

A Preliminary Assessment of Crop Production and Estimated Irrigation Water Use for Chihuahua, Mexico

Presented at

***“Free Trade of the Americas, the WTO and New Farm Legislation:
Responding to Challenges and Opportunities”***

San Antonio, Texas, May 24, 2002

Parr Rosson, Aaron Hobbs, and Flynn Adcock

Texas A&M University

Background

- **U.S. - Mexico 1944 Water Treaty**
- **Mexico to Deliver 350,000 Acre Feet (AF) to the U.S. Annually from Rio Grande**
- **Mexican Deficits Began in 1995**
- **Currently a cumulative Debt of Approximately 1.5 Million AF**
- **U.S. to Deliver 1.5 Million AF to Mexico Per Year from Colorado**

Methodology

- **Annual Production, Acreage and Yield Data Collected from SAGARPA for the Entire State of Chihuahua, Mexico**
- **Analysis of Trends**
- **CropWat Version 7**
- **Penman-Monteith Method**

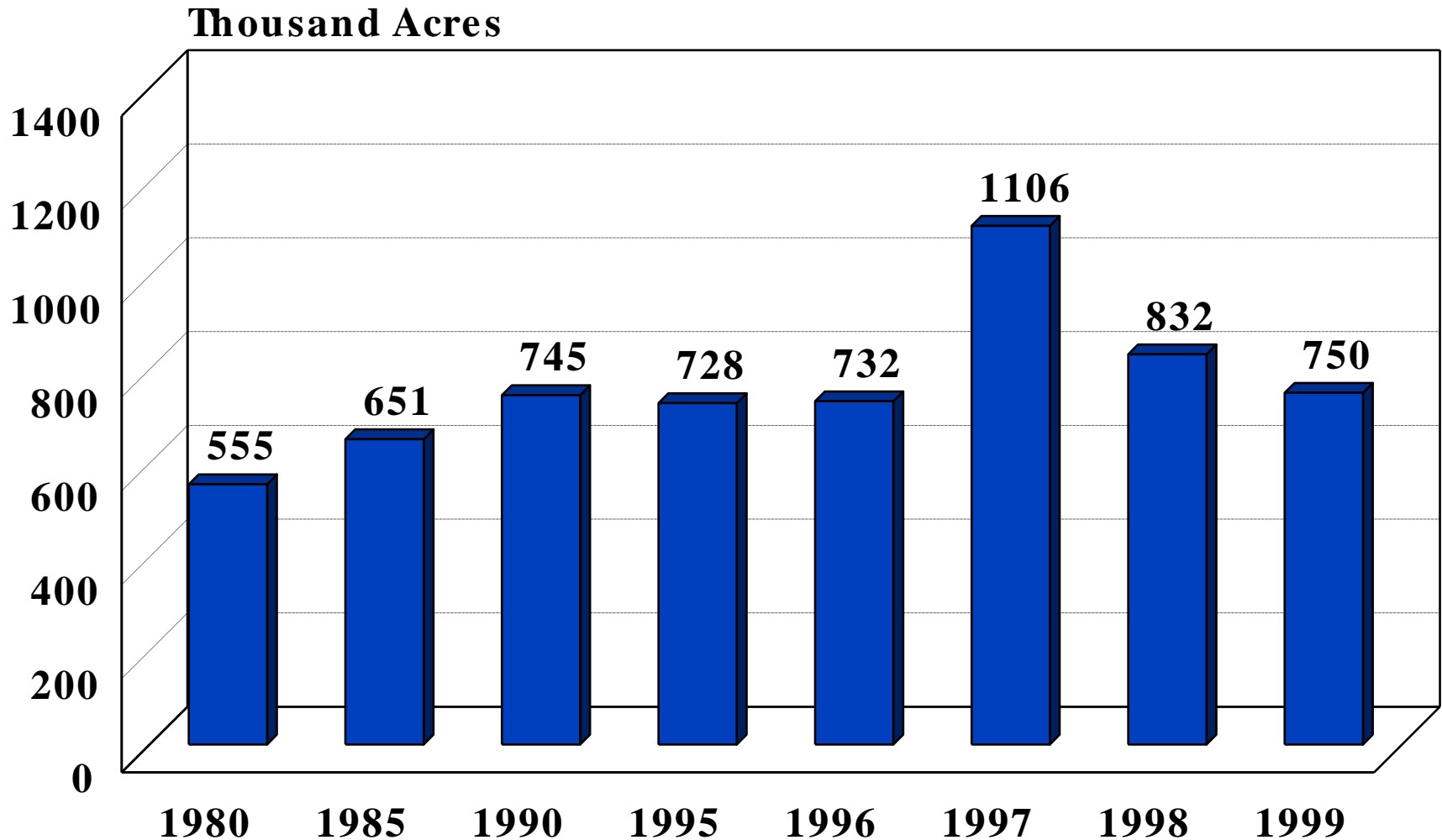
CropWat

- **Estimated Evapotranspiration Rate (ET_o)
Calculated for Chihuahua, Mexico**
- **Rainfall Measured for Chihuahua, MX**
- **Medium Soil Type**
- **Irrigation when 25% of ET_o, to refill to soil capacity**
- **Plant date set by crop**
- **Irrigation Efficiency estimated at 50%**

Penman-Monteith

- **Penman-Monteith Monthly ETo Calculated for Chihuahua by CropWat**
- **Coefficients from FAO**
- **Multiplied the monthly ETo by the Coefficient For the Season then Subtracted Out Rainfall for the Time Period**

