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industry policy is to be changed as radically as Dr. Schapper suggests then I claim it should be completely rationalised within the limits of the level of assistance which he believes necessary.

I suggest that prior to such a change it is essential to have a study of the industry to estimate the adequacy of the milk supplies that would then be available.

Finally, if this study shows the change is feasible, I believe that the wholemilk producers, committed as they are to high cost production by a mistake which is not their own, may have a logical claim for a more gradual change than Dr. Schapper proposes.

REVIEWS

Mechanization in Agriculture. EDITED BY J. L. MEIJ. (Amsterdam: North Holland Publishing Company, 1960.) Pp. xi + 379, 55/- stg.

This book, which is comprised of nine essays by an historian, agricultural engineers, economists and agricultural economists, is the second in a series of "Studies in Industrial Economics". In an introductory note it is stated that "Though the problems in the micro-world of the firm and the influence of its behaviour on society as a whole are studied extensively there still exists a lack of that collaboration between students of different nationalities which has proved to be so fruitful in other sciences and even in other parts of the economics". The principal aim of the series is stated to be "to stimulate study and research in this part of economics and to further an interchange of ideas and results on an international basis". But according to the dust cover the volume "is intended for practicing farmers no less than for students and specialists" and a reading of the volume tends to confirm the inference that there is some confusion of purpose by the editors and publishers.

As with so many collections of essays on a broad theme, there is no real continuity and there is great variation in the approach and in the level of appeal of the different contributions. A few chapters such as Barker's "Mechanization and Farm Management" in which, *inter alia*, methods of costing farm machinery operations are discussed, may be of some interest to farmers but the discussion is unnecessarily lengthy in places and is rather too elementary to be of much interest to agricultural economists.

Heady's contribution, on the other hand, which deals, descriptively, with the "Extent and Conditions of Agricultural Mechanization in the United States" is, as one might expect, concise and to the point but even Heady breaks little, if any, new ground. Another descriptive chapter on "Conditions of Mechanization in Europe" by F. S. Mitchell of the National Institute of Agricultural Engineering, Silsoe, England is too broad and generalized in its scope to be of much value and the same remark could be applied to several of the remaining contributions.

The book is something of a hotchpotch and while it may have some value to agricultural economists concerned with investigations of farm machinery usage and costs as well as to undergraduates in agricultural economics, it is too variable in its quality and in its level of approach to have any widespread value.

P. C. DRUCE

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Sydney.*

Economics of a Multiple-purpose River Dam : Report of an Enquiry into the Economic Benefits of the Hirakud Dam. BY N. V. SOVANI AND N. RATH. (Poona : Gokhale Institute of Politics and Economics, 1960.) Pp. xi + 389, 50/- stg.

The subtitle adequately describes the contents of this publication. The investigation is directed towards assessing the benefits likely to accrue from the construction of a dam, channels, hydro-power and flood control works on the Mahanadi River at Hirakud. The Mahanadi flows into the Bay of Bengal through an extensive delta system about 250 miles below Calcutta. The area of land commanded by irrigation is just less than 1.5m. acres—about three-quarters of the total irrigated area in Australia.

The control of the Mahanadi has been investigated intermittently following disastrous floods and/or famine since the first canal system was installed on the delta in 1865. The final investigation was completed in November, 1945. Like the Snowy Mountains scheme, rapid decisions were made by the Central Government and interested States. The foundation stone of Hirakud Dam was set in March, 1946 and irrigation water and power were available in January, 1957. Economic investigations commenced in 1954 and the *Report*, which took a year to write, was submitted to the Orissa Government in September, 1958.

The major part of the book is concerned with a socio-economic survey of the delta and upstream areas. Census data were unreliable. Sample grids of 10 square miles were used, 20 in the delta zone and 9 in the upstream area. (Population densities seem to range from 100 to over 500 per square mile.) Smaller samples were also available to determine production patterns and costs with irrigation. Surveys were also made in the urban areas and data were available of power requirements for aluminium, steel and ferro-manganese industry development, for other industries, for bulk sales to the adjoining State of Madhya Pradesh and for domestic supply.

Benefit-cost ratios are derived in the manner outlined by the United States Federal Inter-Agency River Basin Committee. Only primary and secondary direct benefits are used and secondary benefits are not complete. Indirect benefits are excluded. Two items of cost are estimates only. The cost of industrial production is calculated by deducting a notional 10 per cent value added by manufacture from the gross value of production. Sugar factory costs are placed at 80 per cent of gross production.

