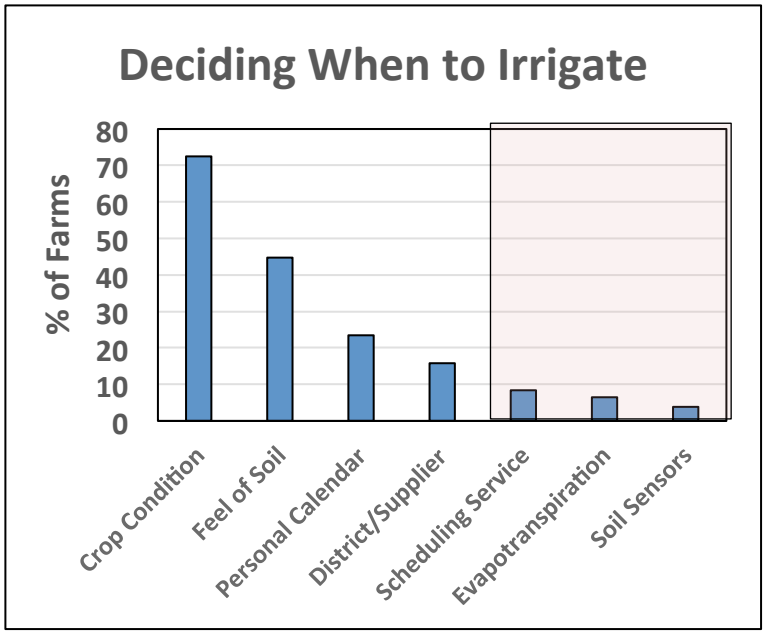
Southeast Arizona
Tree Nut Production


Mature Pecan Orchard


Young Pistachio Orchard

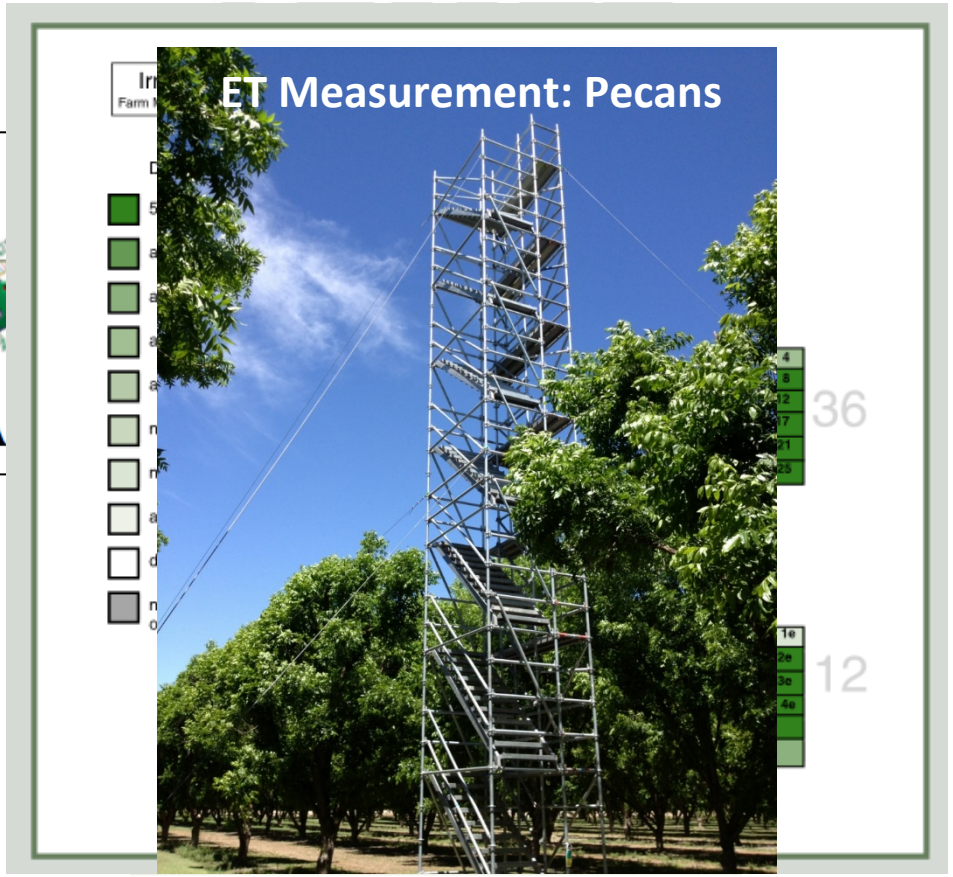
Nut trees have replaced cotton & alfalfa as a way to improve farm profitability in Southeast Arizona. Most new plantings use drip/micro-irrigation to apply water.

Decisions Regarding Irrigation Timing



USDA 2013 Farm and Ranch Irrigation Survey

Limited use of scientific scheduling methods



Source: Farm Credit Services Southwest, 2004, https://www.fcssw.com/en/About-Us/~/media/Files/Newsletter/spring04.ashx

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Improving Irrigation Efficiency

Barriers

Barriers to Irrigation Improvements	Farms	Land (a)	Water (a-ft)
Landlord will not share costs	297	192,388 (23%)	919,114 (17%)
Improvement won't cover install. costs	560	124,760 (15%)	572,066 (11%)
Cannot finance improvements	1209	121,436 (14%)	519,227 (10%)
Will not be farming long enough	243	97,354 (10%)	520,142 (10%)
Uncertainty about water future	598	114,054 (13%)	443,406 (8%)

2013 Farm and Ranch Survey, USDA, NASS

Values in ( ) represent % of irrigated land or % of ag water use

-Remote Land Ownership
-Poor Economic Return
-Financing
-Urbanization/Age
-Water Future

NRCS EQIP for irrigation improvements (since 1997): $74 Million
NRCS EQIP for sprinkler/drip irrigation: $42 Million on 182,000 acres