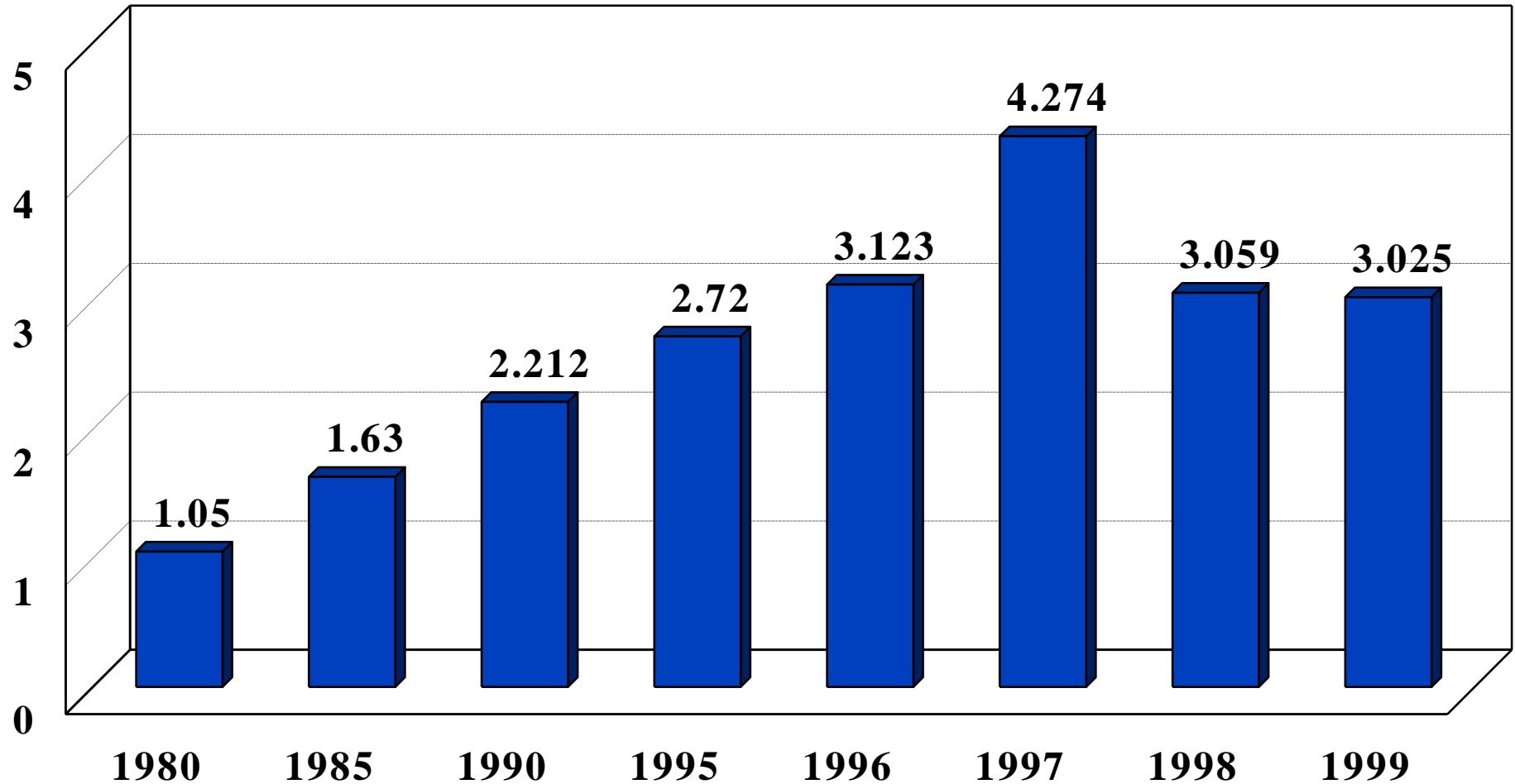
Harvested Acres in Chihuahua, MX 1980 - 1999



Source: SAGARPA; Total for 31 crops included in study.

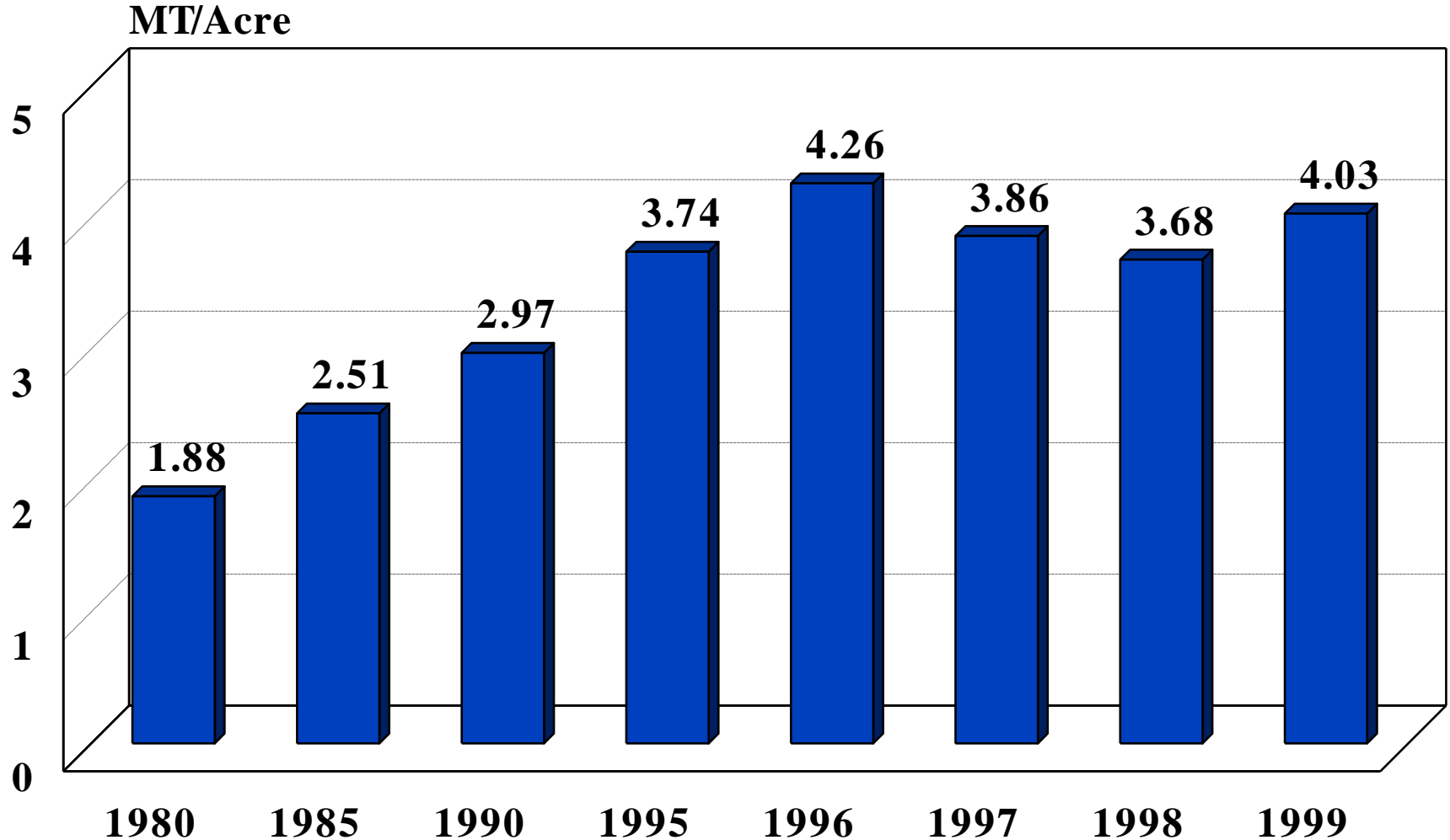
Production in Chihuahua, MX 1980-1999

Million MT



Source: SAGARPA; Total for 31 crops included in study.