To overcome the difficulty of deriving interest rates which reflect the real social cost of capital investment, two benefit-cost ratios are calculated. One is based on the interest rates of 3.75 to 4.25 per cent charged to the project and the other is based on a rate of 10 per cent. The benefit-cost ratios so derived are as follows :

				Interest at 3.75-4.25%	Interest at 10%
Irrigation—					
Primary				2.40	1.58
Secondary				2.26	1.70
Hydro-power—					
Primary				1.12	0.58
Secondary				1.11	1.01
Total benefits				1.37	1.15

Peasant income is expected to increase by 325 per cent. From the fourth year, State revenue will have a surplus to repay capital costs. After 1970, when the "betterment levy" ceases, the project will show an annual deficit—including capital servicing charges—of £A23,000 per annum.

The benefit-cost ratios are derived on minor changes in cropping patterns in a short time series and to this degree benefits are underestimated. There is a plaint that research has not indicated the cropping patterns that could fully utilize the additional resources, and extension services are woefully inadequate for making major changes in peasant farming skills. This has a familiar local sound.

Outwardly sound, the book is badly bound, printed on poor quality paper and for an Indian production has the inevitable errata slip inside the front cover. Completed as the project came into operation the survey is, as the foreword points out, "neither of great academic importance nor of much practical use". It is interesting to read it and cogitate about the difficulties presented to the authors and how population pressures make these projects more viable. Some day Australia may use—and publish—benefit-cost analyses when determining the best investment of public capital.

R. W. PRUNSTER

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Cost Studies in Agriculture. (Bombay : Indian Society of Agricultural Economics, 1961.) Pp. vii + 117, Rs.8.00.

Although this excellent seminar publication covers much familiar ground to those conversant with cost studies in agriculture, its main value lies in the recognition that concepts based on experience in Western and European countries are of limited and sometimes of no value for cost studies in the less advanced economies.

Many of the papers carefully point out that the aim of cost studies in such countries as India is somewhat different from that in the more advanced countries. The main problem facing India is one of increasing food production and therefore agricultural policy is directed towards this goal. However, in the more advanced economies, agricultural policy is directed towards price stability for agricultural products, often as a result of surpluses, and a more equitable distribution of income to the agricultural sector of the economy. Thus, although the aim of cost studies is to act as a guide for policy decisions, the ultimate objectives are different.

The seminar is mainly concerned with the peasant sector of Indian agriculture and only passing reference is made to the purely commercial section. This raised the point that the "validity of economic analysis based on the theory of competitive equilibrium through market forces is limited" in Indian agriculture. The non-economic factors in peasant and subsistence agriculture are often more important than the economic aspects. Because of this, cost studies must fit in with the broad context of the agriculture of the country.

Although Indian agriculture has a very large proportion of under-employed labour, it is being utilized ; however, its opportunity cost in many areas of the country is zero or near zero. Thus, the problem of its valuation in cost studies is raised, so that imputed costs become a

dominant consideration. To-date, no satisfactory solution has been reached on the problem of imputed costs.

Many of the problems raised in this interesting seminar have or will have direct relationship to agriculture in the Territory of Papua and New Guinea. As native agriculture becomes more sedentary with increasing importance on cash export crops, cost studies will need to be carried out to assist in the formulation of agricultural policy. Many of the problems raised during this Indian seminar will have to be tackled ; namely, the role of imputed costs, the importance of non-economic factors, and perhaps in the future, some under-employment of labour as population increases, especially if economic development lags behind social advancement.

The papers and discussions which range from the uses to the design of cost studies will be of considerable value to all working on cost studies in Australia. This is particularly true in the need to design cost studies to answer rather specific problems, an aspect often overlooked in this country.

G. R. SPINKS

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Linear Programming and the Theory of the Firm. BY K. E. BOULDING
AND W. A. SPIVEY. (New York : Macmillan Company, 1960.)
Pp. ix + 227, 55/9d.

“ This volume is the joint product of a seminar of college teachers of economics . . . The main object . . . was to examine some new developments which were relevant to the theory of the firm, and which had grown up in the last ten or fifteen years outside of professional economics.”

It consists of twenty pages (including the preface) by Professor Boulding, seventy-six pages by Professor Spivey and one hundred and twenty pages devoted to the main topic. Professor Spivey's contribution is split equally between an introduction to set theory, vectors and matrices ; and, an introduction to linear programming. The introduction to set theory can be easily followed by anyone who has read Kemeny, Snell and Thompson's *Introduction to Finite Mathematics*, or the first chapter of Debreu : *Theory of Value : An Axiomatic Approach*. It suffers, however, by being without exercises, which would obviously be required by anyone meeting the ideas for the first time. The set theory is only used in Spivey's introduction to linear programming, where it is not really needed since the presentation is on the same level as Vajda's *Theory of Games and Linear Programming*.

The important essays are :—

1. *Analytical and Graphical Comparison of Marginal Analysis and Mathematical Programming in the Theory of the Firm* by Yuan-Li Wu and Ching-Wen Kwang, which concentrates on marginal *cost* analysis in the theory of the firm. This chapter has an interesting discussion of non-linear revenue functions. It is a pity that the production economics relationships were largely ignored, and one would have liked to see a warning that their U shaped average cost curve could only be obtained for the linear programming model by violating the convexity assumption.

