Understanding and Managing Water Demand in Agriculture

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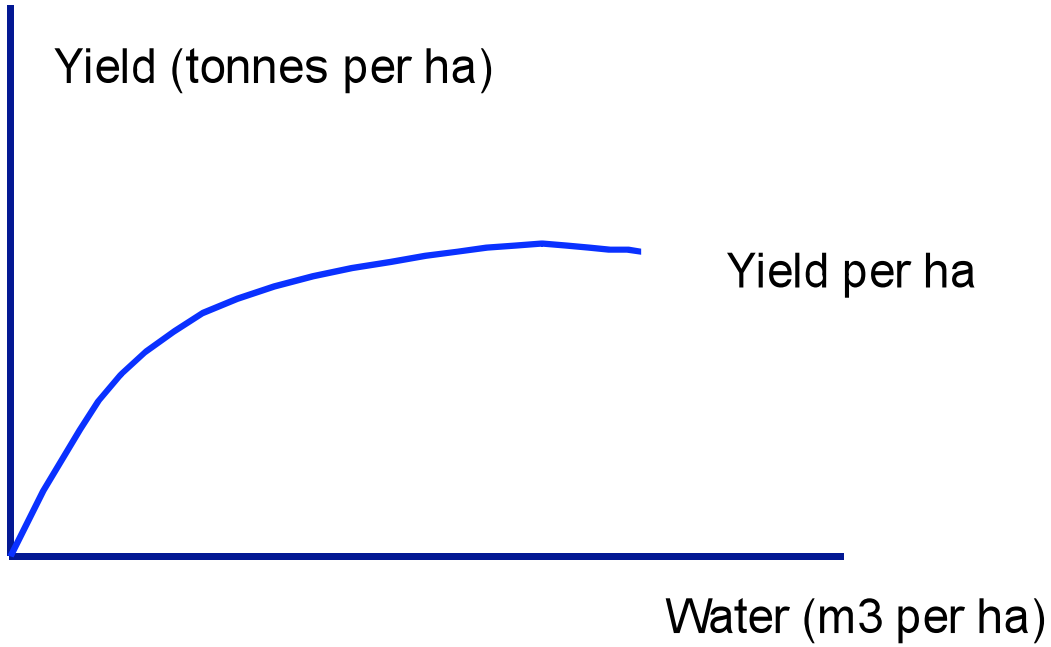
Understanding Demand Management

- Conceptual Foundation
- A Working Definition
- Goals and Approaches
- An Example: Broadview Water District
- Pricing Design and Irrigation Responses
- Summary