Average Yield in Chihuahua, MX 1980-1999



Source: SAGARPA; Average for 31 crops included in study.

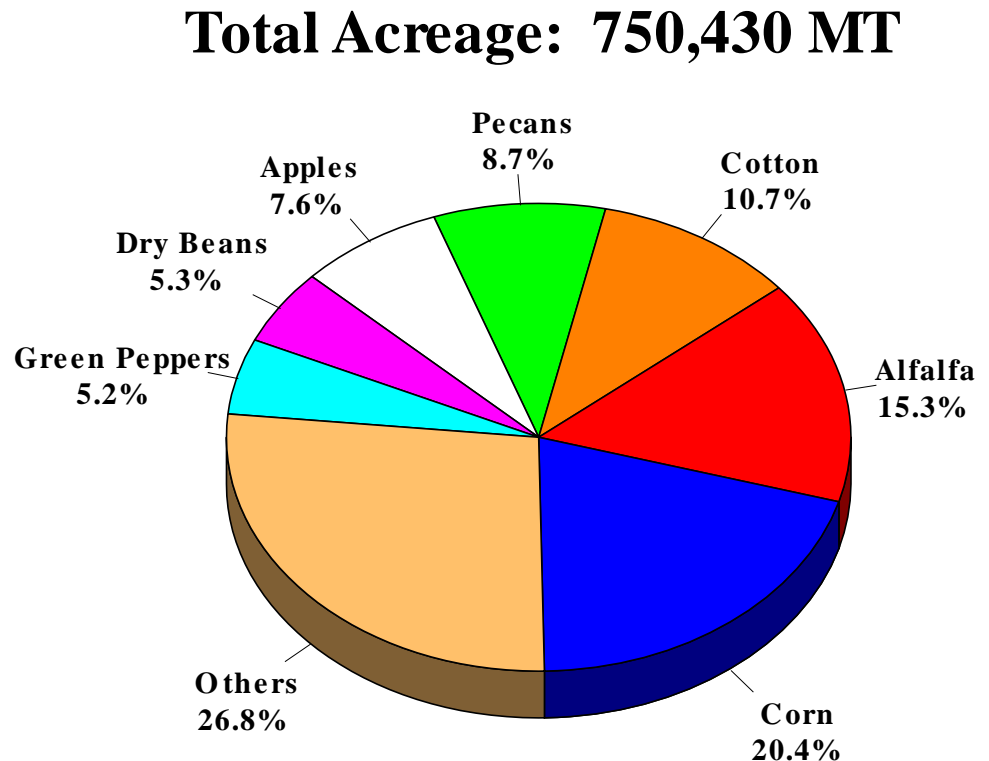
Percent Increases in Harvested Acres, Production and Yield for Chihuahua For Major Crops

	1980-1999	1990-1999	1995-1999
Harvested Acres	35%	.72%	3.13%
Production	191%	36.72%	11.21%
Yield	114%	35.74%	7.84%

Source: SAGARPA; Increases for 31 crops included in study.

Crop Acreage, 1999

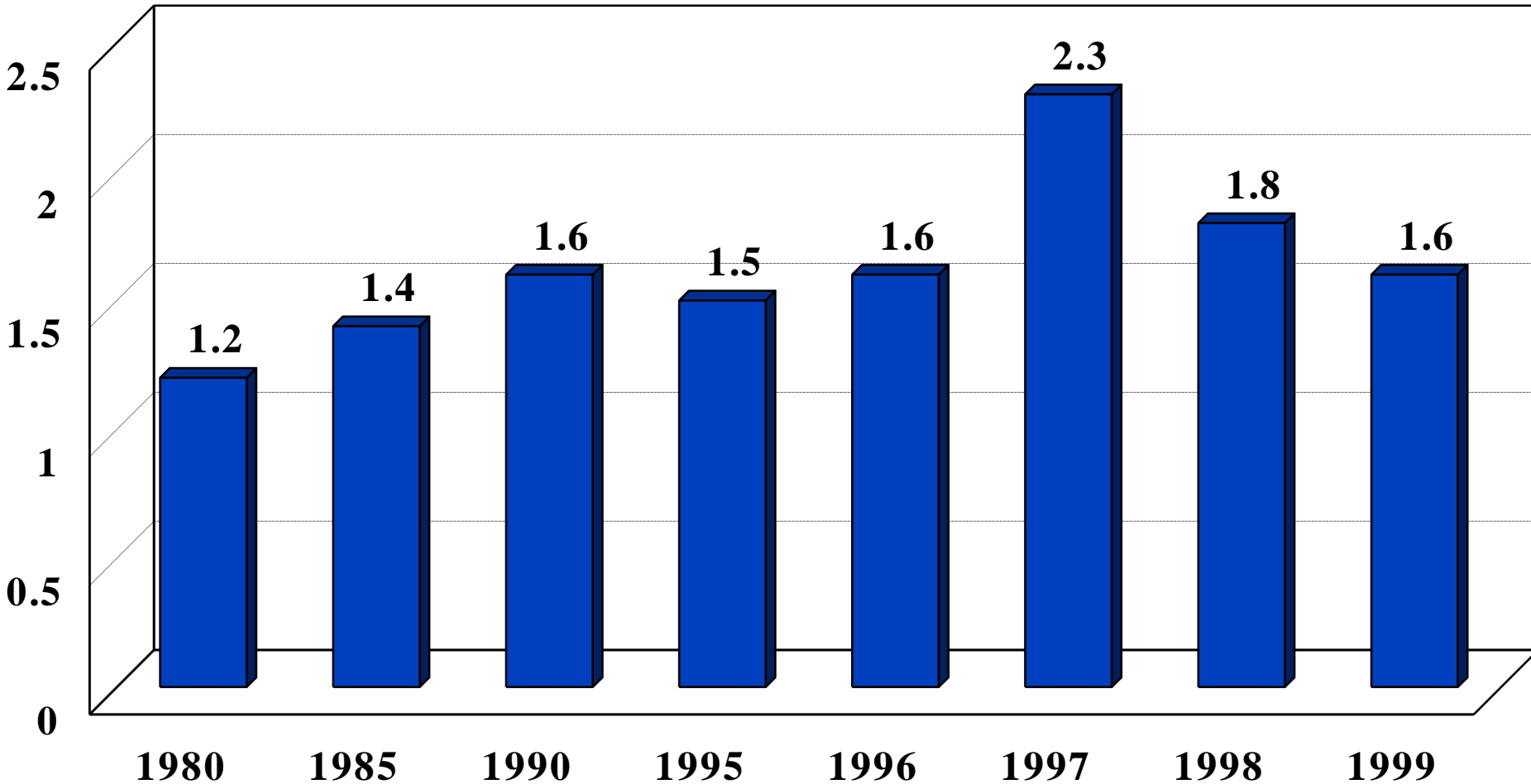
- Corn
- Alfalfa
- Cotton
- Pecans
- Apples
- Dry Beans
- Bell Peppers