2. *Operations Research : Its Nature and Scope* by Hans. H. Jenny, which lists the major topics of interest to “ operational researchers ” and brings out the point that *as practised* operations research is quite

restricted in the sense that it concerns the optimization of some simple objective function (such as minimizing distance travelled, or machine time, or cost).

3. *Multiple Goals in the Theory of the Firm* by C. Michael White, which surveys the n -dimensional nature of a firm's objective function. He shows how a linear programming formulation of the firm's problem would allow the maximization of sales volume (Z_1), value of assets (Z_2) and financial ratios (Z_3), with or without upper and lower constraints on profits. Unfortunately, he does not suggest the form of the function which would relate Z_1 , Z_2 and Z_3 to the firm's ultimate utility function.

4. *A Short Essay on a Managerial Theory of the Firm* by Sherrill Cleland, which traces the development of the theory of the firm from the simple classical assumption that only the efficient would survive, through monopolistic competition and Abbott's product adjustment, to a theory with considerable control by the firm of its product and factor markets. This leads to a theory where by providing for noiseless feed-back and appropriate adjustment, the manager can be freed to concentrate on his main function, planning dynamic development of the firm.

There is a useful bibliography of 178 references.

In short, this book should probably be purchased for the library, as providing a brief review of the current flux in the "theory of the corporation". This flux probably has relatively little to add to the theory of the farm firm. The chapter on set theory may be ignored since the important essays involve nothing more sophisticated than an occasional summation sign or inequality.

WILFRED CANDLER

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Yearbook of Agricultural Co-operation, 1960. (Oxford : Basil Blackwell, 1960.) Pp. iii + 396, 35/- stg.

Co-operative Organization in Tropical Countries. BY SHEILA GORST. (Oxford : Basil Blackwell, 1959.) Pp. xiii + 343, 25/- stg.

Co-operation in Karjan. BY M. B. DESAI. (Bombay : Indian Society of Agricultural Economics, 1961.) Pp. viii + 131, Rs. 5.00.

These three books do not seriously challenge the dictum that co-operation is long on experience but short on theory. With the exception of one chapter in the *Yearbook*, the material is mainly descriptive and deals with co-operatives in countries from the Arctic to the South Pacific under a variety of political conditions.

Produced under the auspices of the Plunkett Foundation for Co-operative Studies, the *Yearbook* comprises brief chapters on co-operation in a number of countries. Although no writers from behind the Iron Curtain are represented, three essays on co-operation in Poland, Eastern Europe and the Communist Countries of Asia are included. The dose of theory is contained in a chapter by Yehud Don, "Economic Analysis of Agricultural Co-operation". The writer does not break any new ground but reviews recent contributions to the theory of co-operation, coming down—rather heavily—on the side of those who regard the co-operative not as an independent economic unit but rather as a "common plant, owned and operated jointly by several firms as an integral part of each of the several firms". This reviewer, for one, feels that for most

economic purposes a co-operative cannot be regarded otherwise than as an independent unit, formulating its own policy ; this even more so, because, in the words of the author, the co-operative, in its competition with other sectors of the economy, has to use “ the generally accepted devices and weapons of efficiency, optimal size, low cost of production, high grade service and even monopolistic bargaining ” (p. 50).

The argument that a co-operative is not an independent unit, but rather a vertically integrated branch of the member firm is, of course, rather attractive to the co-operator, for it implies that a co-operative can make neither profit nor loss and therefore is not liable to pay company tax, a fact which is generally acknowledged by governments. The so-called “ profit ” becomes a residue which results from entries in the “ internal bookkeeping ” of the member firm. Don takes this argument a step further and concludes that any dividend received by a member should not be liable to income tax either ; the dividend simply means that the member has been able to buy goods or services cheaper than he otherwise would. However, in case the member is a firm whose income is increased by lower charges, this argument does not seem valid, a point which is ignored by Don.

In any case, this whole theoretical structure breaks down when non-members use the facilities of the co-operative. Then any surplus shared out between members cannot be regarded otherwise than as profit. Don recognizes this and is willing in such cases to waive part of the income tax, although he does not discuss to what extent the co-operative should be held liable for company tax.

Sheila Gorst's *Co-operative Organization in Tropical Countries* has a somewhat misleading title, for it is “ A study of co-operative development in non-self-governing territories under United Kingdom Administration 1945-55 ”, a rather severe curtailment of “ Tropical Countries ”. Remnants of British colonialism? The book itself is an interesting enough piece of description. The first part, “ Survey 1945-55 ”, is a detailed account of co-operation in the territories for which Britain was responsible during this period, including territories such as Ghana and Malaya which have since become independent. The second part of the book is called “ Analysis ”, but is rather a summing up of what has been achieved during the period under review.

