California Irrigation Economics: Trends, Driving Forces and Speculation on the Future

August 14 2008

Richard Howitt

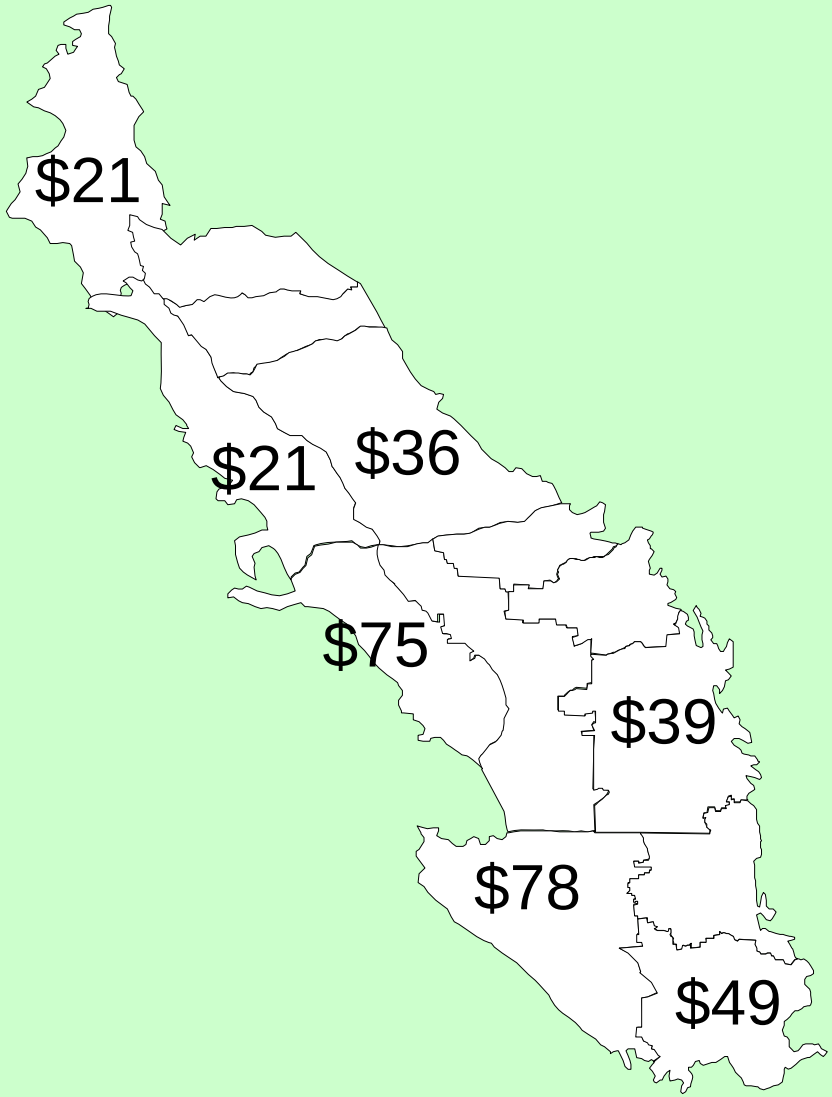
Agricultural & Resource Economics

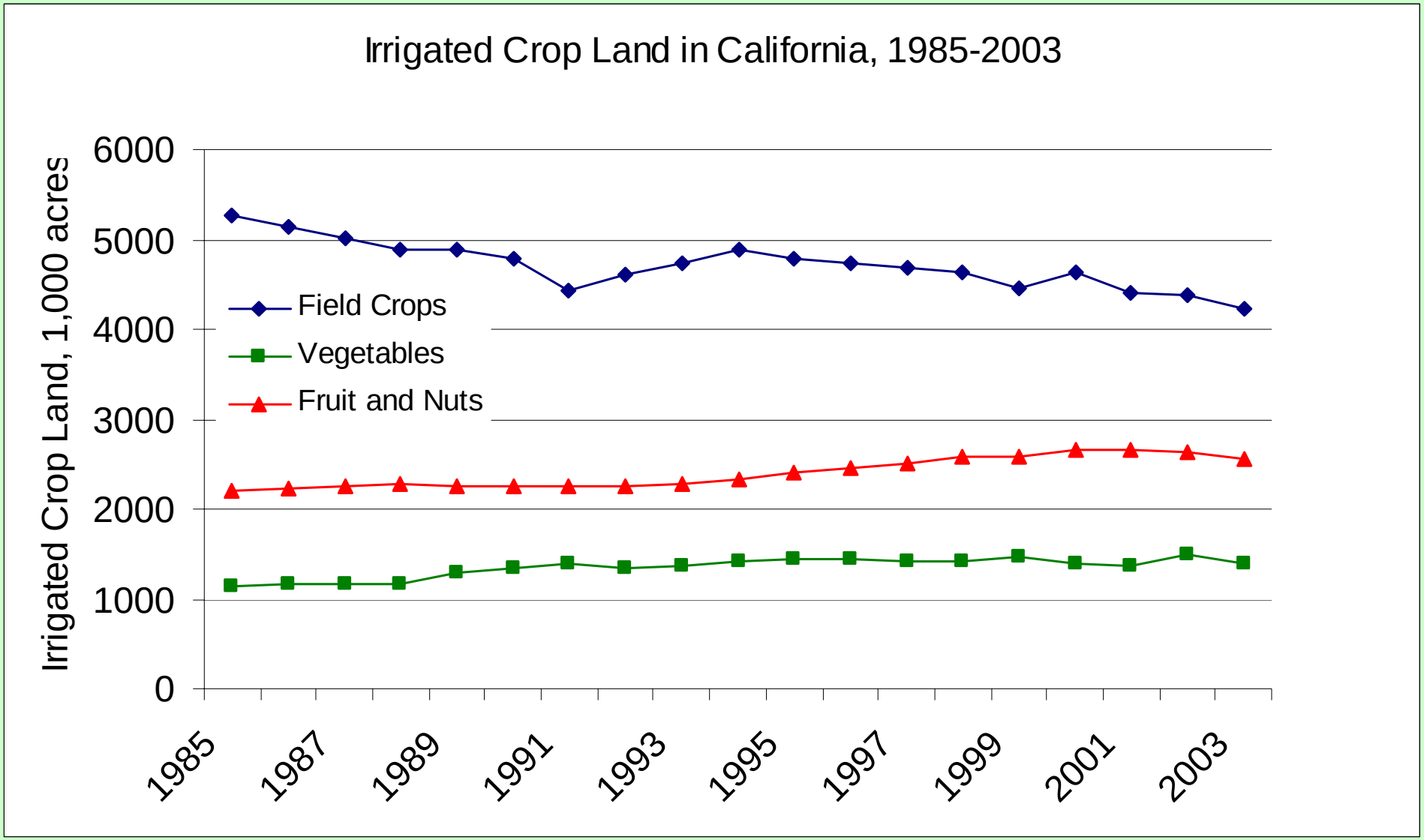
UC Davis

Overview