Source: SAGARPA

Estimated Irrigation Water Use in Chihuahua, 1980-1999

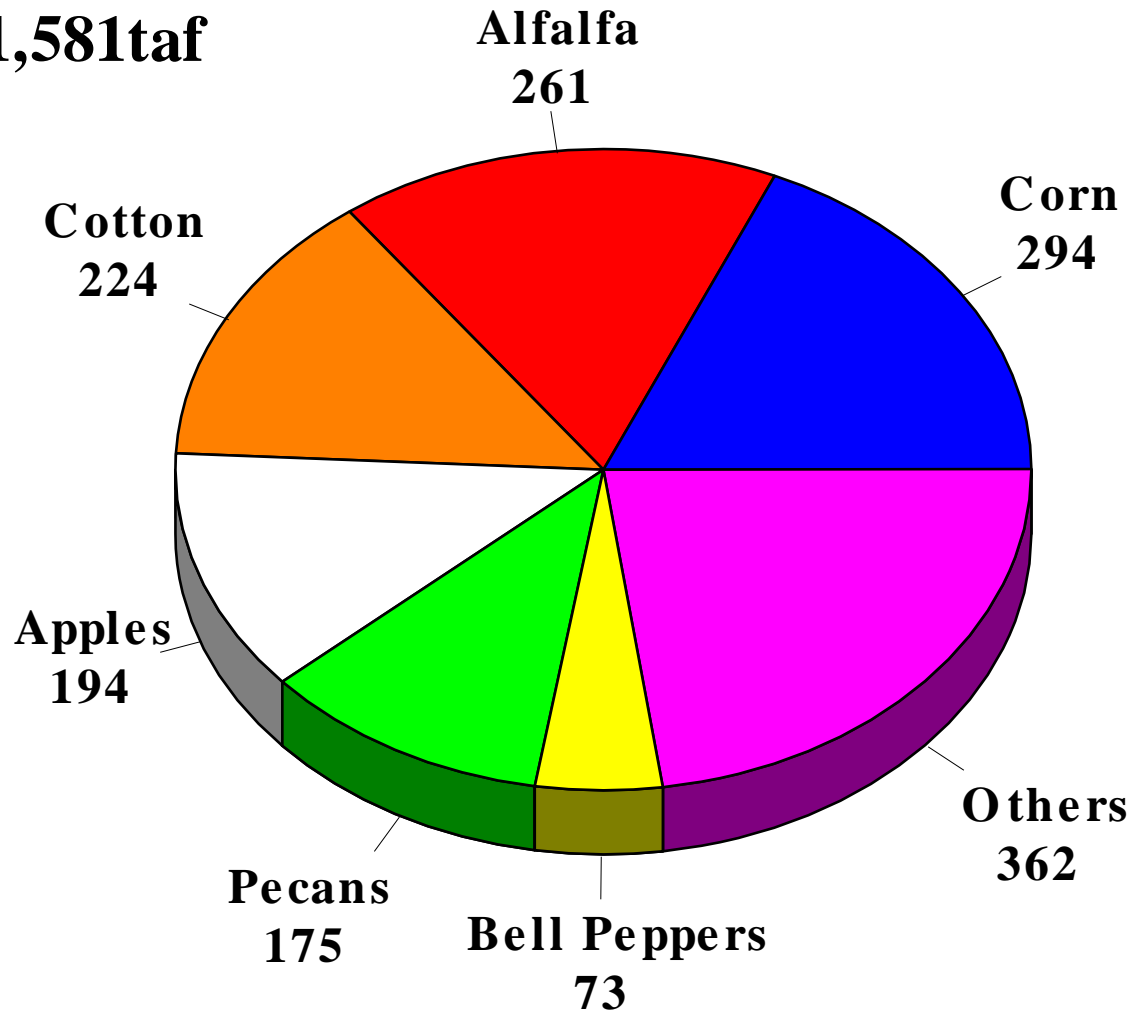
Million Acre Feet



Estimates: CropWat and CNAS; Total of 27 crops included in study.

Estimated Irrigation Water Use in Chihuahua, MX 1999 (1,000 acre feet)

