



TR-118

Economic Implications of Farmer Storage of Surface Irrigation Water in Federal Projects: El Paso County, Texas

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The Bureau of Reclamation has approved a program for farmer storage of surface irrigation water in Elephant Butte Reservoir, New Mexico. This program would allow individual farmers to store part of their annual surface water allotment in the reservoir subject to evaporation loss to be drawn at a future date upon request. The purpose of this study is to ascertain the economic implications of such a program for farmers in the El Paso County Water Improvement District No. 1.

The economic analysis was based on results from a linear programming model developed for crop production in El Paso County. The model was designed to maximize net farm revenue. Twelve crops were included in the analysis. The effects of soil type and salinity level of irrigation water on crop yields for all twelve crops were estimated. Input requirements by crop and yield level were identified. Input categories included seed, chemical, water, machinery, labor, harvest, other and fixed costs. Irrigation alternatives included both surface and ground sources. In addition, the water saving technology of laser leveling was incorporated into the model.

The model was restricted by acreage of a soil group with a specified level of salinity in the underlying groundwater. Also, the quantity of surface irrigation water available was limited.

This static linear programming model was applied for various surface irrigation water allocations ranging from zero to three acre feet per acre of cropland with groundwater assumed available. This procedure produced a schedule of net farm revenues for alternative surface irrigation water allocations for use in conjunction with groundwater. The procedure was repeated with groundwater availability limited to zero. These two schedules of net farm revenues were then used (1) to form the basis of two temporal linear programming models which maximized the real value in 1980

dollars of a stream of net farm revenues, and (23 to evaluate a specified annual surface irrigation water use scenario of two acre feet per acre per year.

The temporal models maximized the 1980 real value of net farm revenues. This revenue stream was generated by optimal temporal use of the actual annual surface irrigation water allotments for 1963 to 1980. This optimal use includes the opportunity to store water in Elephant Butte Reservoir subject to evaporation. Results were obtained both with and without groundwater pumping over three surface water use scenarios (actual, optimal temporal and two acre feet per year).

The results of this study indicated that, with the ability to store surface water, temporally optimizing surface water use would have increased the real value of net farm revenue \$0.84 per acre per year or 0.4 percent above the real value of net farm returns implied by the actual use rates for the groundwater pumping case. For the no groundwater pumping case, the real value of net farm returns increased by \$3.56 per acre per year or 2 percent above the net farm returns indicated by the actual use rates. Also, storing surface water for future use, or accumulation, tends to decrease the year to year variability of net farm revenues. Groundwater pumping is also known to decrease this variability.

The target surface water allocation of the project administrators is three acre feet per year. The optimal temporal solutions tended to be between this three acre feet allocation and the two acre feet allocation as specified in the two acre feet per year scenario. An optimal temporal allotment of three acre feet appears too high while two acre feet appears too low. Without a system of farmer-held surface water storage, optimizing temporal use of surface irrigation water would not be possible. Thus, this water storage opportunity is an important irrigation management tool for individual farmers in the El Paso County Water Improvement District No. 1.

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