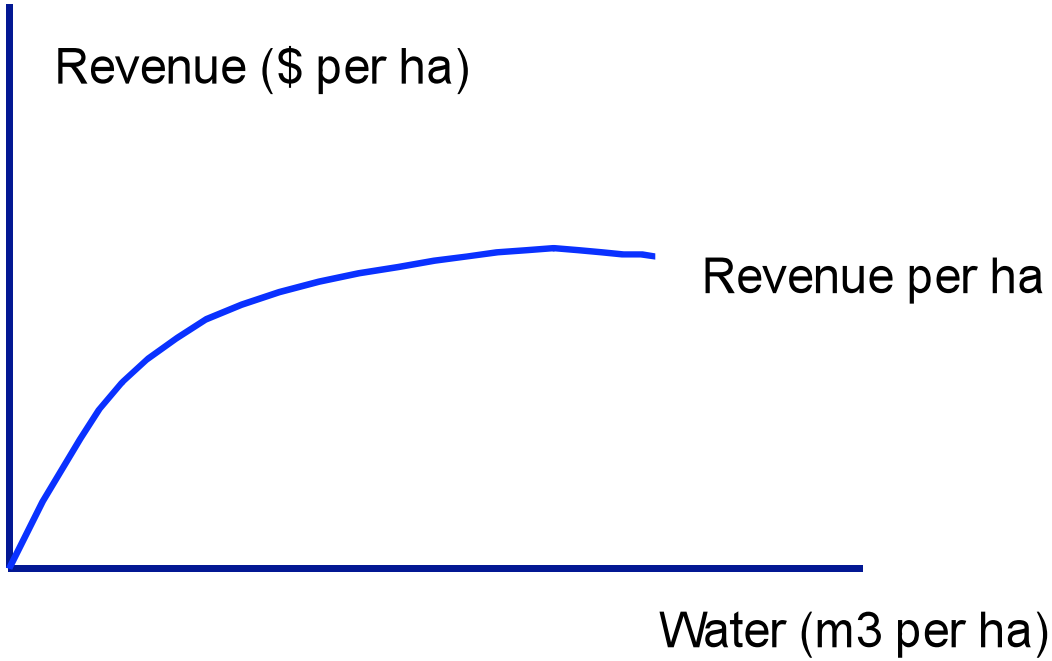
Conceptual Foundation

Starting with a Production Function



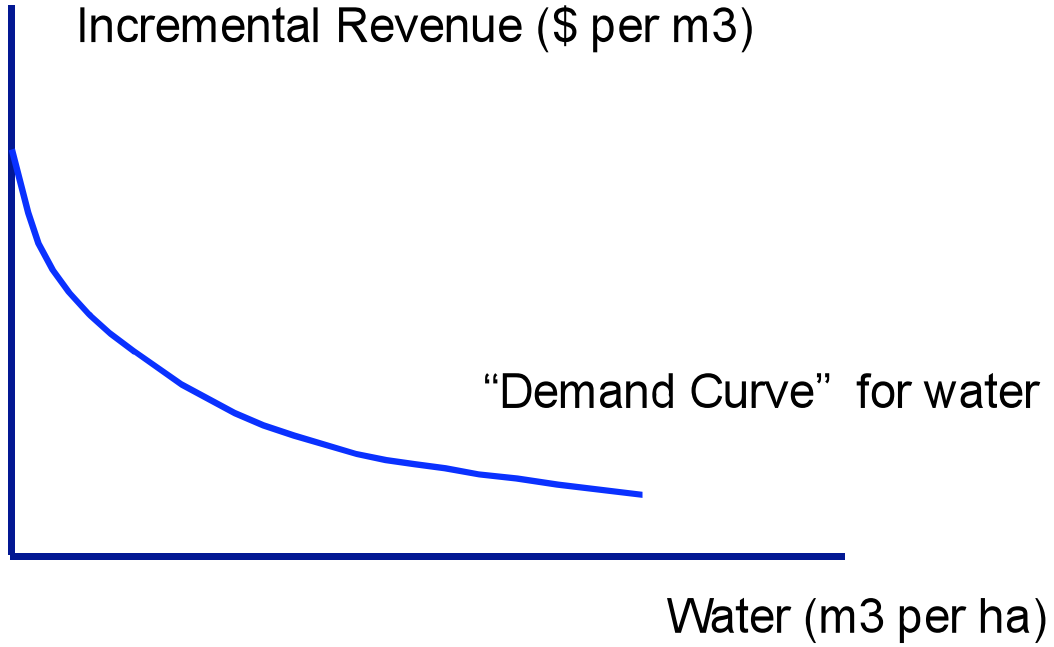
Conceptual Foundation

Converting to a Revenue Function



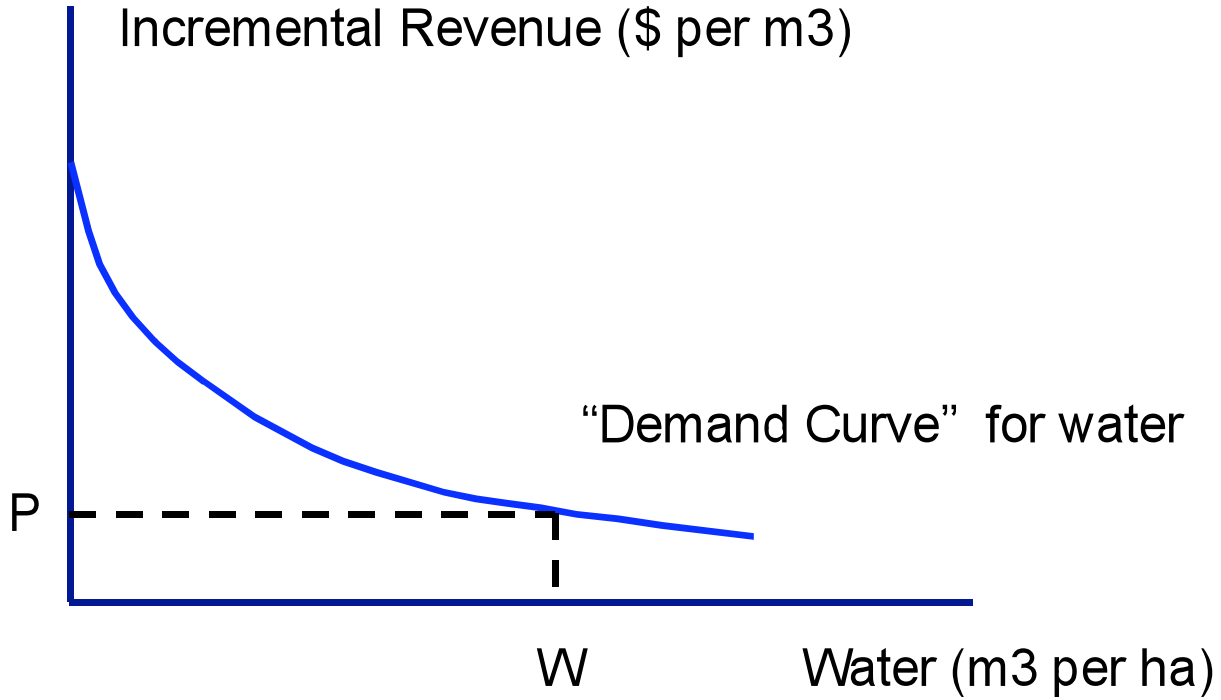
Conceptual Foundation

Deriving the Incremental Revenue Function



Conceptual Foundation

Demand: A schedule of prices and amounts



A Working Definition of Water Demand Management

Water Demand Management involves efforts to:

A. Move farmers along the water demand curve, and

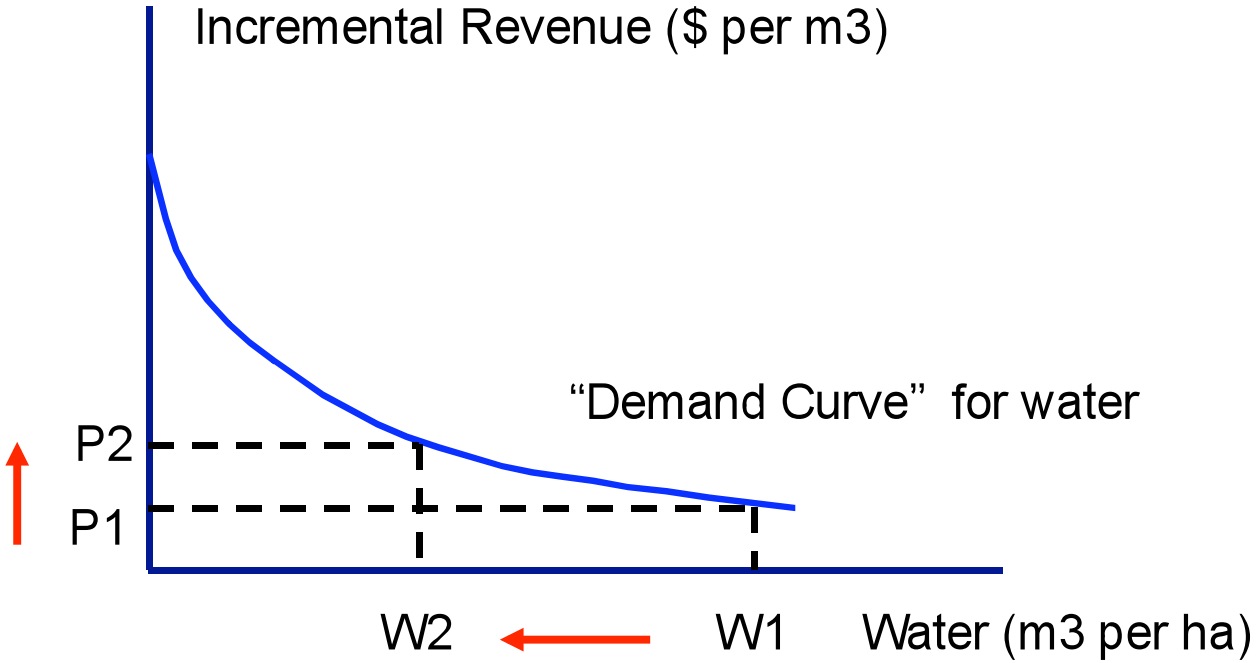
B. Shift the water demand curve inward.

Goals and Approaches

- Goal A: Moving Farmers Along the Curve
  - Adjusting Water Prices
  - Adjusting other input prices
  - Imposing Water Allocations
- Goal B: Shifting the Water Demand Curve
  - Through improvements in technology
  - Through improvements in productivity
  - By correcting market distortions

