

Gutwein, B. J. 1991. Analysis and prediction of regional irrigation water demand. Ph.D. dissertation. Colorado State University. Fort Collins, Colorado. 162 pp.

The study of irrigation water demand has largely been limited to field level considerations of evapotranspiration. There has been little research into the dynamics of irrigation water demand of a region or district. In particular, very little work has been done on short term regional irrigation demand, the focus of this study. Presented here is an analysis of daily irrigation demand for the Imperial Valley, California. Included is a presentation of a computer model which forecasts irrigation demand 4 days in the future. The Imperial Valley has a year round agriculture encompassing 200,000 hectares of irrigated land. The Imperial Irrigation District (IID) operates a demand type system where farmers order water 1 day in advance. However, due to the travel time, IID must order water from the Colorado River 4 days in advance. The IID Watermaster must predict how much water the farmers will order. Any excess water flows into the Salton Sea and is effectively wasted. Under an agreement with the Metropolitan Water District, IID is in the process of upgrading its delivery system and operations in order to conserve water. This project aided the water conservation effort by developing a better understanding of system water demand and creating a decision support tool for forecasting demand.

The project used advanced systems analysis and modeling techniques based on General Systems and Information Theory. Factors considered include water rates, farm size, cropping patterns, salinity, day of week, holidays, season, weather, and climate. The results indicated that the annual pattern of water demand is the single most important consideration. In addition, the study indicated that both short term and annual water demand is strongly influenced by rainfall even though average annual rainfall is less than 70 millimeters. The General Systems techniques were very useful for modeling a complex systems described by a large data base. The primary limitations of the techniques were their newness and subsequent lack of prescribed procedures