Agricultural Economics RESEARCH

Contents for JANUARY 1952 *Vol.* IV, *No.* 1

Input-Output Relations in Feeding for Eggs ..... *Peter L. Hansen & Ronald L. Mighell* 1

Survey of Ownership of Forest Land in California ..... *Adon Poli* 8

Agriculture and the General Economy ..... *Karl A. Fox & Harry C. Norcross* 13

Book Reviews ..... *James P. Cavin, R. J. Foote, William T. Wolfrey, Jr., George L. Robbins, Carl C. Taylor, George R. Phillips, Nathan M. Koffsky, C. Kyle Randall, Max J. Wasserman,* and *Gladys L. Baker* 22

UNITED STATES DEPARTMENT OF AGRICULTURE • Bureau of Agricultural Economics

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C. Price 20 cents

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AGRICULTURAL ECONOMICS RESEARCH

A Journal of Economic and Statistical Research in the
Bureau of Agricultural Economics and Cooperating Agencies

Volume IV JANUARY 1952 Number 1

The Economics of Input-Output Relationships in Feeding for Egg Production

By Peter L. Hansen and Ronald L. Mighell[1]

From a physiological standpoint there is good reason to believe—although specific evidence is inadequate to prove—that the law of diminishing returns applies in feeding chickens for egg production. From an economic standpoint this does not appear to have the practical significance that it does, for example, in milk production. It is almost always most profitable to feed hens to capacity. Chief opportunities for economic adjustment of production arise rather through such things as proper culling of flocks or varying the composition of the ration to take advantage of changing cost relationships of the components. The new "high efficiency" rations appear to offer promise for more profitable production under favorable price relationships.

THE MOST EFFICIENT utilization of concentrate feeds is a key problem in the field of animal nutrition. The technical and economic phases are closely associated and experience has shown the need for joint technical-economic analysis of such questions as the most profitable rate of feeding.

From the viewpoint of the biological processes involved, animal products can be divided into two broad classes. In the first class are those products resulting from the growth of the animal, principally represented by meats. In this type of production the presence of diminishing physical returns has long been recognized.[2] More feed is needed for each additional pound of weight, as the animal's growth slows down with approaching maturity. The increasing level of maintenance for a larger body over more units of time is the explanation for this phenomenon.

In the second broad class are those animal products that are "manufactured" by the mature animal. Milk, eggs, wool, honey, and the work performed by draft animals, are examples. Such products are produced as a continuous or intermittent flow through a period of time, and the presence of diminishing physical returns is not so clearly visible. The early investigators naturally thought of the analogy of a machine. The cow or the hen could be thought of as a living machine taking in feed consisting of maintenance and production portions and producing a continuing stream of output. In this approach, the relation-

[1] The writers are indebted to H. R. Bird, Bureau of Animal Industry, ARA, for helpful comments on several aspects of the technical phases of the feeding problem. This study was made possible by the Bankhead-Jones Special Research Fund.

[2] The concept of diminishing physical returns refers to the general principle of diminishing productivity. This is sometimes stated briefly as follows:

In a given state of the arts, after a certain point is reached, the application of further units of any variable factor to another fixed factor (or fixed combination of factors) will yield less than proportional returns.

ship between the production feed (above maintenance) and the output was assumed to follow a straight line of constant marginal efficiency. Feeding standards and recommended allowances have been constructed largely on this conceptual basis.

A confusing element in making and using feeding standards is the matter of capacity variations and the difficulty of determining an individual animal's capacity. Practical feeding is a matter of dead reckoning. The feeding has to be adjusted after "logging each day's sailing" and in the absence of careful records more refined methods of feeding may be out of place. In the case of hens, feeding is usually on a flock basis and this further complicates matters by making it necessary to gauge average responses of large numbers of individuals.

That biological machines may have more flexibility than mechanical machines was long believed but not definitely confirmed for milk cows until the work of Jensen, Woodward, and Associates.[3] Their research was carried on in a special project undertaken by the United States Department of Agriculture in cooperation with 10 State agricultural experiment stations during the late 1930's. From this it was established that although the production of milk is increased by heavier feeding, the increase in the output of milk for each additional input of feed is progressively less than feeding standards would indicate.