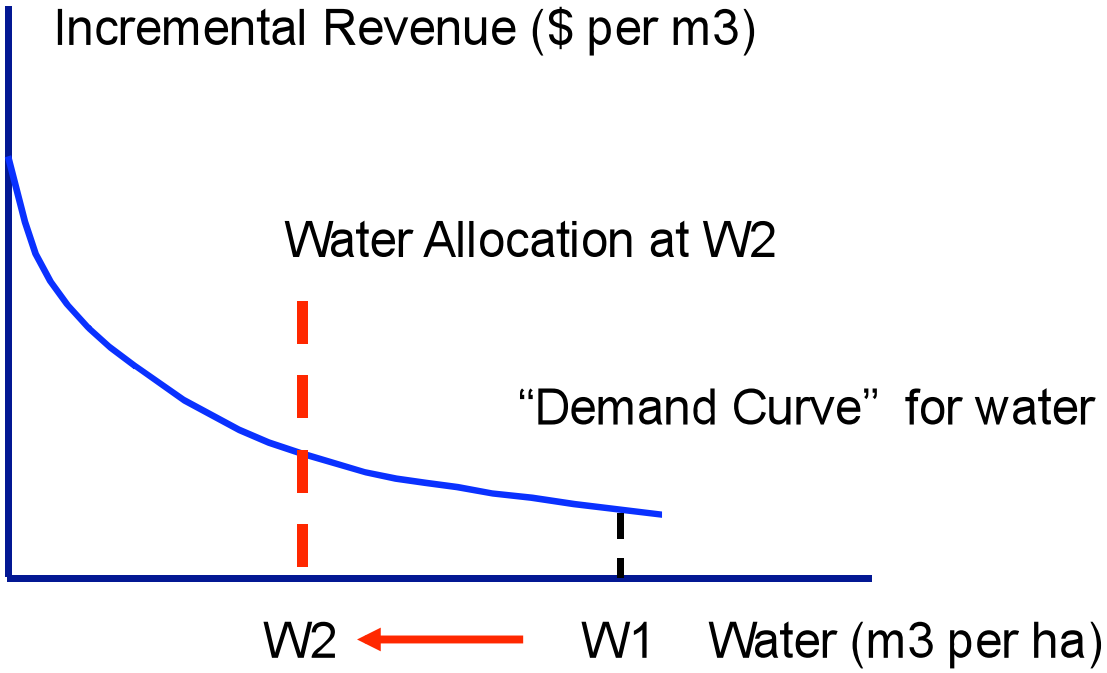
Goals and Approaches

Movement Along the Curve via Prices



Goals and Approaches

Movement Along the Curve via Allocations



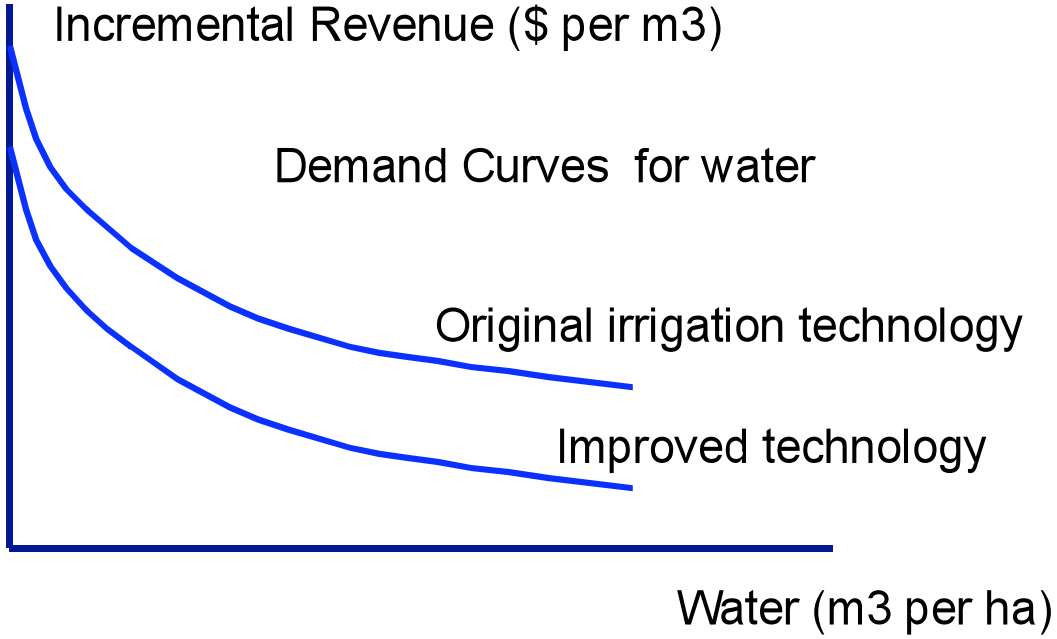
Shifting the Water Demand Function

Water Demand is a function of many variables, some of which are shifters in price-quantity space.

W = W(water price | irrigation technology,
crop production technology,
crop prices,
other input prices,
climate)

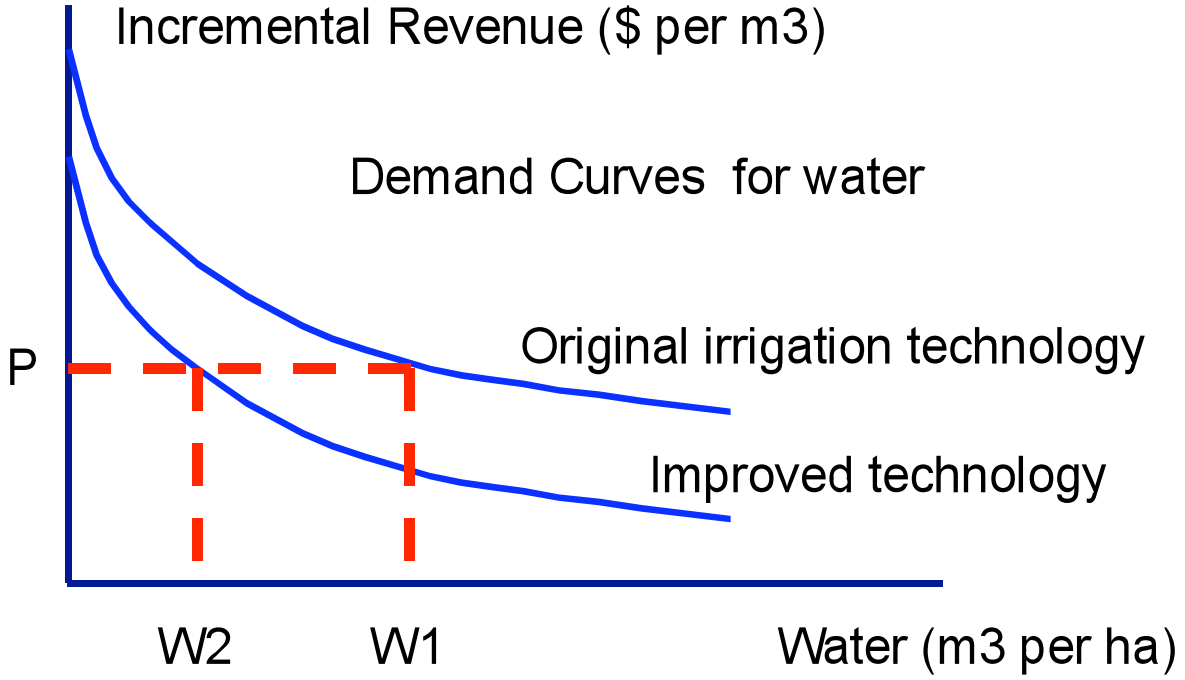
Goals and Approaches

Consider the role of irrigation technology.



Goals and Approaches

At any price, a smaller quantity is demanded.



Additional Considerations Regarding Water Demand Function Shifters

- Shifting the Demand Curve Inward
  - Improving irrigation technology
  - Correcting input price distortions
  - Correcting output price distortions
- Shifting the Demand Curve Outward
  - Improvements in crop productivity
  - Increases in crop prices
  - Possible implications of climate change

