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Book Reviews

The Economic Demand for Irrigated Acreage

By Vernon W. Ruttan. The Johns Hopkins Press, Baltimore. 139 pages. 1964. \$4.

THIS LITTLE BOOK is an analytical piece loaded with information and appraisals of the nature and prospective demand for irrigated land in the United States. Although the author makes some policy judgments that spring from his research, I think the major theme of the book is methodological. It sets up some of the many necessary economic dimensions to be considered in determining relative profitability of public and private investment in irrigation development.

"Economic Demand for Irrigated Acreage" and its fairly extensive footnotes bring the reader to date on recent developments in projection techniques. Many of these developments are related to the recent expansion in the availability of rapid computers.

Since the book is methodological, I would like to move directly to the innards of the story, skipping over the introductory chapter and a good historical perspective on resource utilization in agriculture. Ruttan's analytical framework at first glance seems entirely too simple, but you will find it ingenious and useful. It incorporates some important economic dimensions and remains simple enough for the wide regional applications presented in the study.

The "productivity model" consists of a Cobb-Douglas production function from which a "marginal value product" is derived for irrigated land and current operating expenses. The production function expresses value of farm products sold (X) as a function of acres of irrigated land (L) and current "output-increasing" operating expenses (E):

$$(1) \quad X = A L^a E^e$$

From this function, the marginal value product for irrigated land, our primary interest is:

$$(2) \quad M_a = \left(\frac{X}{L} \right) a$$

The author then determines national output (X) essentially on the basis of demand--output is determined by population and income growth, assuming an income elasticity of 0.15. Regional output is estimated from national output on the basis of past trends. To illustrate the general framework, the author first makes an independent determination of national output and from this determines output for the region. With regional output, the demand for irrigated land (L) is determined in (2) given values for (a) and (M_a) estimated from the statistical fit of the regional production function. One other addition to the model is an identity equating the computed marginal value product (M_a) to the cost of bringing an acre of irrigated land or other input into use (M_c). This permits the easy substitution of the marginal cost (M_c) for the marginal value product (M_a) relating the demand for irrigated land (L) to alternative costs.

A slight further complication of the above framework gives the equilibrium model. In addition to regional production functions (1), the equilibrium model contains marginal value product functions (2) for irrigated land (M_a) and for operating expenses (M_e) as well as two identities equating calculated marginal value products to budgeted input costs. This model, which simultaneously determines output and inputs, indicates acreage that would result by profit maximization, assuming constant input and product prices as well as no change in technology. The equilibrium model was used primarily as a frame of reference rather than as a basis for projections for specific future dates.

Armed with statistically fitted regional production functions and his analytical framework, the author computes marginal value productivity estimates for major inputs. Current irrigation costs as well as the much higher projected "full" costs of irrigation were also estimated for each region. Estimates were then made for 1954 and projected for 1980 assuming current costs and estimated full irrigation

costs. No attempt will be made to summarize all these projections and their policy implications (chapter 6). In general, results based on the model were better for Western regions than for Eastern regions where there is little irrigation.

The book has much to recommend it, but my review would be less than complete without raising some questions and pointing out some limitations. I am sure that most, if not all, these questions are well known to Ruttan.

The author uses a rather unsophisticated demand relationship as a basis for projecting national output, and the link from the national to the regional level is a weak one. Export demand, currently a big uncertainty, is not adequately provided for in the author's framework. There is no explicit handling of the important effects of price on demand and on output in agriculture. Recent recursive frameworks in use in the Department of Agriculture estimate an equilibrium price or show the impact of several price and cost alternatives.

Possibly one of the biggest shortcomings of the model for projections work is that it does not reflect technology. The use of budgeted cost levels, which imply a completely elastic supply response for inputs, also limits the use of the model.

Statistically fitted regional production functions show considerable variability in factor productivity for alternative formulations and for different regions. These variations plus some relatively flimsy regional data give cause for caution in drawing precise policy conclusions. But this the author knows well.

The methodology, background information, and projections in the book are well worth your time and effort. The book will help to improve long-run decisions--possibly not with specific answers, but with an improved analytical tool.

Rex F. Daly

Roots of the Farm Problem

By Earl O. Heady, Edwin O. Haroldsen, Leo V. Mayer, and Luther G. Tweeten. The Iowa State University Press, Ames. 224 pages. 1965. \$4.95.