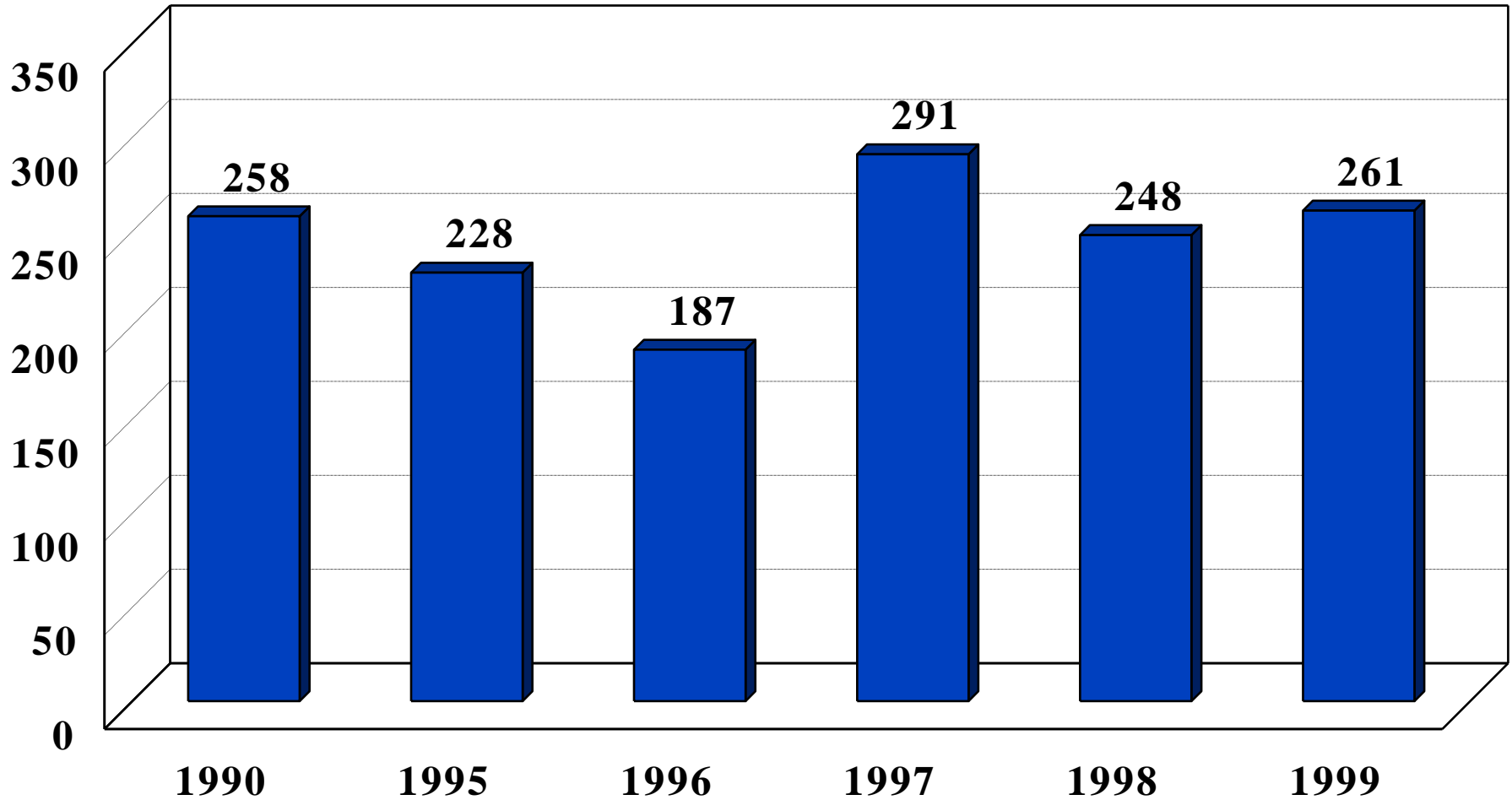
Total: 1,581taf



Estimates: CropWat and CNAS; Total of 27 crops included in study.