An Example of Water Demand Management: The Broadview Water District

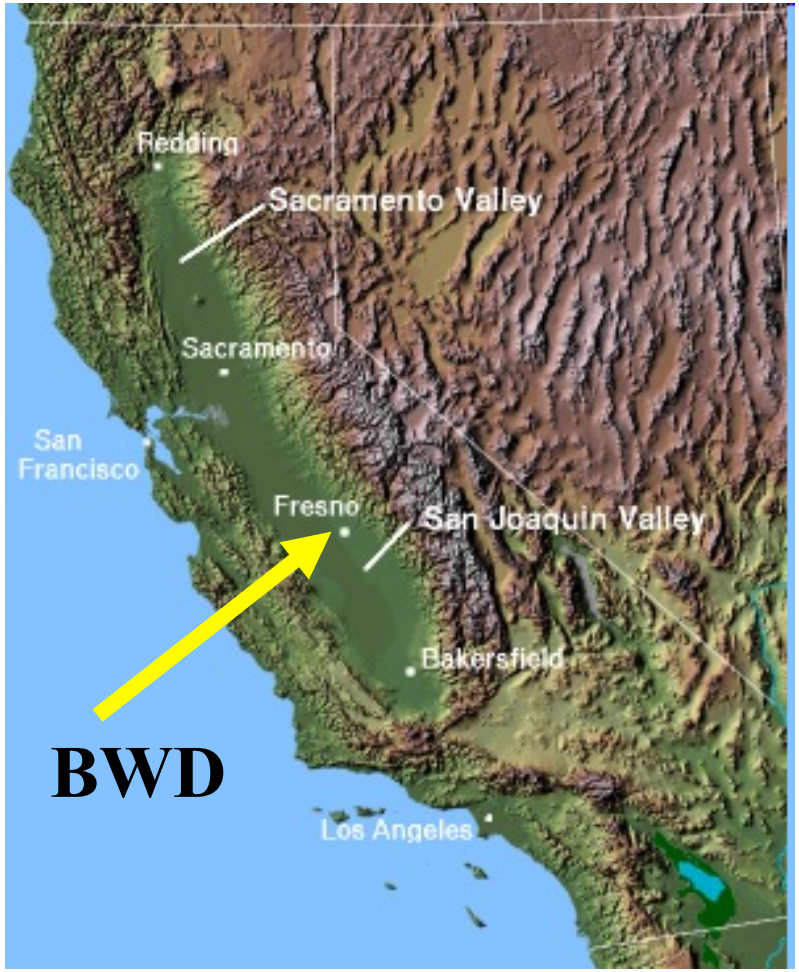
Location: San Joaquin Valley of California