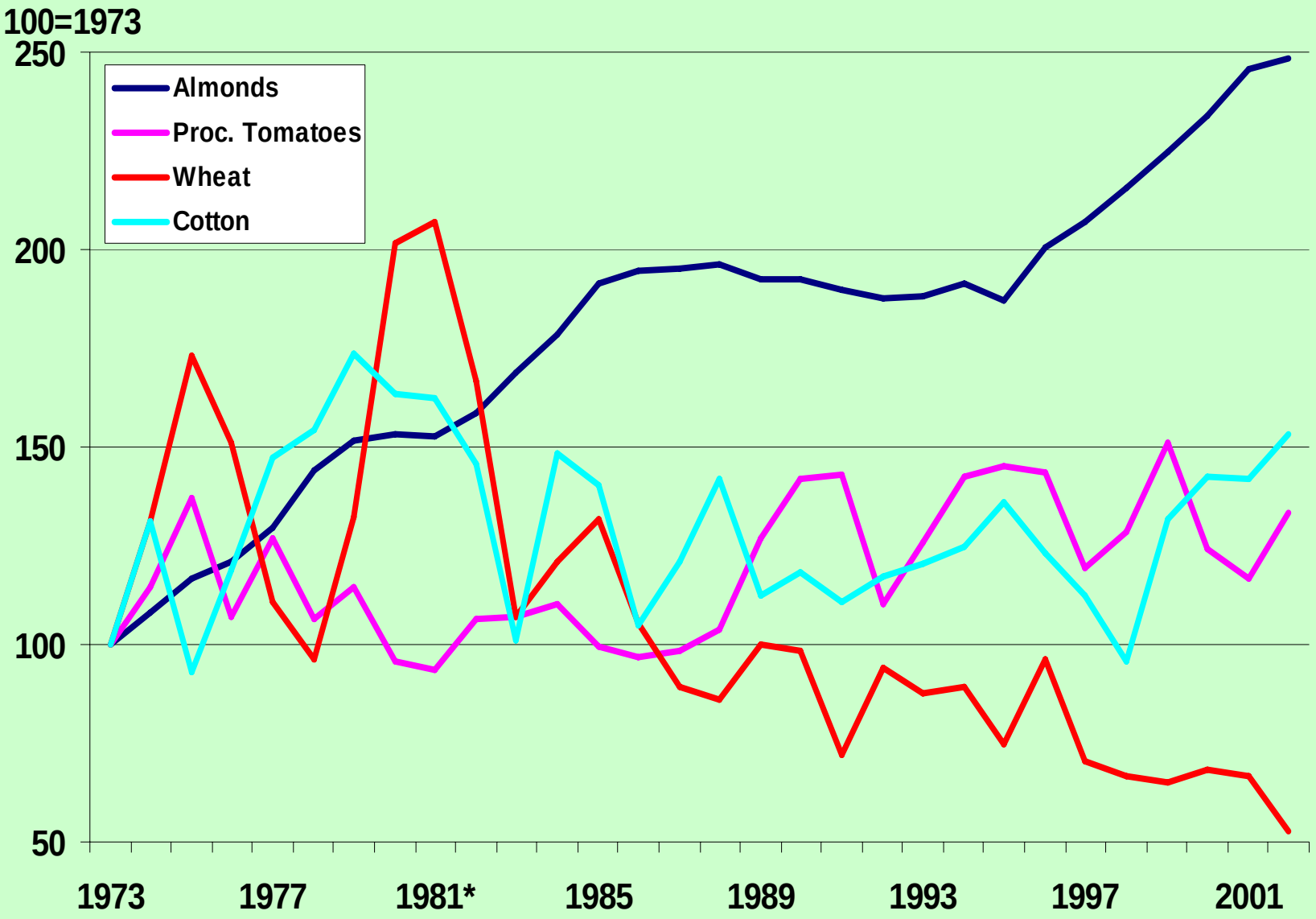
- The Value of Irrigation Water
- Past Trends
- Economic effects on the irrigation to drainage linkage
- Driving trends in the Irrigation economy
- Speculations on the effect of current trends on irrigation and drainage

Lowest value of irrigation water ($2004)




Irrigated Crop Land in California, 1985-2003
Irrigated Crop Land, 1,000 acres
6000
5000
4000
3000
2000
1000
0
Field Crops
Vegetables
Fruit and Nuts
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003