Although at first sight the achievement may seem impressive, nevertheless, some doubts may remain in the mind of the reader whether the direction of development has always been the right one. As Sheila Gorst states, amongst peasants “ co-operative thrift and credit has made most progress ”. Insofar as thrift and credit societies stimulate the flow of savings from wage earners towards the peasant class where they can be invested, with probably very high marginal returns, the development must be advantageous. From the reports from a number of areas, however, it would appear that thrift amongst peasants is also considered as worth promoting. This is a debatable point. The primary producer, rather than savings, needs credit in order to build up his productive resources. With the exception of Ghana, furthermore, the societies do not appear to have been able to promote long-term loans and their activities have been limited to providing short-term credit. The Ghanaian example shows, however, that with government help, co-operatives can do good work in the long-term loan market.

Rather disappointing is the performance by marketing societies. The peasant emerging from his subsistence society into the chill climate of

the money economy, will be extremely handicapped by the lack of proper marketing channels or, even when these are provided, by his lack of understanding of the operation of Western marketing methods. Marketing co-operatives are probably one of the best means of providing the first and creating the second. Nevertheless in many areas it appears that Governments are willing to sacrifice long-run development for some direct gains.

Professor Desai's small tome is a report on the activities of co-operatives in the Baroda district of the Bombay State in India. The Report is based on surveys and field investigations whereby approximately ten per cent of the members of large societies and fifteen per cent of small societies with a membership of less than 50 were contacted. It may be of interest to workers in underdeveloped areas as it gives an impression of the factors which underlie success or failure in promoting co-operation in a primitive peasant community.

J. VAN DER MEULEN

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Armidale.*

Agrarian Policy of the Chinese Communist Party. BY CHAO KUO-CHUN.
(London : Asia Publishing House, 1961.) Pp. xii + 399, 55/- stg.

Dr. Chao Kuo-chun offers an historical survey of Chinese Communist Party agrarian policy in the period from 1921 to 1959. The study, which is in the main based on Chinese documents available in libraries and institutions outside China, is divided into three sub-periods : (i) The period to 1949 in which the communist party had authority over varying areas first in the south and later in the north and north-west of China ; (ii) 1949-1953, the period of " Land Reform " in which the holdings of landlords were re-distributed and a system based on small-scale peasant ownership was established ; (iii) The period from 1953 to 1959 in which this agrarian system was transformed in a series of revolutionary changes first to collective farms and then, from mid-1958, to communes. The statistical material and documentation extends to the early months of 1960.

The theory, asserted but not argued, around which the material is arranged, is that " organizational leadership " is the decisive element in " effecting a breakthrough in a stagnant backward rural economy ". As one would expect, great attention is given to the analysis of communist party resolutions, state legislation and detailed administrative arrangements. This material is pieced together from a very wide range of Chinese sources. To this is added an account of the techniques of persuasion and coercion that are intended to make reality a mirror of the administrative wish.

However, the question of judging the effectiveness of the policies seems hardly to arise. Readers who come to Chinese material with some idea of fairly strict technical and economic limits to the process of economic growth, will look in vain for checks on the reliability of official claims. Nor is there a grading of the value of evidence. All seems to be given about equal weight whether from official statistical releases or from exemplary and cautionary tales in Chinese newspapers and magazines. The drastic revision of the original estimates of 1958 output, together with the almost complete lack of detailed statistics since 1959, have caused many people to despair of making any useful judgment about Chinese rural production.

Dr. Chao Kuo-chun writes after the revisions were made and uses the revised figures in his tables, but I can find only two short references to the fact that the original estimates were too high. There is no indication of the magnitude of the corrections (e.g., grain output instead of increasing by nearly 100% is now said to have increased by 35%) nor any answer to the doubts that must now be cast on Chinese official statistics.

While there are revised figures for aggregate grain and cotton output in 1958, the original figures for area afforested, new tools produced, wells dug, acres deep ploughed, fertiliser collected, etc., are reproduced in this book without qualification and untinged by the doubts which must spread from the rejected output figures. It is astonishing to find the statement: "The steady improvement in the agricultural statistics since 1952 has been recognized by western specialists" (p. 260). In support of this a reference is made to an article published in May 1958, written before the claims and revisions of the "Great Leap".

The unrevised figures carry with them the overtones of unlimited optimism of the period; it seemed that limits to production existed only in the minds of men. For example, it was believed for a time that because of huge technical advances, both the area of cultivated land and the number of people engaged in agriculture could be reduced while output continued to rise rapidly. This short-lived confidence finds its place (at p. 168) as "the long-range blueprint of agriculture, as envisaged by the Chinese planners".

It would seem indeed that the introduction of the commune form of organization begins a new period, study of which must be deferred till reliable and detailed statistics are available. We must also wait to decide whether Dr. Chao Kuo-chun is correct in his opinion that Chinese communist rural policies have been realistic, responding sensitively to the needs and wishes of the Chinese peasants (pp. 241-2).