A POPULARIZATION of earlier research as presented in "Resource Demand and Struc-

ture of the Agricultural Industry," Ames, 1963, this book contains a few additional interpretations and results of some later research. The central thesis is that the farm problem in the United States--production in excess of market demands (the symptom)--arises from rapid substitution of capital inputs for labor (the cause).

Agricultural output has increased continuously since 1870, the authors say, but it was the mid-1930's before output rose faster than inputs. The productivity of inputs increased greatly after 1940. Capital input per unit of labor input more than doubled between 1940 and 1960. Total agricultural output gained roughly 60 percent in that period, with practically no change in the aggregate of farm inputs. Annual use of farm labor decreased from 20 billion to 10 billion man-hours from 1940 to 1960; use of cropland for crops also declined. But sharp increases occurred in use of capital inputs, including machinery and power, fertilizer, lime, other agricultural chemicals, and purchased seed, feed, and livestock. Farming practices also were greatly improved.

With improved inputs, output increased faster than demand and prices fell, the authors state. As a result, labor returns declined relative to nonfarm incomes, and labor was encouraged to migrate from the farm.

But what has been the motivation for changes toward greater use of capital inputs? It comes primarily from technological advances and competitive pressures from other sectors of the economy, the authors say. Farm wage rates, while low in absolute terms, have become increasingly high in relation to farm prices and to costs of other inputs. The vast accumulation of social overhead in the United States was a prerequisite to technological advances and the wide adoption of capital inputs. The authors mention education and both public and private contributions to technology. They also mention the goals and values of farmers and incentives offered by the profit motive. They might have said more about other elements of social overhead, such as access to markets provided by waterways and highways; freedom from religious taboos; and favorable systems of inheritance.

Attention is given to opportunities for substituting inputs, and to demand for the different kinds of inputs, including estimates of demand

elasticities. Farmland prices, and changes in number and incomes of farms, by farm size, also are discussed. On the subject of commodity supply and farm income adjustments, the authors indicate that output response to price change is relatively slight in the short run, and that reducing price supports cannot be depended on to improve the farm income situation. Output appears to be more responsive in the long run, that is, in a period of more than 20 years. In the short run, they report, a 10 percent decline in farm prices might be associated with a 1 percent decline in production; over the longer period production might decline by 5 to 7 percent.

Seventeen pages are devoted to a discussion of different schemes for adjusting farm output to demand. This section suffers somewhat from brevity and an abundance of assumptions. The authors reach the conclusion that "net social welfare may not, in fact, be maximized by free markets."

"A Picture of Agriculture in 1980" is a fitting conclusion to any contemporary book in agricultural economics. Total agricultural output requirements projected for 1980 range from 35 to 50 percent above the 1960 value. Input requirements are based on straight-line extensions of the 1950-60 trends in input productivity, corrected for weather. These projection techniques are admittedly naive. The results in terms of total output are somewhat lower than those given by Daly and Egbert in the January 1966 issue of this journal ("A Look Ahead for Food and Agriculture"). However, no set of projections 15 to 20 years ahead is likely to be highly accurate. The projections of inputs, moreover, even if only roughly approximate, are useful in farm policy formulation and for industries supplying goods and services to farmers.

Much in the book is not new. But the authors present a highly readable account of the causes and consequences of farm troubles, and of the economic forces that have increased the use of fertilizer and chemicals, farm machinery, and operating inputs, while decreasing the need for farm labor.

Robert M. Walsh

Index Numbers, Theory and Application

By Walter R. Crowe. McDonald and Evans, Ltd., London
368 pages. 1965. \$6.95.

THIS VOLUME on "Index Numbers, Theory and Application" is light on Theory and heavy (relatively at least) on Applications. Theory is indeed touched upon, but after the "touching" the author almost invariably refers the reader to other writers. This is true to such a degree that the term "Theory" deserves no place in the title.

Perhaps the philosophical level of the book is best characterized by a paragraph occurring on page 84, near the end of the cursory chapter on "Tests for Perfection." The paragraph is:

"Have we now discovered the perfect answer? Whatever the mathematical virtues of a formula the main considerations determining the choice are practical--ease of calculation and all around reliability."

And not much has been offered by the author as a means for determining reliability.

The book is divided into two parts. Part I is entitled "The Theory of Index Numbers" and consists of a once-over very lightly of such conventional subjects as "which average," "what base," "relatives or aggregates," and "weighting," that usually receive more comprehensive treatment in a good academic text. One section in the 10-page chapter on "Various Adjustments" is "Time Series Analysis," a subject that can scarcely be covered in a whole chapter, let alone in a section of a short chapter. Perhaps the best chapter in part I is that on "The Development of Index Numbers." Although the chapter does not delve deeply into the real problems of index numbers it traces the development of the idea of an index, mentions some of the contributions of various writers, and introduces the reader to some of the "Greats" in the literature. However, the work of Wesley C. Mitchell is barely mentioned (and that not in the history chapter).