Acreage Index for Selected California Crops, 1973-2002

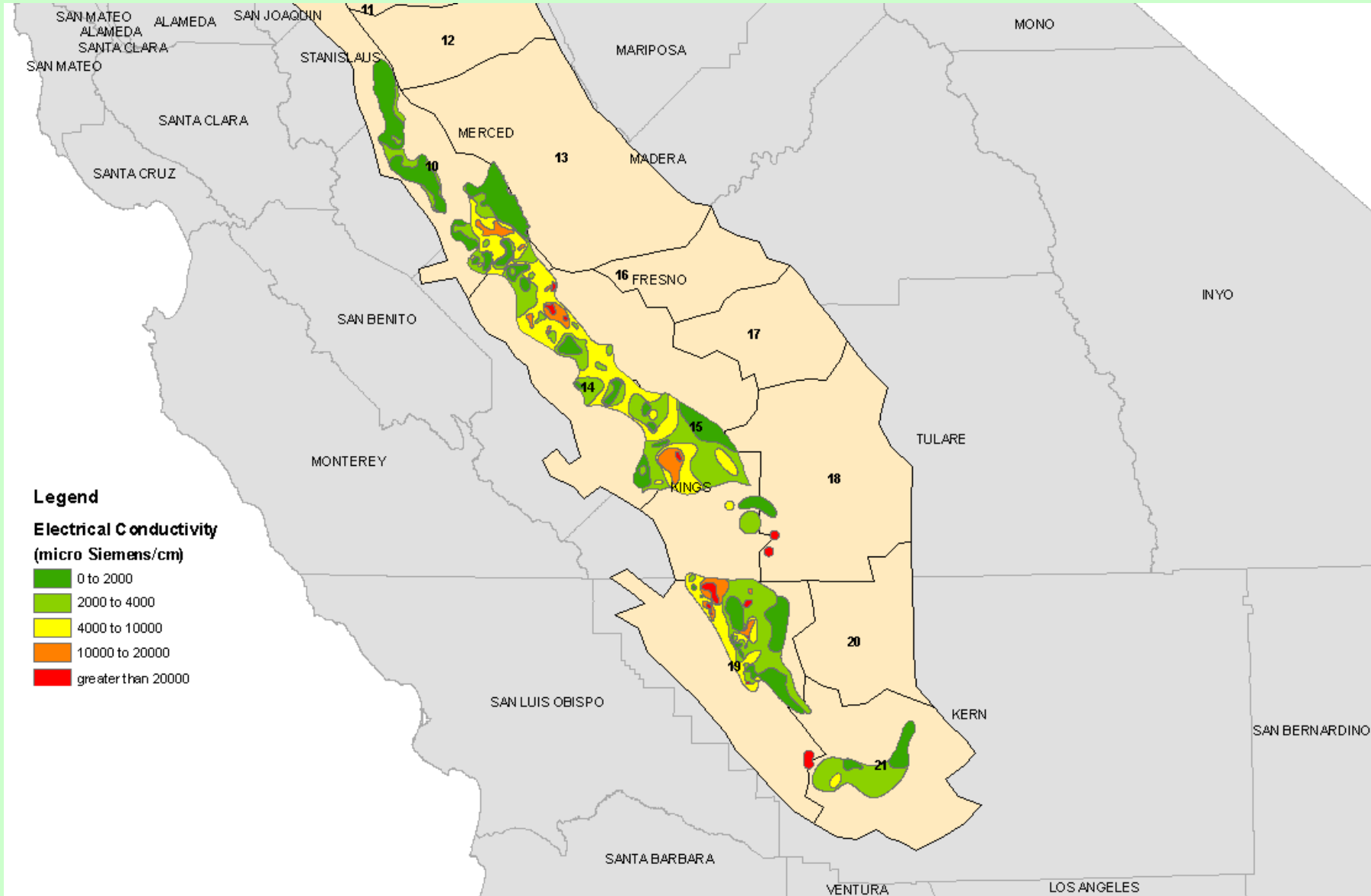


Crop Production Trends

Growth rates for yield per acre, 1960-2002

Wheat	1.80
Rice	1.35
Proc. Tomatoes	1.75
Fresh Tomatoes	1.20
Cucurbits	1.17
Other Vegetables	1.01
Almonds/Pistachios	2.33
Other Deciduous tree crops	0.82
Subtropical crops	0.72
Vineyard crops	0.90