E. RUSSELL

University of Adelaide.

Principles and Practice of Farm Management Accounting. BY C. A. MALLYON. (Sydney: Law Book Co. of Australasia, 1961.) Pp. viii + 363, 63/-.

Literature of this kind is in all too short supply in Australia. There is no shortage of books and articles on the more advanced techniques such as linear programming and, at the other end of the academic scale, text books on elementary book-keeping are readily obtainable. This volume occupies an intermediate place, and shows not only how farm records can be compiled, but, far more important in these days of the cost-price squeeze, it shows how farm records can be used to point the way to more profitable farming.

The book is divided into seven parts. The first three parts deal with the introduction and operation of an accounting system, and the presentation of accounts, respectively. This section of the book is more or less routine accounting procedure applied to agricultural conditions and explained in terms which suggest a wide experience of rural affairs. The instructions are free from ambiguity and supplemented with adequate examples of book-keeping entries. The author has taken obvious pains to make his explanations abundantly clear so that those who have never had the advantage of formal book-keeping instruction can have no difficulty in following the right procedures. Text books on farm book-keeping are often open to the objection that they are merely adaptations

of conventional record keeping for industry and commerce with no regard for the special requirements of agriculture. This book, on the other hand, has been written from the agricultural point of view. This is evident right through the volume and particularly in a chapter devoted to "short-cut accounting" methods which has been written for farmers who feel they cannot devote enough time to keeping a full set of books and consider the cost of having the job done by a professional accountant is more than they can afford.

The majority of farmers are interested in book-keeping only to the extent that they can satisfy the minimum requirements of the tax collector. The chapter on taxation accounts, though making no claim to exhaustive treatment, is particularly interesting because it shows the difference between profit for taxation purposes as determined under current legislation and profit for management purposes. Few farmers appreciate the significance and magnitude of the difference between these two figures and a perusal of this chapter would prove very enlightening.

The remaining four parts of the book are of more specific interest to the agricultural economist. These encompass the analysis of accounts, budgeting, project accounting, forms of ownership and some concluding comments on the future of farm accounting.

The section on analysis is particularly helpful to all concerned with the future profits of farming. The subject is dealt with systematically under the following headings—financial structure, economic results and technical factors. Then follows a chapter on the presentation of reports to primary producers—a chapter which many city accountants could study with great advantage. Budgeting is dealt with in considerable detail, and a chapter is devoted to the elements of linear programming. Part of this section is somewhat advanced for non-technical readers but the chapter on budgetary usage shows how financial plans should be drawn up for a number of seasons. It should prove of great value to all farmers and is particularly recommended to those who are at the beginning of their farming career.

The book includes all the information necessary to compile and analyse a set of farm records. It is written in a simple straightforward style (albeit occasionally long-winded) so that the farmer who writes up his own books can follow the instructions, complete his own records and make his plans for the future intelligently. Perhaps the greatest scope for the book lies with practising accountants and tax agents who previously only drew up tax statements, but are now called upon to advise farmers on detailed financial matters to a much greater extent than when farming was more profitable a few years ago. Extension workers are increasingly drawn into the complications of farm finance because farmers have to be convinced that the new scientific advances will be profitable before they will change their methods. This volume will be an indispensable reference for the many problems they will encounter. Too, research workers in academic circles should find that the emphasis on practical issues is a helpful reminder of the everyday financial problems on the farm.

A. A. DAWSON

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The Australian Dairy Industry. EDITED BY N. T. DRANE AND H. R. EDWARDS. (Melbourne : Cheshire, 1961.) Pp. xviii + 324, 84/-.

In the past twelve months the reviewer has taken part in a number of

discussions with overseas visitors about the possibilities of setting up as a dairy farmer in Australia. His task has been made very much lighter by being able to refer enquirers to this book. (The overseas visitors were for the most part well-to-do farmers from British East Africa. This was perhaps just as well in view of the price of the book. Whether those dairy farmers who would most benefit by a study of the book would read it even if it were presented free, may be doubted, but the price will surely make certain that they do not.)

The Australian Dairy Industry is a representation, refurnished and brought more up to date, of the material contained in the privately circulated *Economic Survey of the Australian Dairy Industry* by members of the Faculty of Economics in the University of Sydney. To have this material in a handier format in itself puts one in the editors' and publisher's debt.

Yet one feels that more could have been done with the book—or that it should have been published earlier. Although the Preface is dated May 1960, the book did not appear until early in 1961, by which time the *Report of the Dairy Industry Committee of Enquiry* had been published and the possibility of the United Kingdom's entering the European Economic Community was being hotly canvassed. The absence of more than a brief mention of these two topics gives the book an air of remoteness from the arena, particularly where the reader has had even a small hand in them. The book gives a deal of basic information, an exhaustive analysis of the reasons underlying the Australian dairy industry's problem, and recommendations for their solution, the last being close, in principle, to the main recommendations of the Committee of Enquiry. The strength and weakness of our knowledge of the industry is clearly brought out: what is known comes from a very limited number of sources and is by no means as up to date as could be wished; what is not known, and what one would have liked to see, particularly on the manufacturing side, would fill such another book.

