

AGRICULTURAL WATER DEMAND IN THE APALACHICOLA-CHATTAHOOCHEE-FLINT AND ALABAMA-COOSA-TALLAPOOSA RIVER BASINS

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Abstract. Water demands are increasing rapidly in the Alabama-Coosa-Tallapoosa (ACT) and Apalachicola-Chattahoochee-Flint (ACF) River Basins in Alabama, Georgia, and Florida. A dependable water supply is vital to the continued well-being and economic development of the area. Proposals to develop water resource projects and to change water uses in north Georgia have raised concerns between water user groups in the three states.

The U.S. Department of Agriculture's Natural Resources Conservation Service, formerly Soil Conservation Service, conducted an analysis of agricultural water demand. The results indicate that agricultural water demand was 400 million gallons per day in 1992, and could approach one billion gallons per day by the year 2050 in the ACT/ACF river basins. Georgia's water demand has accounted, and is expected to continue accounting, for 72% of this demand, while Alabama's and Florida's demands are approximately 21% and 7%, respectively.

THE COMPREHENSIVE STUDY

Severe droughts experienced in Alabama, Georgia, and Florida during 1981, 1986, and 1988 significantly focused public attention and concern on water shortages and lake drawdowns experienced in the ACT and ACF river basins. This acute level of public awareness made water conflicts a hot political topic in 1990 electoral campaigns. The media published numerous articles on the controversy, the players, the ongoing events, and the perceived consequences.

In 1992, the Governors of Georgia, Alabama, and Florida, along with the Assistant Secretary of the Army for Civil Works, signed a Memorandum of Agreement establishing an equal partnership among the four parties to address interstate water resource issues. A key part of this agreement is to conduct a Comprehensive Study of the ACT/ACF river basins. The goal of this study is to develop relevant technical information, strategies, and plans for long term basin wide management of water resources.

Agricultural Scope of Work

The Comprehensive Study includes nine scopes of work, one of which is agricultural water demand, to assess the river

basins. The agricultural water demand scope of work contains three requirements: 1) to document historical (1970-1990) water use, 2) to establish current (1991-1992) water use, and 3) to project water demand for specified years between 1995 and 2050. This goal was accomplished by assessing the historical and current demand for agricultural water, and by projecting demands for water resources for the years 1995, 2000, 2010, 2020, and 2050. These assessments considered factors including, but not limited to, topography, climate, and water conservation techniques.

The agricultural water demand scope of work specifically calls for a description and quantification of existing and projected agricultural water resources in the ACT/ACF through the year 2050. Individual components of the agricultural water demand scope of work include crop and orchard irrigation, aquaculture, livestock, and poultry. Many Federal and State agencies, university personnel, professional associations, and private growers throughout the project area participated in this effort.

Limitations in Historical Water Use Data. Despite increased efforts to collect water use data over the past fifteen years, agricultural data availability varies among the states. For some commodities, a complete record of county data for the 1970-1992 period is available, while for others, records for only one or two years could be found, particularly in the case of irrigation data.

The task of developing reliable projections was further complicated by the fact that it was necessary to project future demands for 26 separate commodities in 17 designated planning areas within the overall study area to the year 2050. Therefore, projections reflect estimates for assumed conditions.

METHODS

A primary concern was that study results be both credible and acceptable to the agricultural interests of each state. With this in mind, Natural Resources Conservation Service (NRCS), formerly Soil Conservation Service, personnel worked with agricultural specialists in each of the three states to develop their own inventory, analyses, and projections.

This necessitated extreme care among states in comparing data sources, analytical procedures, and assumptions supporting projections.

The study was conducted in five phases: Inventory, Analysis, Alternatives Development, Projections, and Relationships.

Inventory Phase. Data were compiled for individual commodities by county for the historic (1970-1990) and current (1990-1992) periods. Specific commodities inventoried included crops (peanuts, corn, cotton, vegetables, tobacco, sorghum, soybeans, wheat, and hay); orchards (peach and pecan); aquaculture (pond and raceway); nurseries (container, greenhouse, and field); livestock (dairy cattle, beef cattle, and swine); poultry (broilers, layers, and turkeys); and turf farms. Total acreage, irrigated acreage, and water use data were collected.