Central Valley Salt Affected Areas

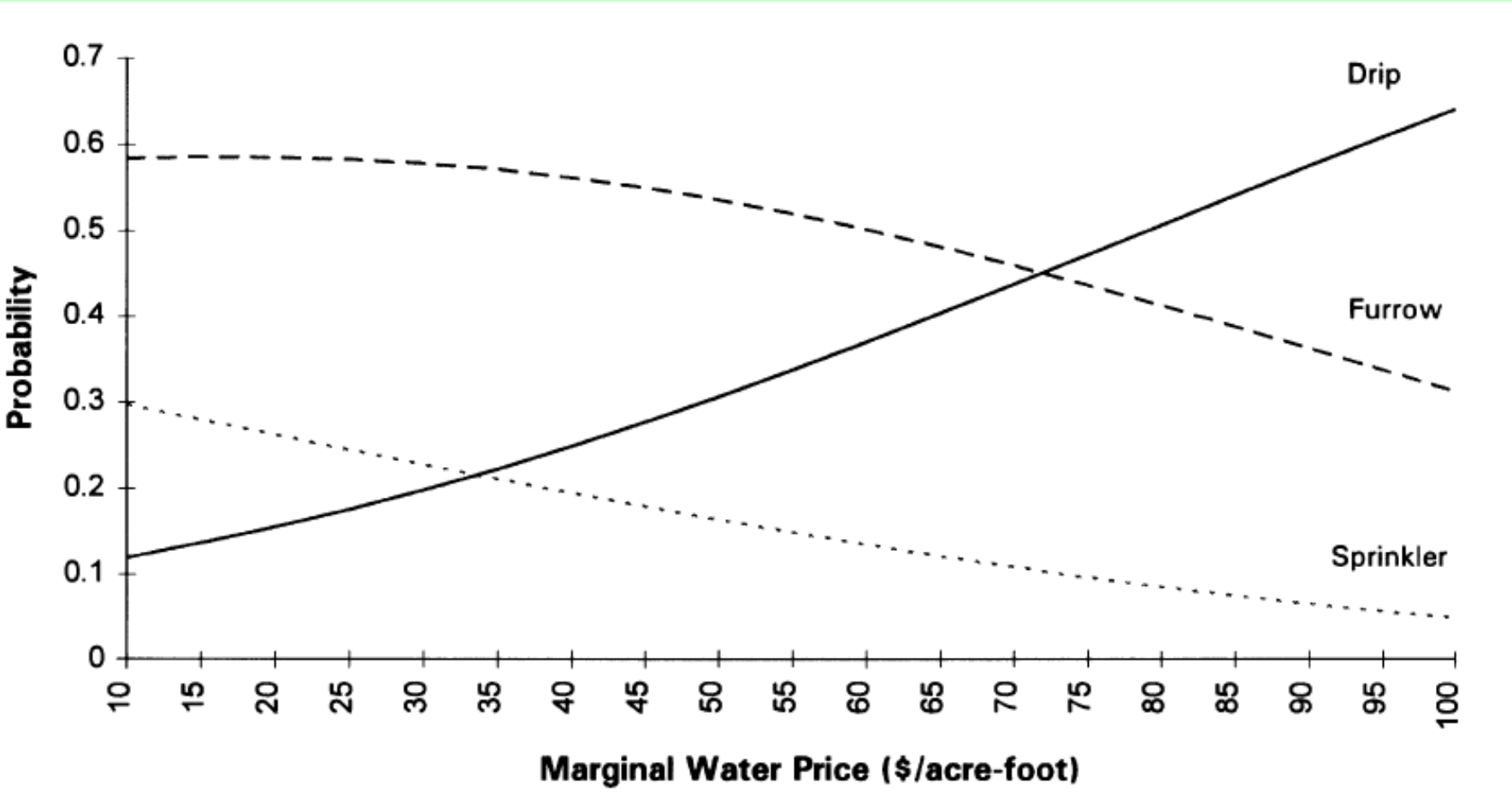


Cropping pattern Shift Effect on Drainage

- Shift to Fruits,nuts and vegetables will help reduce drainage flow and load
  - Lower applied water per acre
  - Higher water value pays for better technology
- Fruit, Nut and Vegetable yields are more sensitive to salt levels.

CROP	C50 (mS/cm)
Alfalfa	6.85
Field Corn	6.85
Grain	13.04
Orchard	4.13
Pasture	8.85
Rice	18.00
Sugar Beet	13.04
Tomato	6.85
Truck Crop	6.50
Wine Grape	8.85

