

data implies more precisely what a number of West Pakistan farmers reported—that the water requirements for any two crops grown in the same months are equal (except for rice, where there is some percolation loss). It therefore follows from the data that the total water requirement for any crop depends only on the length of its growing season, and on the months in which it is grown. Because the sum of the acreages of each crop times their monthly water requirements per acre cannot exceed the water supply for each month, there are twelve restrictions in all.

The Model: The linear programming models that follow are simply an efficient way of determining an optimal production plan under the restrictions just described. The programming model has three quantitative components: (1) an objective function, taken here as the highest annual net return from agricultural output with the available resources, (2) alternative methods for employing the resources; in our case, different crop and livestock activities, and (3) limited resources or other constraints; in this instance, given supplies of irrigation water and land. The objective function is defined in terms of the value derived from crops and livestock, less the variable costs of producing these products. The crop and livestock activities are related to the scarce resources by input-output coefficients. These indicate the amounts of limiting resources required to produce a given quantity of each output. The entire model, showing each of the above components, is given in Table 5.18.

The linear programming models presented in this section are useful only if their limitations are realized. They are designed to reveal optimum production patterns within the following assumptions: (1) That the necessary factors of production, such as water, are available at the time, in the amounts, and of the quality assumed in the calculations, (2) That the ratios of crop yields to the various inputs used in the calculations are correct, and (3) That the prices used in the model actually prevail in the Khairpur region.

It is quite probable, however, that as the irrigation system of the area is improved, and as the total economy of Pakistan develops, the prices and relative profitability of different crops will change. At the same time there will be changes in the productivity and form of the technical factors of production. It therefore follows that the models presented here are a framework for asking proper questions; they cannot give a once and for all answer to the question, "What is the best production pattern?" To be effective as a planning tool, these models must be set up as an apparatus into which new data are fed as they are collected. This presupposes that provisions will be made for gathering such information.