Analysis Phase. An assessment of the historical database was made, trend analyses were conducted and projection techniques developed. Attempts were made to conduct ordinary least square analysis on the historical data to run future projections; however, wide ranges in historic commodity numbers, reflecting market volatility, rendered statistically insignificant results. In the interest of time and limited resources, projected future water demands were developed through a consensus of expert opinion.

Alternatives Development Phase. Determinations of alternative growth conditions (assumptions) were developed. Commodity specialists identified factors, as well as the trends of these factors, influencing the growth of individual commodities.

Projections Phase. An optimistic, expected, and pessimistic growth rate was forecasted for each inventoried commodity. Specifically, projections were made for total crop acreage, crop irrigated acreage, water demand per acre by crop, total water demand by crop, irrigated crop production, livestock and poultry numbers on farm, livestock and poultry water demand, turf acreage, turf irrigated acreage, nursery acreage, nursery irrigated acreage, and aquaculture water demand. These projections were made for 1995, 2000, 2010, 2020, and 2050 in each of the 17 planning areas, and for each of the 26 commodities inventoried. All totaled, well over 1200 projections were made.

Relationships Phase. Water availability and agricultural production were examined, with emphasis on seasonal water needs and the effect of insufficient water supplies on production.

Water Conservation Potential

The potential for voluntary water conservation was calculated in the tri-state study area. The methodology used included: 1) knowledge of existing farmers using water

conservation irrigation technology as a percentage of all farmers, 2) expert opinion of eventual percentage using this conservation technology by the year 2050, and 3) the water savings factor associated with each technology.

CONCLUSIONS

Agricultural water demand has experienced a tremendous growth since 1970. Collectively, demand has grown from under 100 million gallons per day (mgd) to nearly 400 mgd in 1992. Expanded use of irrigation systems on crops and orchards during the late 1970's and early 1980's account for much of this growth. Crops and orchard irrigation accounted for two-thirds of the 400 mgd in 1992. Much of this demand was concentrated in southwestern Georgia and southeastern Alabama.

Agricultural water demand is forecasted to increase steadily throughout the projection period. Demand is expected to increase nearly 40% between 1992 and 2000. By the year 2050, the expected agricultural water demand could approach 1 billion gallons per day. Alternative scenarios range from a high of 1.15 billion gallons per day to a low of 760 million gallons per day in 2050. Approximately 90% of new agricultural water demand will be for irrigating crops and orchards. The relative demand among the states is expected to remain near its present allocation of 72% in Georgia, 21% in Alabama, and 7% in Florida.

A number of irrigation practices offer potential for agricultural water conservation in the ACT/ACF river basins. Among the more promising are irrigation scheduling, conversion to low pressure center pivot or drip systems, and use of low energy precision application of water. Combined water savings in the ACT/ACF area with full utilization of available water conserving technologies is estimated to be approximately 12% annually.

Water availability is critical to the production of certain crops. For irrigated corn, a 50% reduction in water leads to a 33% decrease in yield. Seasonal water needs are also critical. Lack of water during key growth stages such as pollination, pod setting, and pod filling can essentially destroy the crop. Over 80% of agricultural water demand occurs between, and including, the months of May and August.

DISCUSSION

Greater awareness of environmental values, water quality, ground water overdrafts, and limitations of available water supplies are having a dramatic effect on water resource management. Making accurate long-range projections is difficult, due to the volatile agricultural market and production susceptibility to undesirable weather. Additionally, technological innovations and genetic developments to increase water use efficiency, and which are not now available, will undoubtedly be commonplace during the next

half century.

One of the main objectives of this study was to show the general trend in agricultural growth and water demand given alternative conditions (high, medium, and low scenario's) specified in the Agricultural scope of work. The results of this study are not to imply that projected trends in water use will continue during the next 50 years, nor that they should. In fact, it is expected that actions will be taken as a result of the Comprehensive Study to change trends in ways which are considered to be more desirable for all water users.

LITERATURE CITED

Natural Resources Conservation Service, United States Department of Agriculture, Draft 1994. ACT/ACF River Basins Comprehensive Study - Agricultural Water Demand, Auburn, Alabama; Gainesville, Florida; Athens, Georgia