Estimated Alfalfa Irrigation Water Use 1990 - 1999

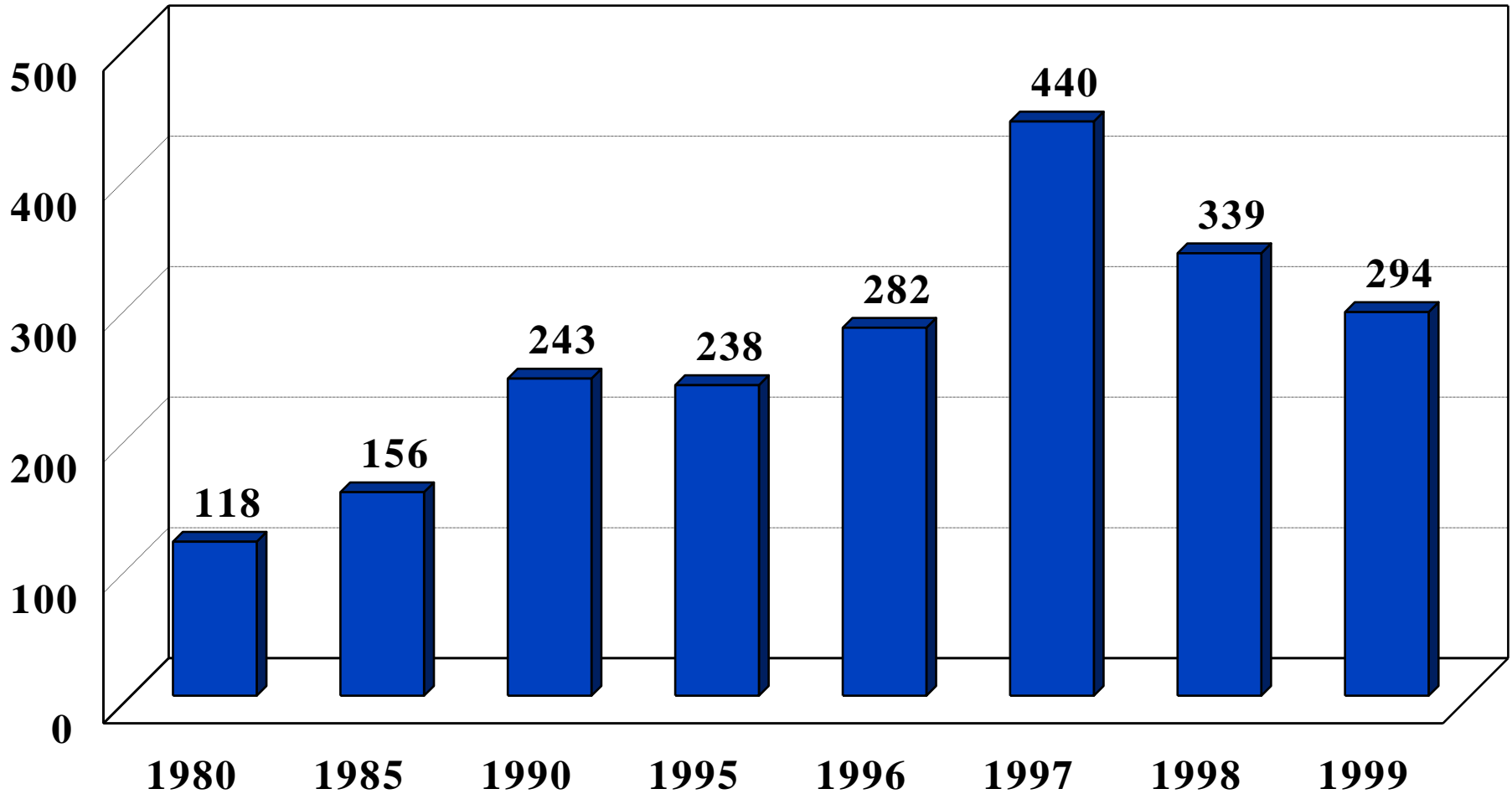
Thousand Acre Feet



Source: CropWat & CNAS estimates

Estimated Corn Irrigation Water Use 1980 - 1999

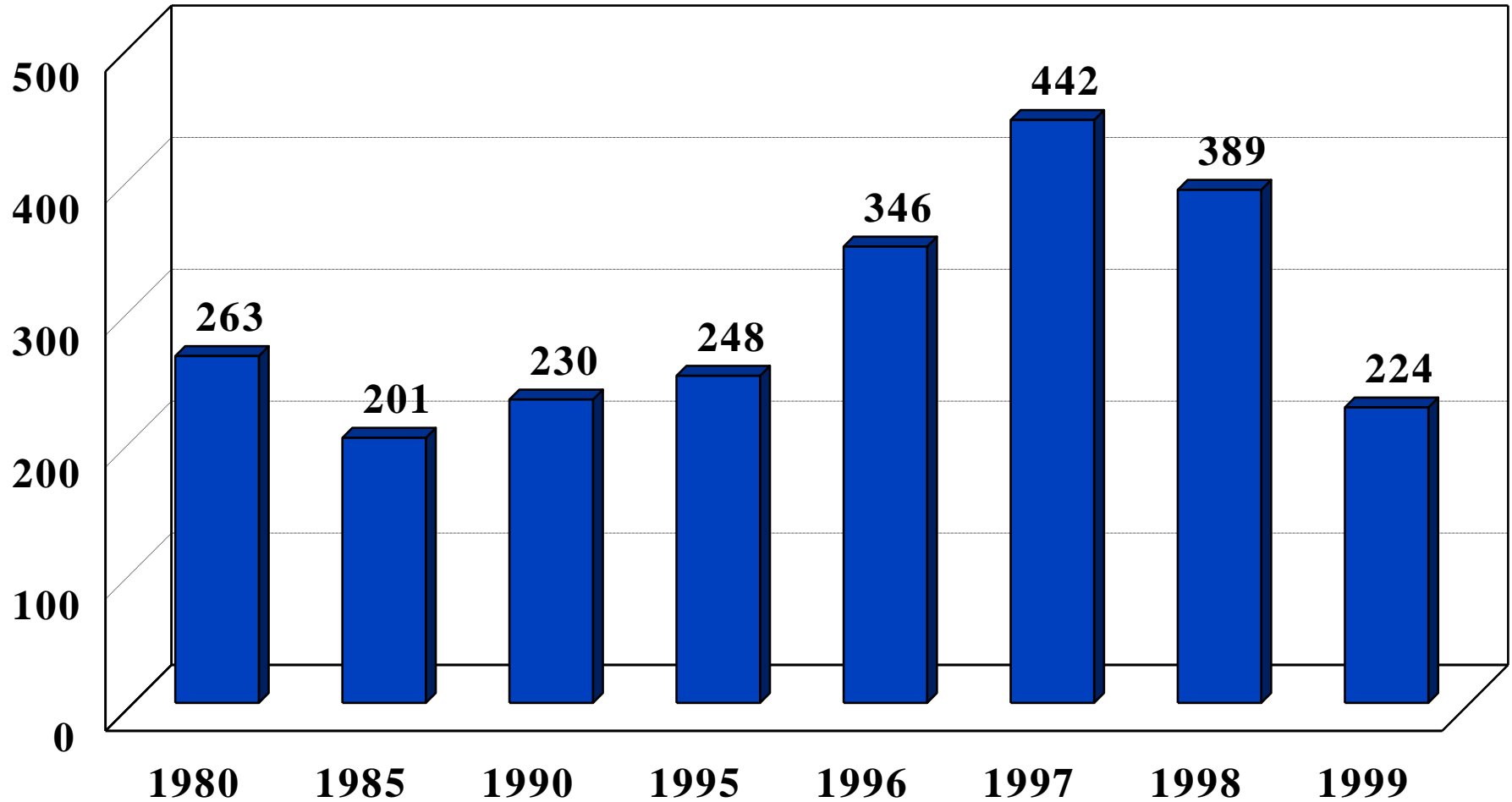
Thousand Acre Feet



Source: CropWat & CNAS estimates

Estimated Cotton Irrigation Water Use 1980 - 1999

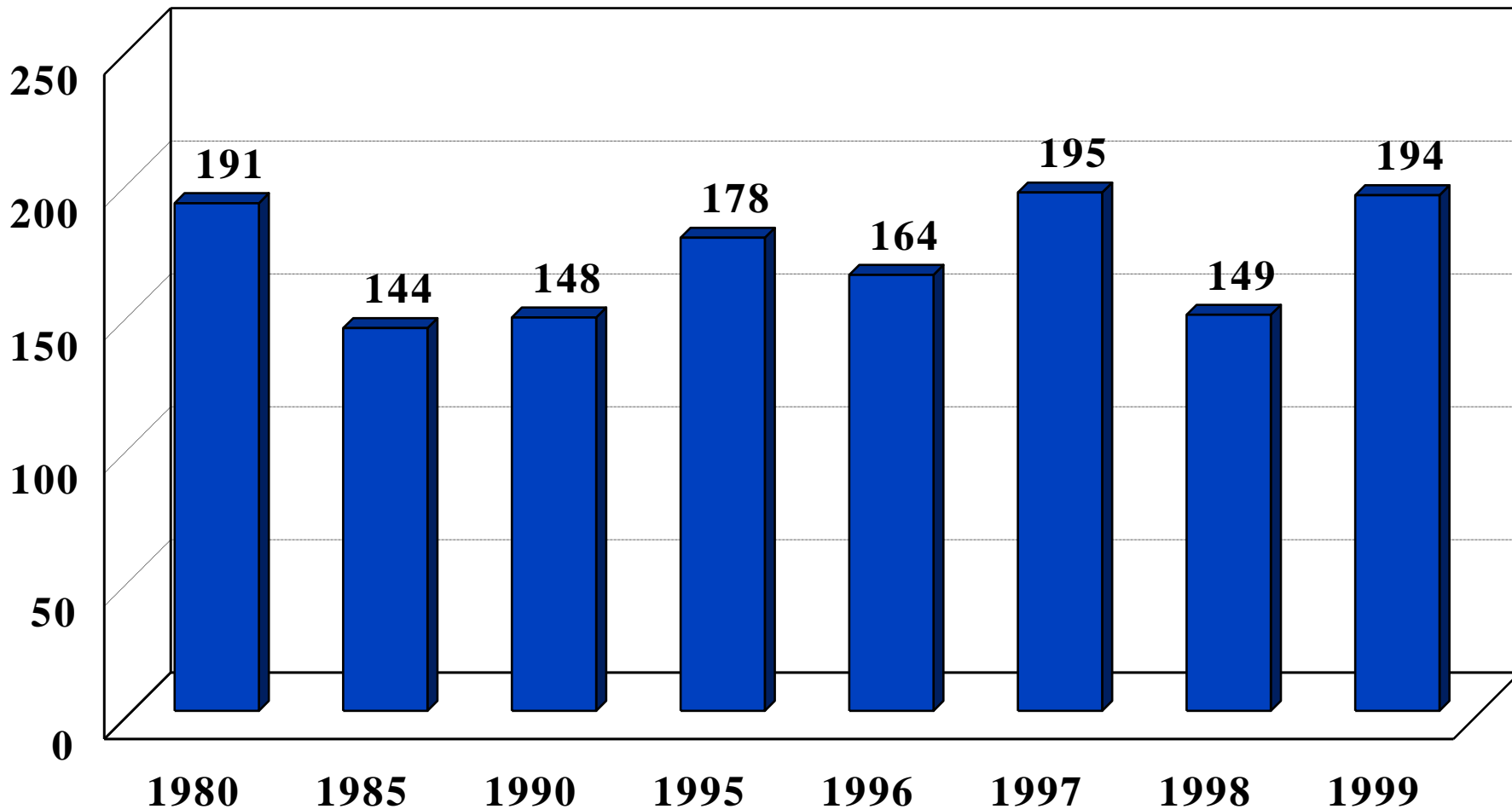
Thousand Acre Feet



Source: CropWat & CNAS estimates

Estimated Apple Irrigation Water Use 1980 - 1999

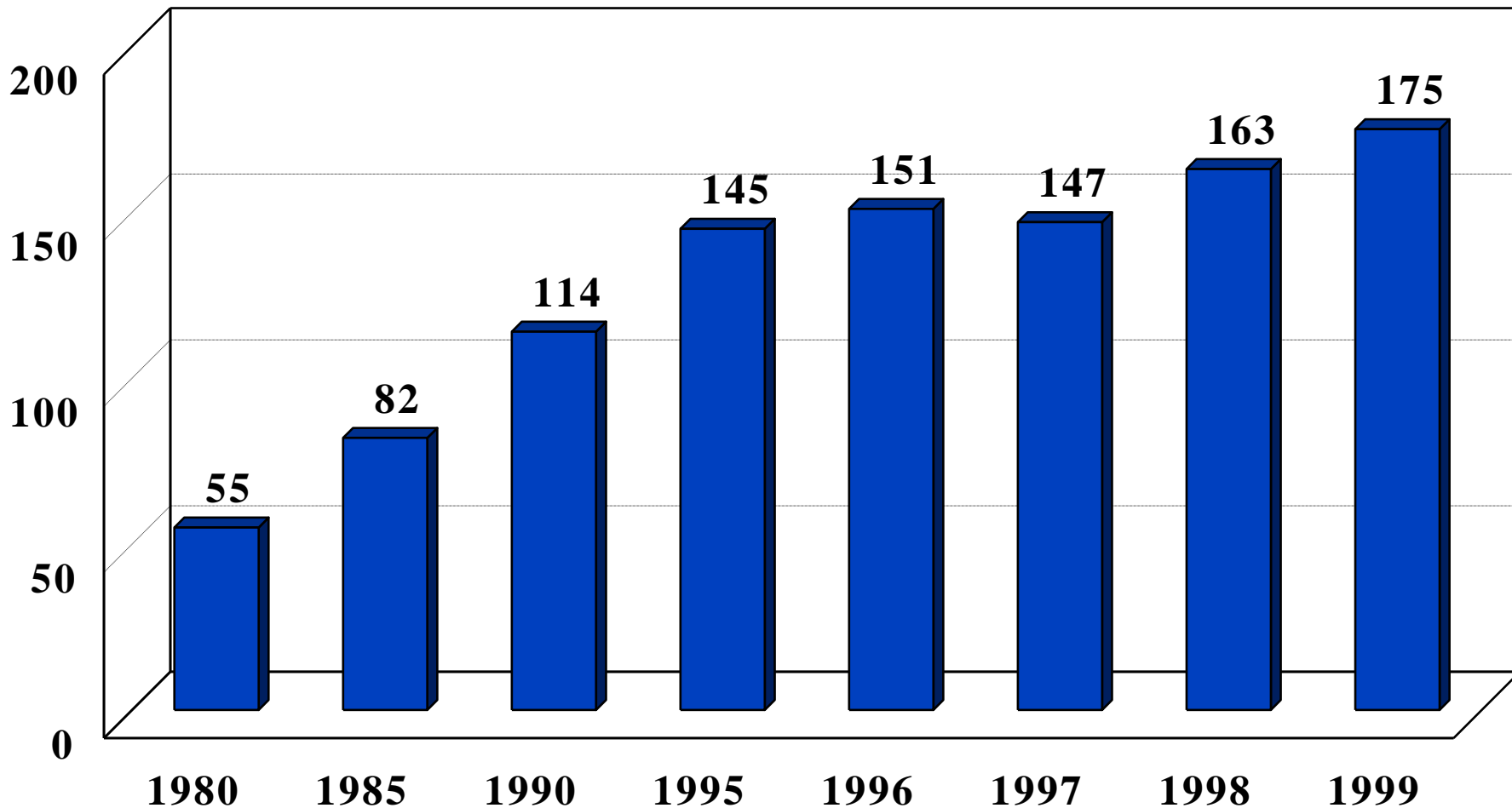
Thousand Acre Feet



Source: CropWat & CNAS estimates

Estimated Pecan Irrigation Water Use 1980 - 1999