Some points call for detailed comment. For example, the analysis of demand for dairy products in the U.K. and in Australia could have been improved. Stone's coefficients based on pre-war data are the only ones quoted for the U.K., but J. A. C. Brown's later work, published in the *Journal of Agricultural Economics* for June 1959, makes one doubtful of the statement on p. 58 that the U.K. price elasticity of demand is "apparently reasonably elastic (about -1.5)". Brown's coefficient, -0.6 , suggests the opposite case. Elsewhere the analysis is conducted in terms of the butter-margarine price ratio. According to data published in N.Z., the average monthly retail price of margarine in London had a range of only 2d. stg. per lb. in six years (1955/60), between 20d. and 22d. Nearly all the variation in the price ratio has stemmed from changes in the price of butter, and a simpler analysis in terms of own price might have avoided the statement on p. 283 that "expanded supplies of butter (to the U.K.) can be absorbed without undue depression of the butter price". The relative changes in supply and price in 1958, 1959 and 1960/61 seem to confirm Brown. (Australian butter in the U.K. is given a flattering status on p. 54, because, one suspects, the U.K. market has not been fully analysed. That some discrimination exists in some areas *against* Australian and similar butters is shown by the price differentials normally enjoyed by Danish butter. Then again, although greater imports from any one source need not depress the average level of prices for butter greatly if the total volume of supply is unchanged,

they can have an effect on the price for that particular butter and other butters in the same group. Here again Danish prices offer a lead.)

It is stated that no very reliable series of retail margarine prices is available for Australia, and the butter-margarine price ratio used is based on Sydney "wholesaler to retailer" prices. The values of a ratio based on the Commonwealth Statistician's retail prices move rather differently. No reason for the rejection or non-use of the Statistician's data is given, and no account has been taken of differences in State consumption rates for butter and margarine. Further, insufficient allowance has been made for the limiting effects of the table margarine quotas; table margarine did not wholly take up the drop in butter sales because, *inter alia*, there was not enough table margarine to go around.

Reference is made to the pressures which may follow if copra producers in Papua-New Guinea look more to the Australian market. But if peanut production in the Northern Territory should prove to be economic on a large scale, the butter-margarine interests' clash should be all the more intense because of their mutually destructive nature.

There is a displaced footnote in Table 12, while the last lines of Table 3 contain a number of misplaced decimal points.

A. D. Ross

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Canberra.*

Agricultural Production Functions. BY E. O. HEADY AND J. L. DILLON.
(Ames: Iowa State University Press, 1961.) Pp. vii + 667, \$6.95.

The authors have set themselves to provide a text "in agricultural science rather than purely in economics", which "*summarises* certain concepts and methods" relating to the estimation and use of agricultural production functions, with an emphasis on concepts, principles and methodological results rather than on practical application to farmer use. (Reviewer's italics.) In the opinion of the reviewer they have largely been successful, although he has doubts about the application of the word "summarises" to a work of 667 pages.

A perusal of the contents of individual chapters gives some idea of the wide scope of this book. The first seven chapters, comprising about two-fifths of the book, are of most interest to economists. A readable account of the historical development of the use of production function analysis is presented in the first chapter. In the second, there is an account of the economic implications of production functions. Here, the authors have explained some of the terminology of production functions for the non-economist and derive algebraically, from different forms of production function, least cost combinations, maximum profit combinations (with limited and unlimited capital), long-run and short-run cost curves, etc. An account of the various algebraic forms of production function available for empirical research and the criteria for selecting from among them for a particular enquiry appears in Chapter 3. In the fourth chapter is an elementary introduction to the statistical techniques involved in estimation, including a brief mention of such topics as multicollinearity, confluence analysis, simultaneous equation estimation and problems of autocorrelation of variables and residuals. The collection of data, both from farm surveys and from controlled experiments, are then discussed (Ch. 5). Two chapters are devoted to problems of economic specification, and to the problems which arise in empirical studies, such as the selection of suitable resource aggregates, the effects of technological

change, the interpretation of estimated returns to scale, the type of recommendations which may legitimately be made from fitted production functions, etc.

The following eight chapters, written by a number of different authors, describe some production function estimates and the derivation from them of economic relationships from experiments involving a variety of types of livestock : hogs (in drylot and on pasture), broilers, turkeys, dairy cows and beef cattle ; and from experiments involving crop response to fertilizers. These chapters seem likely to be of value mainly to economists who are working with physical scientists and provide a very useful source to which they might refer their non-economist collaborators.