Area: 4,000 hectares

Crops: Cotton, Tomatoes, Melons, Sugarbeets, Wheat

Water Supply: Surface water in a federal canal project

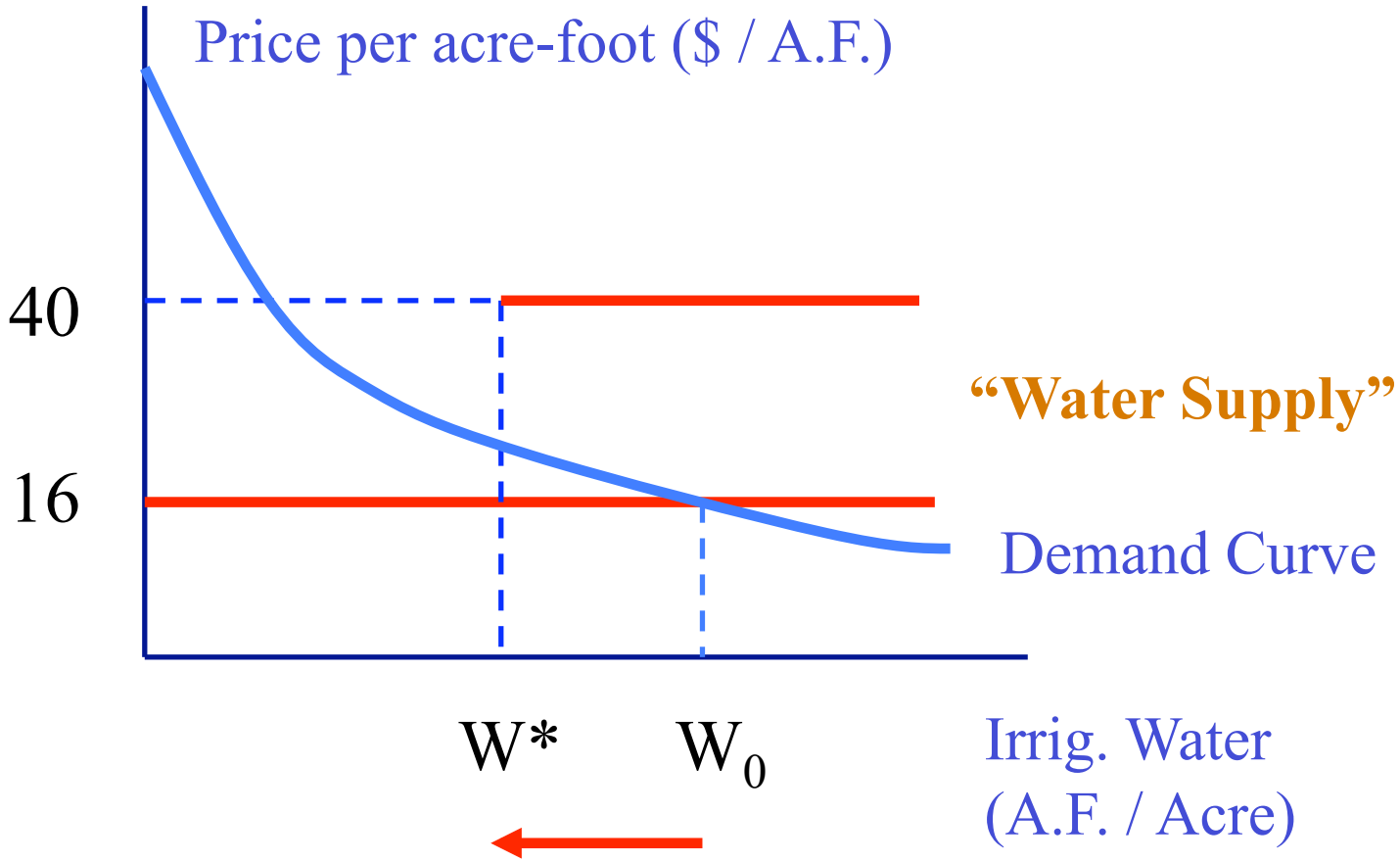
Established: 1955



Irrigation and Drainage Problems at BWD

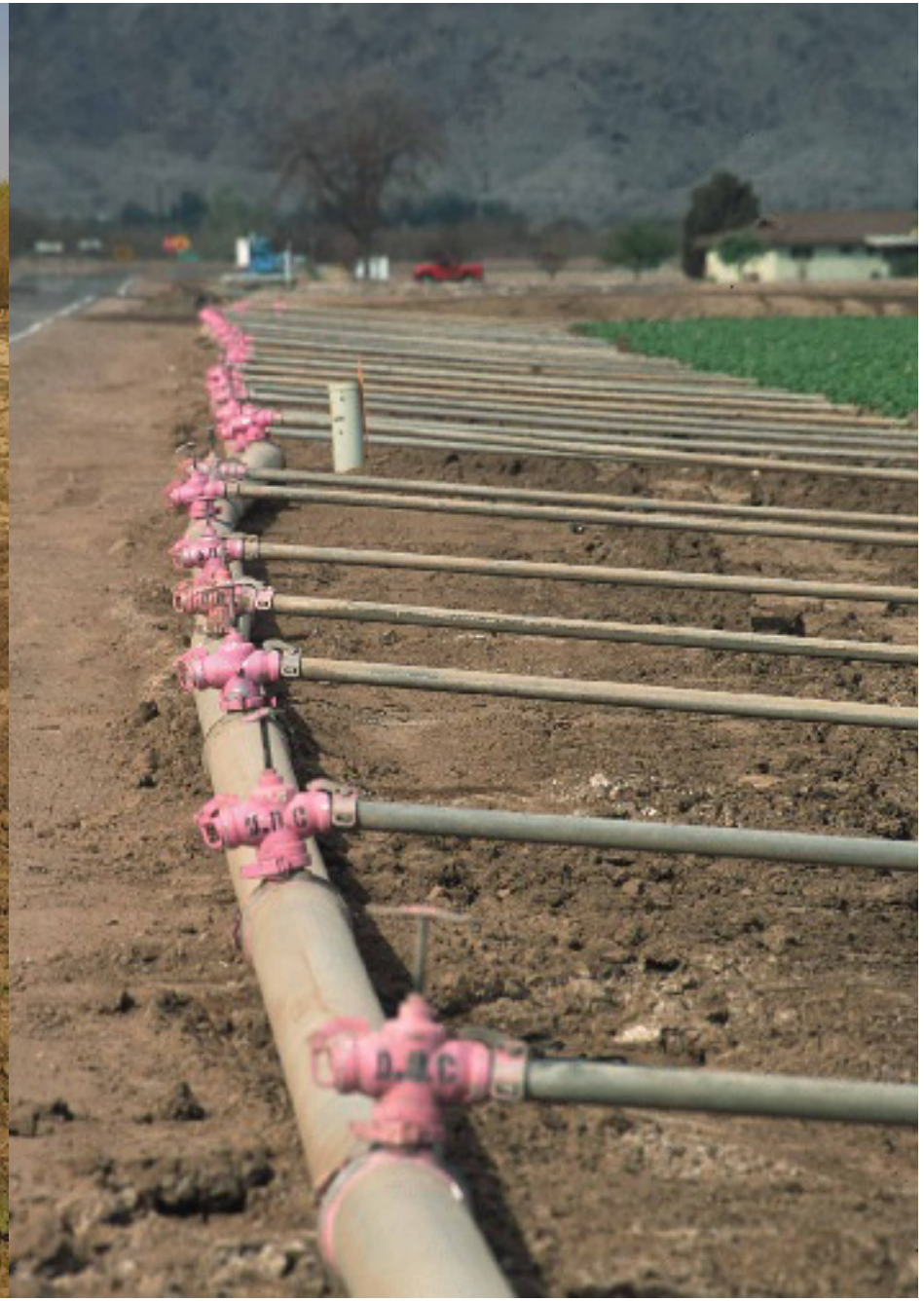
- Excessive irrigation
- Limited drainage water discharge
- Salinity build-up in soils
- Selenium in drainage water
- Improvements needed in water management
- Implemented increase block-rate pricing

Increasing Block-Rate Prices



Examples of Irrigation Responses

- "Low technology," management solutions
  - Reducing furrow lengths and set times
  - Hiring additional irrigators
  - Training and motivating irrigators
- "High technology" solutions
  - Microsprinklers and drip systems
  - Laser leveling
  - Soil moisture monitoring
  - Shallow groundwater monitoring