Eggs and Milk Alike

There are many reasons for believing the same physical principle holds for the production of eggs. In the first place the egg, like milk, is a secretory product of the reproductive system. Furthermore, as has been pointed out by Brody, the physiochemical, metabolic, and endocrine mechanisms of egg production are similar to those of milk production.[4] Differences between cows and chickens with respect to the proportions of the total feed used for maintenance and production have obscured direct comparisons. Brody in discussing this problem says: "The net energetic efficiency thus appears to be of the same order for egg as for milk production; that is, the energetic efficiency of transforming T.D.N. into eggs when maintenance cost is not included is of the same order as the efficiency for milk production when maintenance cost is not included. It is therefore concluded that the ovary and oviduct produce eggs from egg precursors with the same energetic efficiency as the mammary gland produces milk from milk precursors."[5] On the other hand, the proportion of the total feed input that is used for maintenance is considerably higher for hens than for cows.

Elsewhere Brody states that "While no data are available, there is no doubt that egg production is related exponentially to feed consumption in the same manner that milk production is associated with feed consumption, that is, in accord with the principle of diminishing increments."[6]

Economists working with farm-record data have attempted on occasion to measure the relationship between feed input and egg production by statistical means. An example is the Wells-Clawson study reported some years ago in the Journal of Farm Economics.[7] The findings of this study were used as the ground plan for constructing a "conjectured" curve in a recent textbook on farm management.[8] This type of statistical analysis and the subsequent conjectures have served to point the way to further analysis but the specific findings are not supported by the available evidence from experimental work.

Hypothetical Curve

The present writers' conclusions may best be summarized in the hypothetical curve presented in figure 1. This is a total input-output curve for egg production showing diminishing physical returns and constructed in the general manner of the curve for milk production developed in the Jensen-Woodward studies. On the basis of Brody's research, there seems little reason to doubt the

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[3] JENSEN, EINAR, KLEIN, JOHN W., RAUCHENSTEIN, EMIL, WOODWARD, T. E., and SMITH, RAY H. INPUT-OUTPUT RELATIONSHIPS IN MILK PRODUCTION. U. S. Dept. Agr. Tech. Bul. 815, 88 pp. 1942.

[4] BRODY, SAMUEL. BIOENERGETICS AND GROWTH. 1,023 pp. New York, published by the Herman Frasch Foundation. Reinhold Publishing Corporation. 1945.

[5] Ibid. p. 883.

[6] Ibid. p. 95.

[7] WELLS, ORIS V., and CLAWSON, MARION. A STUDY OF EGG PRODUCTION PER HEN IN CENTRAL UTAH. Jour. Farm Econ. 15(4):663-664. 1933.

[8] BLACK, JOHN D., CLAWSON, MARION, SAYRE, CHARLES R., and WILCOX, WALTER W. FARM MANAGEMENT. New York, The Macmillan Co. 1947. pp. 936-940. Also presented in BLACK, JOHN DONALD. THE RURAL ECONOMY OF NEW ENGLAND. Cambridge, Harvard University Press, 1950. pp. 403-406.

presence of some diminishing physical returns in egg production. The parallelism in the physiological mechanisms for producing the two products is too striking to admit any other finding. The essential differences between the hen and the cow are taken into account in the maintenance part of the ration. In the absence of empirical data from research designed to uncover the precise shape of the production function, we are not able to prove just how much diminishing physical returns is present. But there is good reason to suppose that it is not greater than for milk production. We have therefore assumed as an upper limit that it is the same. As indicated later, the practical conclusion will not be affected by any other assumption that involves a lesser rate of diminishing physical returns.

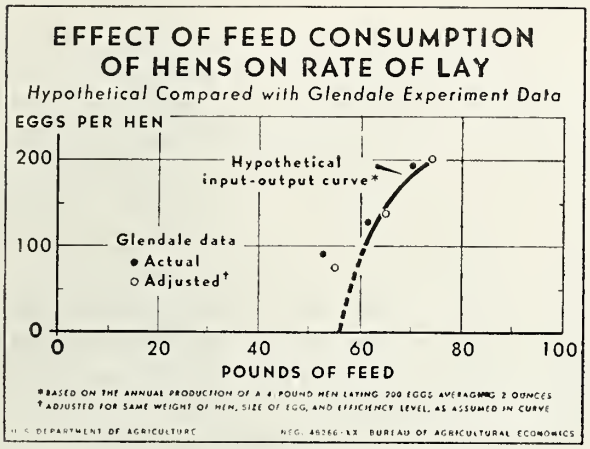

FIGURE 1.

