



**PROJECTED ECONOMIC RETURNS FROM ALTERNATIVE WATER CONSERVATION TECHNIQUES—
SOUTHERN HIGH PLAINS OF TEXAS**

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ABSTRACT

Amounts of water available from the Ogallala aquifer are being diminished since discharge flows exceed recharge flows in the High Plains of Texas where groundwaters have been developed extensively. Declining groundwater supplies will cause irrigated crop production to decrease until it is replaced by dryland crop production. This changeover will affect area farmers and the regional economy. However, methods of water conservation are available to temper the effects.

The economic feasibility of incorporating selected conservation techniques into production plans for farmers in the Southern High Plains of Texas was projected from 1970 to 2019. These techniques were 1) bench leveling, 2) tailwater return systems and 3) deep tillage and other techniques whose potential as water conservation practices have not been fully determined.

Five different combinations of these water conservation methods were analyzed for model farm resource situations for each of the three different initial water availability situations in the study area: Situations 1, 2 and 3 having average saturated thicknesses of 93, 135 and 184 feet, respectively. Modification schemes were applied to irrigated cropland with 0 - 1 percent slope only, 1 - 3 percent slope only and both slope conditions on the model farm.

Recursive linear programming was used to allocate available resources and to determine the net revenues associated with water allocation on a model farm — 549 acres of cropland, 98 acres of cotton allotment, 282 acres of feed grain base and 20 acres of wheat allotment. The effect of set-aside acreage on net returns was estimated by analyzing the model both with and without a set-aside acreage requirement of 168 acres.

Cropping patterns with the various combinations of water conservation techniques were similar for all the combinations evaluated. Three major differences were determined: 1) Wheat for grazing to meet the 168-acre set-aside requirement in the set-aside program was replaced by cotton and grain sorghum in the no-set-aside requirement analysis; 2) the 1 - 3-percent slope cropland was the more intensively utilized after it was bench leveled — because of more efficient utilization of rainfall and consequent lowered irrigation water requirement, it was used for high-intensity irrigated crop production; and 3) the various conservation techniques employed allowed extended irrigated crop production over unmodified land although the economic life of irrigation was not increased.

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Annual net returns to the model farm were increased in all cases but one after installation of the modification techniques. With saturated thicknesses from 184 feet to approximately 100 feet, costs annually associated with bench leveling and tailwater return systems were greater than increased annual returns. Existing wells were able to pump sufficient quantities of water to meet critical season demands when saturated thicknesses were in this range. The amount by which costs exceeded returns was, however, very slight, and the water conserved by the techniques for future use was assumed to justify their installation under these levels of saturated thicknesses.

The increase in discounted present value, computed for 1970, of projected irrigated crop production attributed to alternative water conservation techniques ranged from 36 percent with bench leveling in Situation 1 to 118 percent with the nonspecific 10-percent reduced irrigation requirement in Situation 3. Returns to irrigated production over dryland production averaged 40, 79 and 87 percent, respectively, for Situations 1, 2 and 3.

Evaluation of water conservation practices over the 50-year study period indicated that all of the conservation practices evaluated would be economically feasible investments when considering the entire economic life of the groundwater supplies. The increase in the present value of net farm returns during the 50-year study period attributable to installation of the various conservation practices (when evaluated at an 8-percent discount rate) ranged from 2.69 percent in Situation 3 to 7.86 percent in Situation 1.

The economic life of the groundwater supplies in the Ogallala aquifer was prolonged by only about 5 years with employment of the conservation techniques. The water saved was used almost exclusively to maintain irrigated production at a higher level. This was largely a result of the annual income maximization hypothesis employed in the study.

One figure, 11 tables and a bibliography are included.

KEYWORDS: projected economic returns/ Southern High Plains/ soil conservation/ Texas/ water conservation.

The complete report, B-1153 "Projected Economic Returns From Alternative Water Conservation Techniques—Southern High Plains of Texas", is available from Research Publications Editor, Department of Agricultural Communications, Texas A&M University, College Station, Texas 77843.

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