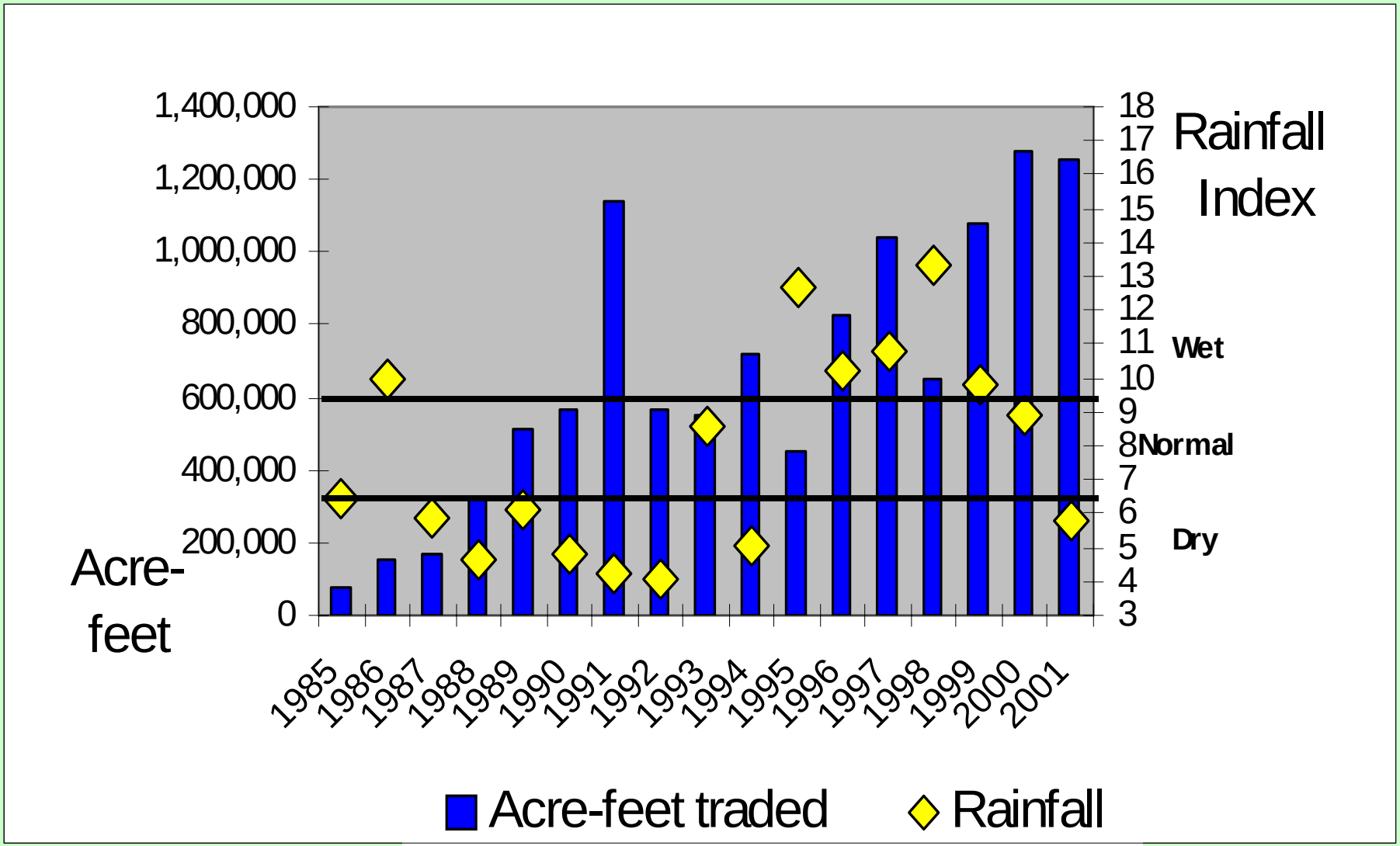
Irrigation technology adoption as a function of water price



Future Drivers of Irrigation and Drainage

- Water trading and Urbanization
- Climate change
- Crop markets and overseas competition
- Crop productivity and irrigation practices
- Environmental regulation - Direct regulation vs Cap and Trade.
- Farm policy – decoupling production.