The chapter entitled "Tests for Perfection" names and illustrates the Time and Factor Reversal Tests and the Circular Test. It touches

only superficially on their implications, and fails completely to provide the student with an understanding of their central position in Index Number Theory. It seems to miss the point that the reversal tests have for their purpose the testing of formulas to determine whether they are biased, and the nature of the bias. The discussion of the Circular Test is completely inadequate and at best can only leave the student confused.

Part I includes a quick presentation of sampling (chapter 11) and of correlation (chapter 12). Chapter 11, however, does not touch on how the theory of sampling should be applied to price collection or to index numbers nor does chapter 12 explain how correlation between prices and quantities affects formula bias. The matters of formula bias and weight bias are mentioned so casually and tangentially that they might nearly as well have been omitted entirely.

Formula (4), page 48, should read

$$\log p_{01} = \frac{\sum \log \frac{p_1}{p_0}}{n}$$

better

$$\log p_{01} = \frac{\sum \log p_1 - \sum \log p_0}{n}$$

The line following the table at the top of page 49 should read

$$\log p_{01} = 1/3 [\sum \log p_1 - \sum \log p_0] \\ = \frac{0.0669}{3} = 0.0223$$

whence $p_{01} = 105.3$.

Part II is devoted to a description of a number of the leading indexes published in Britain and the United States. The discussion is necessarily synoptic and the reader desiring specific information will need to consult original sources. This is, however, probably the most useful portion of the book, providing as it does a

bird's-eye view of available indexes. The reader desiring a general view of available indexes will find this section of the book a helpful compilation.

The preface of the book opens with the statement, "This book is intended to assist students in first-year university courses, in technical colleges, those studying at home, and others interested in statistics by explaining the basic theories on which Index Numbers are calculated and by giving a comprehensive treatment of the applications of Indexes published or available in Great Britain plus a selection of important American ones." A little later is the statement, "It is hoped that it will be used in addition to the standard college textbook."

This reviewer hopes that a standard college text would be used in addition to the volume under review.

A moderately extensive bibliography is included. Readers in the United States, however, will be surprised to see publication of the *Journal of Farm Economics* credited to the U.S. Department of Agriculture rather than to the American Farm Economic Association.

B. Ralph Stauber

National Growth and Economic Change in the Upper Midwest

By James M. Henderson and Anne O. Krueger. The University of Minnesota Press, Minneapolis. 231 pages. 1965. \$7.50.

THE UPPER MIDWEST Economic Study (UMES) was begun in 1960 as a joint project of the University of Minnesota and the Upper Midwest Research and Development Council. The three major objectives of the research were: (1) provision of information and analysis that would be of aid for programs to stimulate Upper Midwest regional growth; (2) advancement of methods for regional economic analysis; and (3) analysis of interactions between general economic development and urban planning within the region. The work has been reported in a series of 9 "study papers," 8 "urban reports," and 11 "technical papers," as well as the present final general report.

In the present report emphasis is placed upon future development possibilities and policy

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In the present report emphasis is placed upon future development possibilities and policy

action alternatives of the Upper Midwest. This region coincides with the Ninth Federal Reserve District, which includes Montana, North and South Dakota, Minnesota, Michigan's Upper Peninsula, and 26 counties in northwestern Wisconsin. The first three chapters cover the region's 1950-60 economic structure and growth in terms of trade, employment, income, population, and migration, the 1960-75 projections of regional economic activity, and a general consideration of regional policy formulation and action. Chapters 4-11 are more detailed discussions of the current problems, future prospects, and action alternatives of natural and human resources, manufacturing, transportation, services, and Government. Chapter 12 discusses monitoring future development of the Upper Midwest in terms of data and methods of analysis, while the appendixes discuss in greater depth the methods underlying the projections and the need for and use of associated economic data.

The UMES projections, based in part on the 1976 national projections of the National Planning Association, are termed "neutral" inasmuch as they take no account of possible effects of regional policy and indicate only what may be expected if past rates of change hold in the future.