In the last two chapters (16 and 17) the authors turn again to production functions from farm data. In Chapter 16 examples are presented of functions estimated from farm samples with some fixed plant. In the concluding section of this chapter, the authors note that no success has been obtained using simultaneous equation models in estimating farm production functions. Reasons suggested for this are :—

“One difficulty evidently is on the high intercorrelation between the numerous variables necessary in a logical simultaneous equation model. Perhaps another reason is that the basic suppositions of simultaneous models may have no special relevance in terms of whole-farm production functions. While reasonable decision models might be established, there appears to be no real biological or physical basis for supposing that the magnitudes of inputs and outputs are interdependent ” (p. 584).

This may well be true in the case of farms producing a single product. However, from the experience of the reviewer in the case of multi-product farms, the use of simultaneous equation models may well prove useful.

The last chapter summarizes and compares whole-farm production function estimates from 13 different nations, and in most cases, from different regions within these nations. It turns out that intra-national departures from equilibrium are sufficiently large (and involving resources virtually immobile internationally) to suggest the conclusion that “intra-national resource transfers must play the dominant role in any initial shift towards greater efficiency in world agriculture”.

Generally, the authors succeed in their aims as set out above. This is particularly so for the first seven chapters. However, a more compact treatment would have been desirable. There is a considerable amount of repetition in the chapters reporting applications to different forms of livestock production and fertilizer response surfaces. The treatment of basic economic and statistical problems in the earlier chapters is likely to prove tedious to the mathematically inclined reader because the discussion is largely by way of example rather than by way of propositions and proofs.

A text of this size (667 pages) is bound to be somewhat cumbersome. The problems of locating information from such a mass of material are greatly increased by the lack of an adequate index, which here covers only three pages. For instance, although the book contains a wide coverage of regression techniques and problems, none of the following topics are listed in the index : multicollinearity, confluence analysis, autocorrelation, variance, regression, regression coefficient, etc. This list, unfortunately, could be much expanded. By way of contrast, the bibliography which is very extensive and which should prove of considerable value to workers in this field, covers some nineteen pages.

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Demand for Durable Goods. EDITED BY A. C. HARBERGER. (Chicago : Univ. of Chicago Press, 1960.) Pp. viii + 274, \$6.

This book is aimed neither at the undergraduate student nor the agricultural economist but rather at the applied economist interested in econometrics. Nevertheless it should be of interest to agricultural economists for two main reasons—first, for a study by Griliches of the demand for farm tractors in the United States, and second, for the methods used to measure the dynamic adjustment processes adopted by economic agents whether consumers, farmers, or corporations.

In addition to the farm tractors study, the book contains studies of automobiles by Chow, refrigerators by Burnstein, non-farm housing by Muth, and the investment of large corporations by Grunfeld. The editor's introduction summarizes the conclusions of the studies and also demonstrates the role played by durable goods in cyclical fluctuations in the United States.

For readers of this journal, Griliches' study stands out from the others not in regard to methods or style (though only he and Burnstein favour the reader with charts of the data) but in regard to subject matter as it is the only one concerned in any degree with agriculture. His model of farm tractor demand is composed of two parts—first, the desired stock of tractors is a function of prices paid for tractors, prices received for crops, and the rate of interest ; and, second, in any year farmers adjust their actual stock by only a proportion of the difference between the actual stock and the desired stock indicated by current prices and interest rates. Models of demand (or supply) such as this, which incorporate an adjustment coefficient, do not assume that the demand (or supply) reaction is instantaneous but allow the reaction to be spread through time so that the short-run elasticities of demand (or supply) can differ from the long-run elasticities. In this case Griliches finds that two alternative forms of the model both indicate an adjustment coefficient of about 17 per cent per annum. This is a particularly slow rate of adjustment. It implies that a price elasticity of about -0.25 in the short-run will be -1.5 in the long-run, and that short-run elasticity of stock demand of -1.0 with respect to the farm mortgage interest rate will be -5.0 in the long-run. It seems that United States farmers are slower and more cautious in adjusting their stocks of tractors to desired levels than United States consumers are in adjusting their stocks of refrigerators, automobiles and houses.

Griliches also examines the influence of other variables on the stock of tractors. He finds that the stock of horses and mules, the wage rates paid to hired farm labour, a measure of proprietors' equity, the prices paid for motor supplies, and also a simple logarithmic time trend, all have little effect on the results ; indeed, most have coefficients that are not statistically significant.

Books such as this tend to raise as many questions as they answer. An important question raised in this book is "What is the correct measure for stock?" Griliches' results show that separately both the total number of tractors and the depreciated real value of tractors have positive coefficients and give almost equally good fits. However, when both measures are used in the same equation, the coefficient of the number of tractors becomes significantly negative while the coefficient of value remains positive. Griliches attempts to explain these results but concludes that there are several ways of interpreting the coefficients and that

much more work is needed both theoretically and empirically on the implications of alternative stock measures.

