Chapter 10

PROGRAMMING MODELS OF INTERREGIONAL EFFICIENCY AND LAND USE IN AGRICULTURE

BY

EARL O. HEADY, NARINDAR S. RANDHAWA,
and MELVIN D. SKOLD
Iowa State University

I. INTRODUCTORY

Though it has not yet been applied widely for these uses, activity analysis is a promising aid for applications in agricultural policy and developmental planning. Programming models are especially well adapted to agriculture because of its spatial characteristics and its spread over the whole of nations. Also, the differential production and price functions which define comparative advantage of agriculture in various regions distinctly require empirical techniques which allow the consideration of many producing sectors, if attempt is made to define optimal allocations of production among regions, to specify preferred land-use patterns, or to express quantitative aspects of interregional competition. For policy and planning purposes, programming models are favoured because the goal ordinarily is one requiring changes in the regional origin of production and the general interregional mix of commodities produced. Regression and input-output models are hardly satisfactory in these analyses, as they can only suggest production patterns and commodity mixes which are tied closely to the past.

Potentials in using programming models arise in such situations as the following. With the development of institutions such as the Common Market, trade barriers and national farm policies are wiped away, and agricultural regions which were previously in economic isolation are thrown into a common competitive environment where their interactions will cause a new pattern of specialization and trade to develop. A priori, it would be useful if programming models

---

1 Professor of economics, former graduate student, and former graduate assistant respectively at Iowa State University.
Planning Experiences
could be applied to determine the nature and extent of these shifts. Policies to aid adjustments among and within regions could then be structured more precisely. Experimentation with various agricultural policies in the United States, with alternatives ranging from (i) government renting of land to withdrawal of it from production at least cost, to (ii) pure reliance on the market mechanism, also imply detailed knowledge of regional interdependencies in production. Finally, in planned economies, programming models provide a means for structuring national production patterns for maximum efficiency; in contrast to an approach not uncommon in the past in which national plans imply that all regional sectors have nearly identical production possibility functions or price regimes and that they should have production goals prescribed accordingly. It is possible, then, that programming models may come to have extreme usefulness and fairly wide application for national policies and developmental planning. The major obstacle to the large-scale use of such models is the detailed data necessary for an industry as complex as agriculture, where technical coefficients vary among commodities and regions. On the other hand, data already being used in the somewhat subjective and informal planning and policy methods of numerous countries can also be adapted to programming models. The informal methods used do not allow full consideration of interdependencies of regions, and substitute commodities in meeting goals of national food requirements or other objectives. The same data could frequently be converted for use in programming models, with a gain in precision of plans and a more efficient use of scarce resources. We shall illustrate the possibilities at a later point in this paper.

II. SOME ALTERNATIVE APPROACHES IN INTERREGIONAL ANALYSIS OF AGRICULTURE

We have used two somewhat opposite approaches in applying linear programming models in regional and interregional analyses of agriculture. To date, a major task has been the accumulation of basic data on such parameters as resource restraints and technical coefficients. These quantities do change with time and economic development, but we are developing a ‘sufficient data bank’ that should allow models applied in the future to have extremely practical uses, powerful applications in national policy and planning, and increased sophistication in terms of economic content and structure.

Conceptually, each farm in a nation can be incorporated in a single