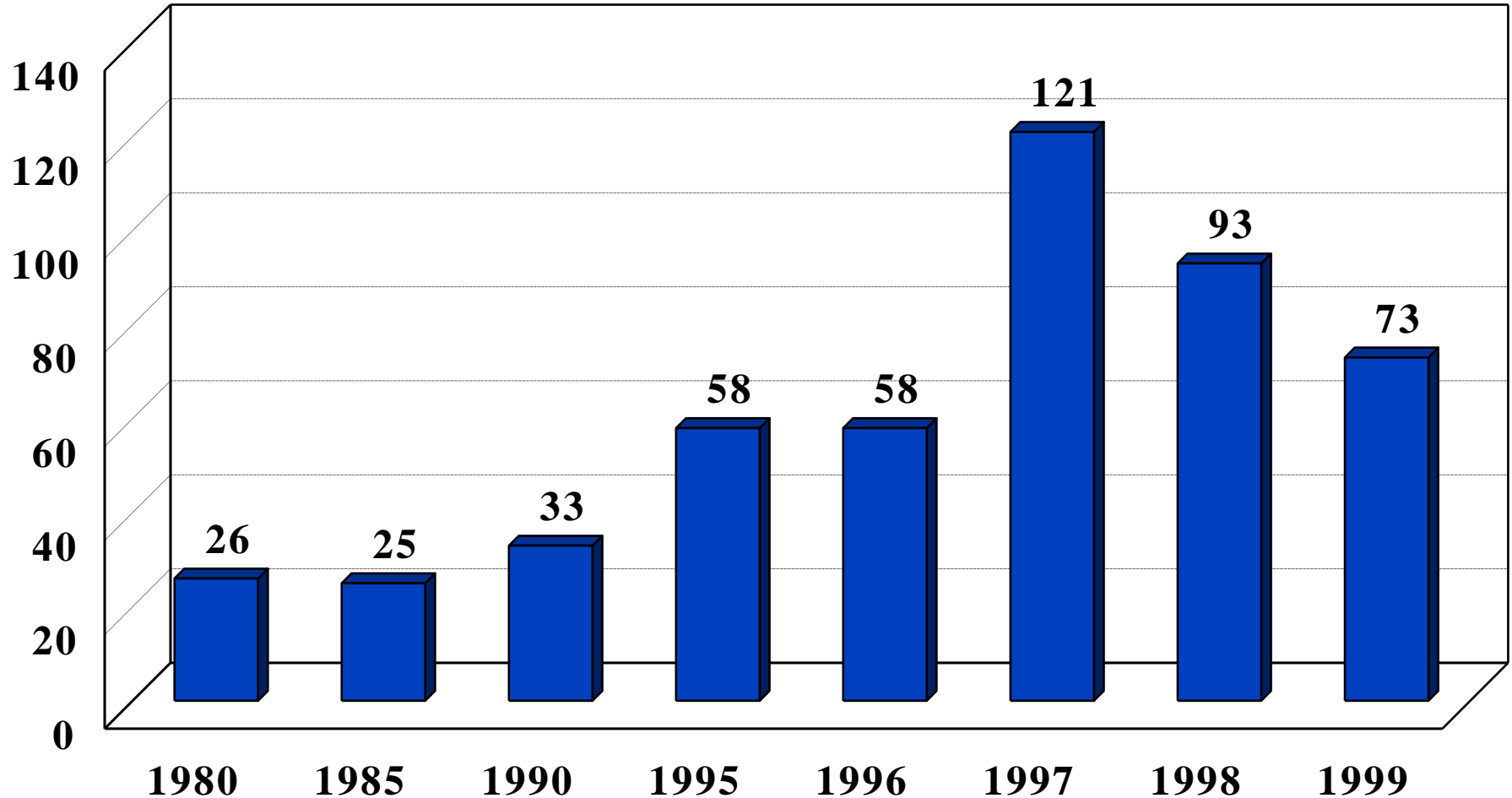
Thousand Acre Feet



Source: CropWat & CNAS estimates

Estimated Bell Pepper Irrigation Water Use 1980 - 1999

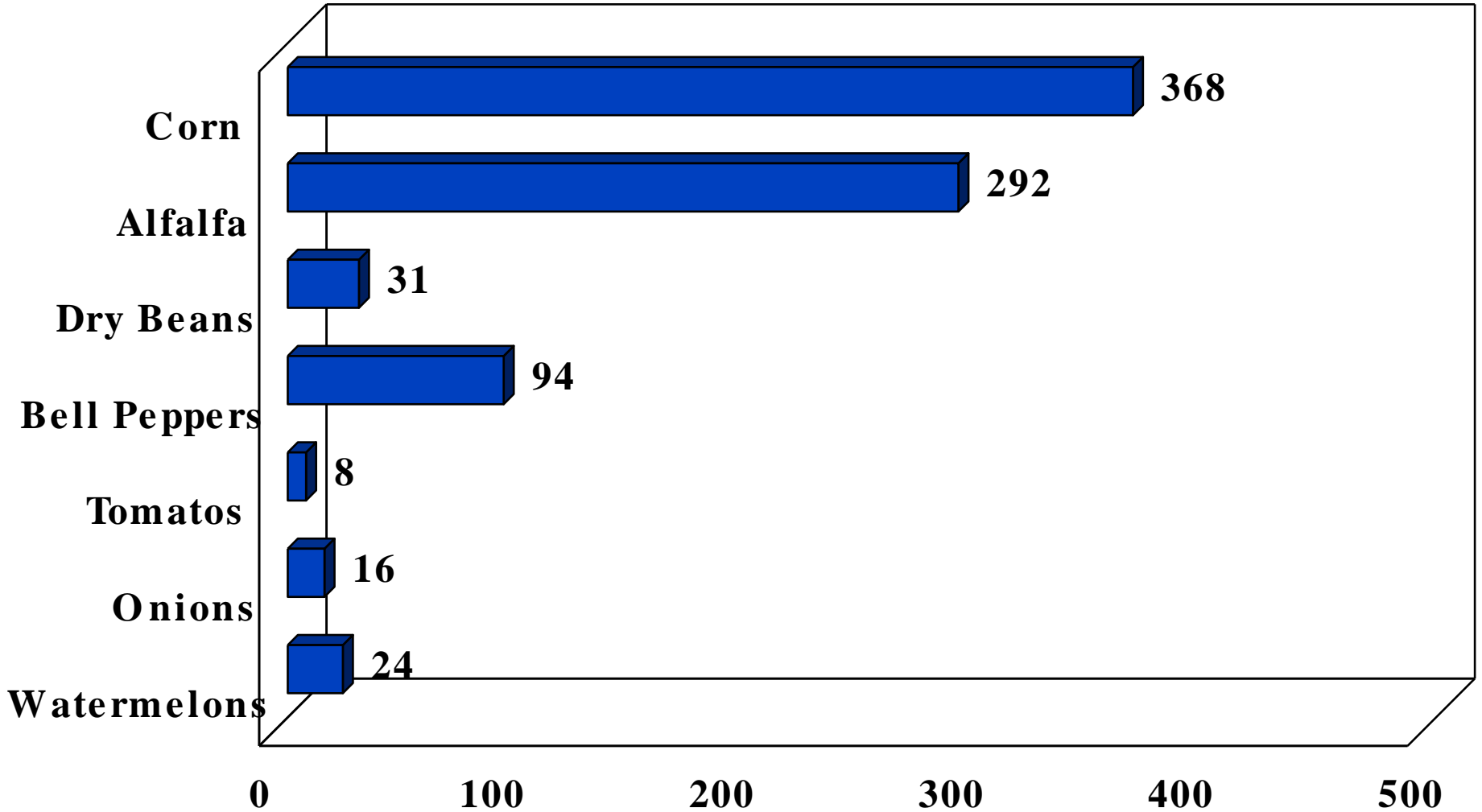
Thousand Acre Feet



Source: CropWat & CNAS estimates

Selected 2001 Irrigation Water Use Estimates

Thousand Acre Feet



Source: CropWat & CNAS estimates

Further Research

- **Update 2000 and 2001 Data for All Crops**
- **Change Efficiency Levels For a Range of Estimates**
 - **Determine Efficiency of Delivery of Water to the Farm**
 - **Determine Application Efficiency in the Field**
- **Factor Yields Into Irrigation Requirements Equation**
- **Determine the proportion of ground water use and surface water use**

Conclusions

- **Total Acreage and Production have continued to increase since the drought began in 1995.**
- **Lower Rainfall and Increased Water Use Have Reduced Flows to the Rio Grand.**
- **Analysis of Irrigation Districts Would Improve Estimates**

Potential Solutions

- **Improved Efficiency of Water Delivery and Use in Chihuahua**
- **Improved Efficiency of Water Delivery and Use in Lower Rio Grande Valley**
- **Form and Implement Effective Binational Water Management Planning**