The studies in the book were undertaken by the Research Group in Public Finance at the University of Chicago. At first sight the connection between durable goods and public finance seems tenuous. However, one of the principal tasks of government tax and expenditure policies is the regulation of the cyclical process and the wide fluctuations of demand for durable goods can have initiating and amplifying effects on that process. Additionally, two of the durables studied—automobiles and refrigerators—are subject to indirect taxation.

Overall, the demand analyses in this volume contain ideas aplenty on methods of measuring relationships between variables and, although hardly comprehensive enough to carry the title “The Demand for Durable Goods”, together they make an admirable addition to the growing literature of empirical studies of demand.

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Economics of Watershed Planning. EDITED BY G. S. TOLLEY AND F. E. RIGGS. (Ames : Iowa State University Press, 1961.) Pp. ix + 339, \$3.95.

This book contains the twenty papers and associated commentaries which comprised the Symposium on the Economics of Watershed Planning held at Knoxville, Tennessee in June, 1959.

The structure of the book is commendable. The groups of papers deal successively with objectives, criteria of attainment, measurement, analysis, and institutional considerations. Unfortunately, some of the authors appear to have been either unaware of the obviously systematic allocation of topics, or unwilling to confine themselves to their allotted subject. As a result, most of the authors dealing with criteria and objectives attempted résumés of the entire field of watershed planning. The consequent generalized and often unsystematic treatment makes the first six papers of doubtful worth. One would be better advised to read the recent works of McKean, Krutilla, Eckstein, and Ciriacy-Wantrup ; and to view with distinct reserve the methods and estimates of the United States Soil Conservation Service. Still, after reading these first six papers, one can at least formulate the definitions and problems which appear to be relevant. The watershed is a hydrological unit of natural drainage, which may or may not be the “appropriate entity” for planning. The usual problem is the regulation of drainage.

The four articles dealing with data collection and problems of measurement in terms of probabilities are clearly written. Four sets of data are examined : economic, hydrological, geological and engineering. In the eyes of an economist, the papers which deal with the three other sorts of data appear to be praiseworthy. If they are in fact only as good as the paper entitled “The State of Economic Data” then they are merely adequate. The commentary following this last article is, however, worth reading for its attack on the current methods of “developing” watersheds and of estimating benefits. This reviewer gains the impression that some of these methods and criteria have become institutions and for this reason are centres of a good deal of professional tension. A reprinted article by G. S. Tolley and R. A. Freund Jr., provides a good link with the

analytical papers. These authors see the probabilistic nature of economic and hydrological data as a sufficient reason for expressing benefits in terms of probability distributions. They do this in an examination of a watershed project involving 169 acres. Their treatment is neat, and their appendix on probability analysis is a valuable review.

There are five articles dealing with analytical methods. All five suggest linear programming. The formal programming framework of constraints, coefficients and objective functions enables the authors to deal more systematically with many problems of objectives and criteria than was accomplished in the early articles specifically devoted to the purpose. Added emphasis is given to the fact that, as a producing and consuming unit, the watershed has no unique or mysterious characteristics apart from the immobility of some of its resources. Therefore the general techniques of economic analysis should apply.

In the first paper, G. A. Pavelis exemplifies the use of programming by a study of a watershed project involving three alternative methods of drainage control and fifty land-use systems for each of twenty-seven paddocks. Most of these land-use systems are screened out by a benefit-cost criterion before being programmed. E. N. Castle deals with the problem of "multiple dam-sites with varying capacities and with a number of alternative uses for water, each use having different seasonal requirements". Two prototype systems are solved by linear programming without introducing any sophistications such as dynamics or consideration of risk, uncertainty and complementarities. E. O. Heady presents formal mathematical models "for specifying the optimum scale of investment and the optimum allocation of a given investment between alternatives within a watershed". The models contain a production function and a price function for each product ; a profit function ; and a set of equated marginal value productivities. The second is couched in terms of discounted returns, and there are interdependencies between years for both farm and watershed activities. The dual solution is extremely interesting.

With the gap between sophisticated models and crude static budgeting for "a typical year of the future" so convincingly demonstrated, some thorough attempt to fill the breach is evidently the task of the moment. Robert Dorfman's paper is the account of a "very preliminary" attempt to do this. Careful study of his method is most rewarding and his concluding remarks are an elegant summary of the situation. The Harvard Water Resources Program, which Professors Dorfman and Thomas apparently control, gives promise of significant contributions.

The final five papers are concerned with institutional constraints peculiar to the United States. They make interesting reading, especially the suggested cost-sharing arrangements and rationalisations of government control. All five papers are published here for the first time.

Economics of Watershed Planning is, on the whole, unexciting. It makes no telling inroads upon the unknown and the writing is too often pedestrian. It nevertheless has its usefulness as a conscientiously compiled omnibus of the state of contemporary watershed planning in the United States, and as such is recommended to research libraries.

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