Annual Water Trades and Rainfall, 1985 – 2001

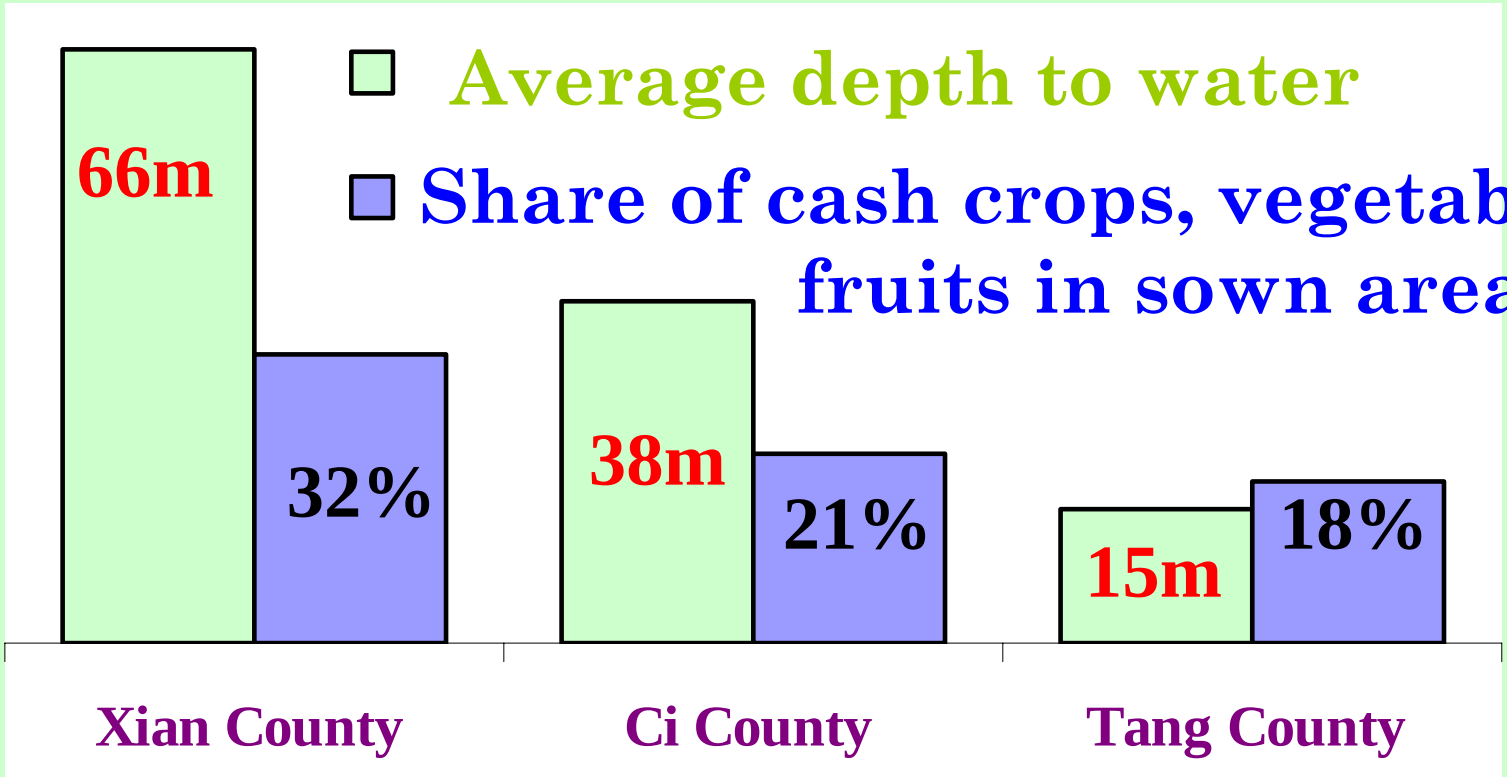


Possible Global Climate Change Effects

- Under the driest scenarios California water supplies could be reduced by 24% by 2100.
- CO2 effect will increase yields
- Increased temperature will have a crop specific effect- no large yield losses until after 2050, but ET will increase.
- The value of water will clearly increase

Heterogeneity in rural China

- Different production technologies.
- Different water depth to water
- Different cropping pattern



Conclusions

- California's irrigation economy will continue to grow in productivity, value, and employment.
- Current yield increases from technical advances averaged 1.2% per year for the past 30 years
- Irrigated land and water use will reduce by 10-15%
- Current drainage production is not sustainable in volume or load.
- Drainage responds to economic price and scarcity signals. Higher water value – lower drainage volume
- Increased water values, environmental regulation, reduced acres, and technical change will drive the central valley closer to a steady state drainage balance.