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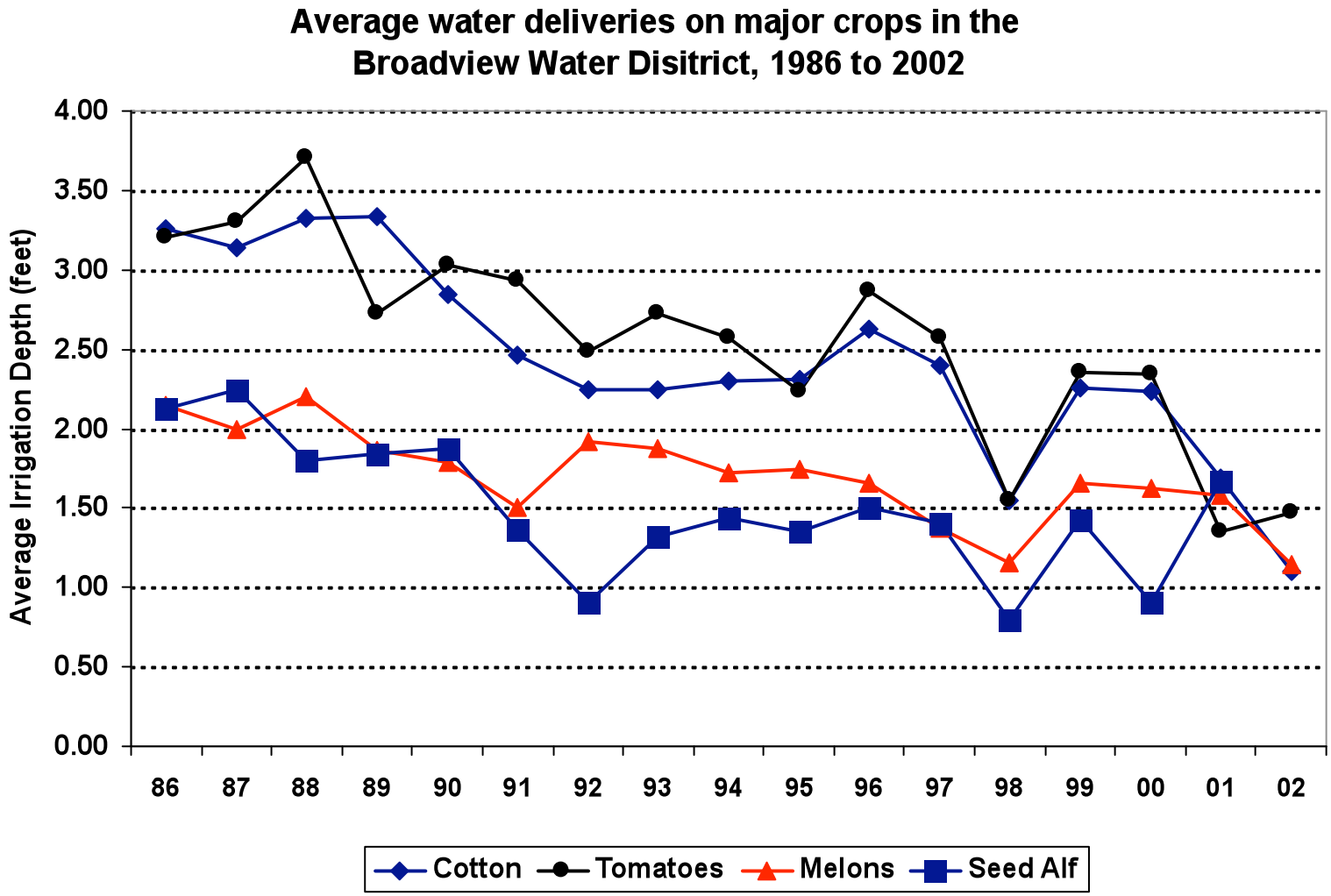
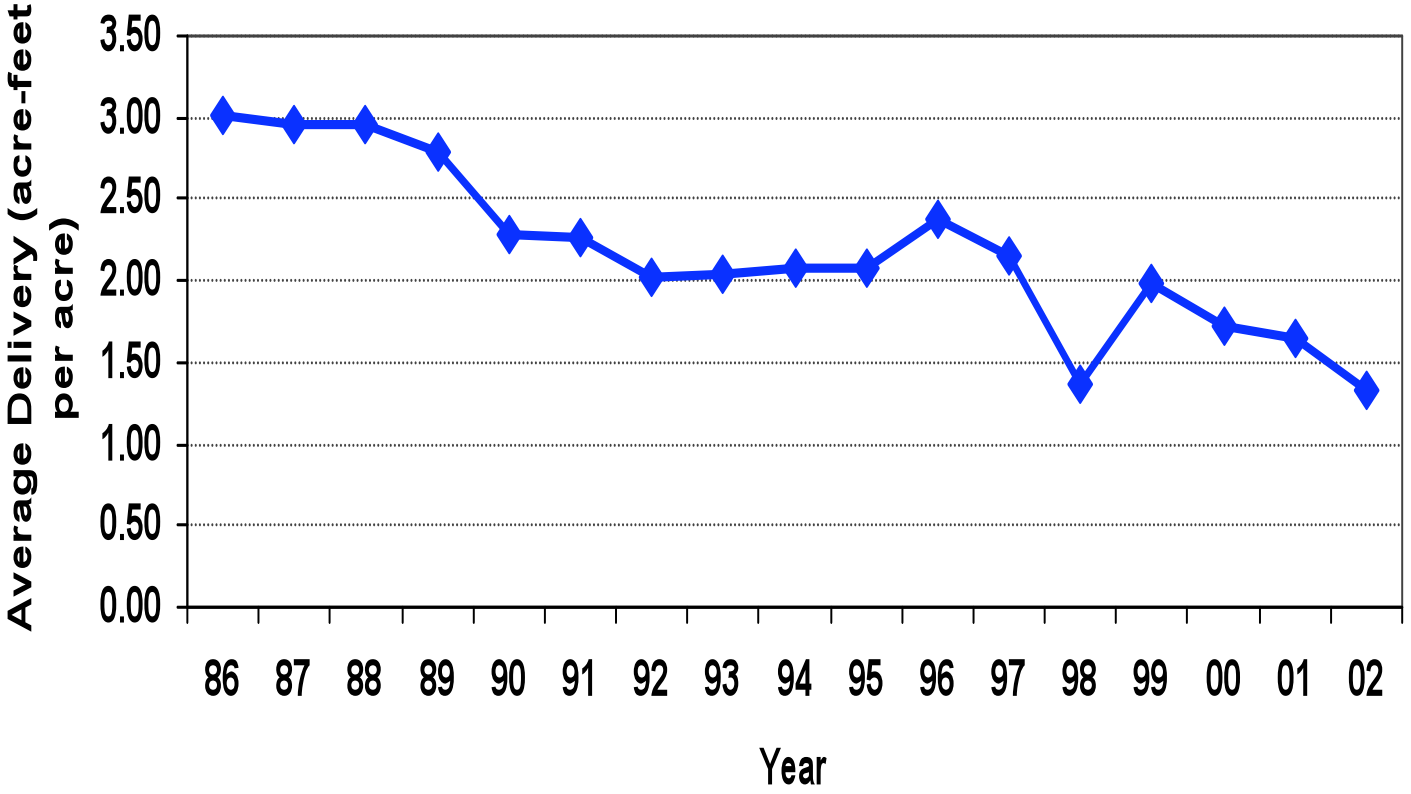
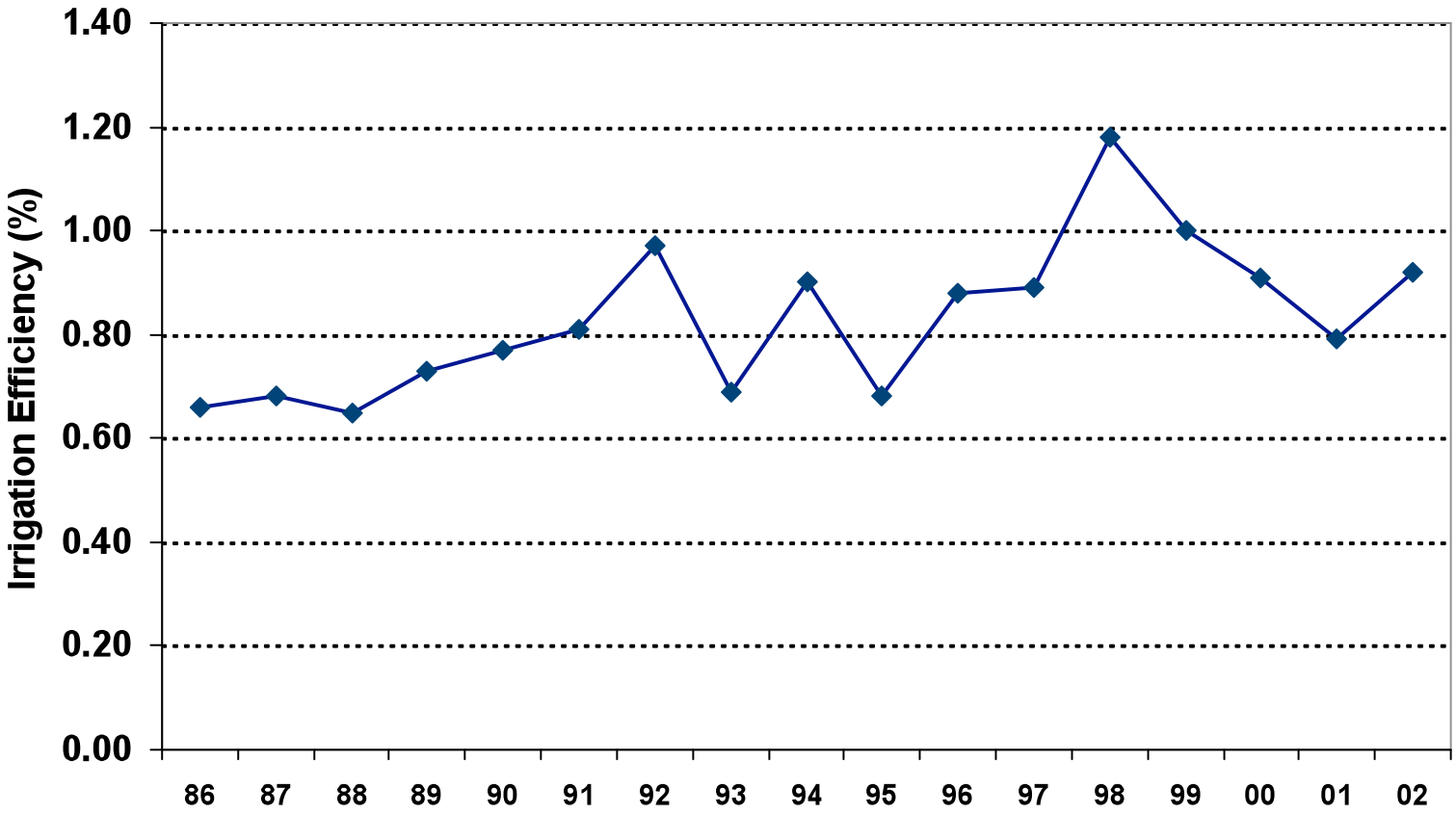

Average water deliveries on major crops in the
Broadview Water Disitrict, 1986 to 2002
Average Irrigation Depth (feet)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
86
87
88
89
90
91
92
93
94
95
96
97
98
99
00
01
02
Cotton
Tomatoes
Melons
Seed Alf

Water Deliveries, Per Acre, in the Broadview Water District, 1986 to 2002



Estimated aggregate irrigation efficiencies in the Broadview Water District, 1986 to 2002



Summary

- Demand is a function; not a number.
- Many dimensions require attention.
- We can shift the demand curve or …
- Encourage farmers to move along the curve.
- Technology is available and affordable.
- Farm-level training and technical assistance enhance demand management programs.

Thank you very much for the opportunity to participate in this important colloquium.