



## TR- 129

### Recursive Programming Model for Crop Production on the Texas High Plains

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- [Full Text](#)

A flexible, recursive programming model of crop production on the Texas High Plains was developed. Besides the linear programming (LP) Optimization routine and recursive feedback section, the model also includes a matrix generator and report writer to make scenario definition and output analysts faster and easier.

The production activities for each run of the model, are defined for one acre of a specific crop or crop rotation, irrigated at particular times, using a chosen irrigation distribution system and tillage method, on a given land class. The irrigation level may be zero (i.e. dryland) and the land class can include terracing when appropriate. The objective function for the LP optimization routine is the maximization of net returns (gross returns minus all variable, or variable and fixed, costs) to land, water and management. For static runs, the maximization includes net returns over variable costs

only; for temporal runs, over variable and fixed costs. LP constraints include land by soil class, irrigation water availability for each of 18 irrigation periods and a total annual water use constraint.

The model can be run as either a static single period optimization or as a recursive, temporal model. When operated in the recursive mode, the model will loop through up to 20 iterations, rebuilding the LP matrix for each iteration and writing a report for each period. The feedback section of the recursive model is used to update the groundwater situation after solution of each iteration. The amount of groundwater used is summed and that usage translated into the reduction in aquifer saturated thickness, increased pump lift and reduced well yield per period. The new groundwater situation plus any inputted changes in prices, technical efficiencies or crop yields form the data, from which the production activities and constraints for the next iteration are built. At the end of the prescribed number of iterations, a summary report covering the whole time horizon is written and the discounted present value of net returns is calculated at three prescribed discount rates.

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