In their discussion of policy and action, the authors consider the divergence among goals--national vs. regional, increased employment vs. increased per capita income, long-run vs. short-run costs and benefits. The levels of decisions (individual, community, State, Nation) and types of actions (legislative, administrative, regulatory, promotional, informational) are also briefly but meaningfully considered.

The authors endeavor to stop short of specific policy recommendations. The indication of likely economic costs and benefits of several alternative actions (or inactions), however, make clear in several instances biases which this reviewer also holds. For example, as a means to attack the low-income problem of farms, creation of new jobs in nearby urban centers is suggested. Nonfarm jobs not only supplement farm income but, in drawing off underemployed agricultural labor, facilitate the consolidation of farms and permit higher returns for those that remain in farming. The discussion of human resources particularly in terms of investment

and the quality of education makes a strong argument for the economic benefits of Federal aid to education in the Upper Midwest.

Continuing changes in productivity and variations in requirements for transportation, services, and Government activity as far as they directly relate to income are incorporated in the UMES projections. Other intersector linkages, however, receive only implicit recognition. For example, while constraints directly affecting growth of primary metal industries were considered, the indirect effects of such constraints on metal-using industries are only subjectively considered, if at all. Greater detail with respect to the interactions among industries and areas, and careful analysis of the relevance of the underlying assumptions, would have provided an even more meaningful study.

In a general report of perhaps the most comprehensive regional study to date, it is not surprising to find a few statements on method which are vague. The reader is referred in numerous instances, however, to the earlier UMES reports and papers which unfortunately were not available in all cases to the reviewer.

The present UMES report makes a major contribution to the literature on regional growth by its explicit consideration of interstate linkages and interactions. The implications for systematized regional economic monitoring system for policy purposes are profound, and warrant the serious attention of all concerned with regional growth and development.

H. Albert Green

Forestry in Communist China

By S. D. Richardson. The Johns Hopkins Press, Baltimore. 237 pages. 1966. \$6.95.

IN 1963 S. D. Richardson, Director of Research of the New Zealand Forest Service, toured Communist China. He is one of the few Western foresters to obtain a first-hand impression of conditions there in recent times. From observation and from data made available to him from many sources--including a file of translations of official Chinese news releases relating to forestry--he has made this report as realistic as possible. Repeatedly,

he calls attention to inconsistent data given to him and implies that the "lily" may have been "killed" elsewhere.

In scope the book covers a description of (1) the country's natural vegetation, soils, and land use; (2) forestry administration and policy; (3) silvicultural practices; (4) water conservancy and erosion control procedures; (5) the economic phases of timber production, forest products manufacture, and trade; and (6) forestry education and research.

The total land area of Communist China is slightly greater than the total land area of the 50 States in the United States. Population is more than three times that of the United States. Cultivated area is 11 percent of total land area in contrast with 20 percent in the United States. Total forest area is variously estimated at 5 to 10 percent of the total land area as against 33 percent in the United States. In general the natural forests predominate in remote areas, whereas the most active industrial development is taking place in areas that lack any substantial forest resource.

Planned industrial development of the nation will require an adequate timber supply. Expansion in mining will call for an additional volume of pit props. Much-needed extension of railway lines will require large volumes of wood crossties. Production of paper and paperboard for printing and for containers for industrial products is expected to increase. Totalling these and other requirements, a substantial deficit of forest products can be anticipated after 1975 to 1980. The spiraling population growth is likely to accentuate this deficit. Prior to this date, timber from the natural

forests can be expected to care for demand.

During the past 15 years Chinese statistics on reforested areas have been startling. Richardson discounts these optimistic claims for two reasons: (1) some statistics are contradictory, and (2) survival in planted stands has been low, in many instances no more than 10 percent. Apparently, the Chinese foresters expect the products of these plantations to make up a substantial portion of the prospective deficit after 1975 to 1980. The author is skeptical that the deficit can be met in this way. Intensification of forestry effort plus increased imports and increased use of wood substitutes will probably be required if planned goals are to be met. In a word, the future wood supply picture is not bright, and colossal efforts will be required to change it substantially.

The book also provides up-to-date information on forestry education and research in Communist China and has 32 pages of excellent photographs of forests and forest enterprises. It is long on observation and on general description resulting from library research. That it is short on solid facts is not surprising. In fact, it is remarkable that the author, obviously a competent observer and analyst, is able to present as complete a general picture as he does. Until Communist China decides to obtain and release more reliable statistics than it has in the past, or to admit more foreign observers, this book is likely to be widely quoted as the most authoritative and thorough study of current Chinese forestry.

Robert K. Winters

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