Figure 1 is therefore constructed in the following manner:

1. Maintenance and production portions of the ration of a 4-pound hen, laying 200 eggs per year, are computed on the basis of average feed inputs given by Titus.[9]
2. A feed input-egg output curve with an exponential rate of 72 percent, or of the same order as that found in the Jensen-Woodward studies for good cows at high-producing stations, is assumed.[10] The curve is drawn by using a short-cut method devised by Mendum.[11]

Note again that the production curve so constructed is essentially the same as the curve for milk production by Jensen-Woodward. This makes the further assumption that a 200-egg hen is a "good" hen comparable with the "good" cows at the high-producing stations in the milk study. The question at issue is whether such a curve would have the same economic significance for the production of eggs as for the production of milk? We must look at the differences between the aggregate production functions for milk and eggs. The most obvious one is that maintenance is a relatively larger part of the hen's total ration, about three-fourths for good hens as compared with less than half for good cows.

A closely related matter is that cows are consumers of less expensive roughage as well as of concentrates, but hens are almost solely "concentrate minded." In practice the roughage portion of a cow's ration may approximately cover its maintenance needs, or considerably more if it is of good quality and freely available. The concentrates are used mainly for milk production. But the hen must first meet its large maintenance needs out of the more expensive concentrates. This means that given percentage changes in the total concentrates fed have much more economic significance for the hen than for the cow. Or looked at the other way around, a considerable percentage change in the production ration for the hen represents a comparatively small change in the total concentrate ration. For example, a 20-percent change in the production ration in figure 1 would amount to a change of only about 5 percent of the total concentrates fed. The effects of changes of this magnitude are difficult to gauge even under experimental conditions where other variables are under some degree of control. Under commercial conditions it would be even more difficult.

In practice, the fact that birds are fed in flocks, rather than individually, introduces another element that becomes an insuperable obstacle to the determination of fine differences. Even in a flock of uniform breeding, there are individual differences in capacity, and a situation with a given ration freely available to a number of birds of differing capacities means that it is not possible to adjust the rate of feeding except on an average flock basis. With the further factor of some unavoidable waste under practical feeding conditions it means that there is no possibility of making any

[9] TITUS, HARRY W. PRACTICAL NUTRITIVE REQUIREMENTS OF POULTRY. U. S. Dept. Agr. Yearbook Agr. (Food and Life) 1939. pp. 787-818.

[10] JENSEN, et. al., op. cit., p. 42.

[11] MENDUM, SAMUEL W. A DEVICE FOR MEASURING YIELDS. Jour. Farm Econ. 30:357-364. 1948.

direct application of the principle of diminishing physical returns if it is of no greater magnitude than that indicated in figure 1.

Glendale Experiment

The foregoing will also serve to interpret more clearly the evidence from the only careful experiment that appears to have been made in the United States on the problem of feeding at different levels for egg production. This is the experiment conducted at the U. S. Department of Agriculture's Southwest Poultry Experiment Station, at Glendale, Ariz., in 1936 and 1937.[12] This work was designed to ascertain the effect of very limited feeding on egg production rather than to measure the effect of more moderate variations from usual rates of feeding. Furthermore the procedure was unlike that in the Jensen-Woodward research on milk production in which both total quantity and composition (roughage and concentrates) were varied, in that the different levels of feeding at Glendale involved no change in the composition of the ration. With present knowledge of poultry nutrition it would be possible to design an experiment in feeding for egg production that would be more nearly comparable with the Jensen-Woodward study. Such a design would involve more points within a shorter range at higher levels of feeding and would include changes in the proportions of the constituents in the ration.

The Glendale experiment consisted of two parts, each covering a year. One part of the experiment began December 24, 1935, and ended December 23, 1936. Another part began January 8, 1936, and ended January 6, 1937. The White Leghorn pullets used were divided into groups of 25 each. All were of the same strain and as nearly as possible of the same weight. In the first part of the experiment two lots with three groups of 25 birds each were fed different quantities of an all-mash ration. The birds in the first group in each lot were given unlimited access to the ration, and so ate all they wanted. The second group was fed 87.5 percent as much as the first group and the third group only 75 percent as much. In the second part of the experiment another lot of three groups was used to repeat the same experiment again. The three repetitions of the experiment agreed in their results.[13] For simplicity only one repetition of the experiment will be used here.

The results of this repetition are shown in figure 1 by the three heavy circular dots. The three light circular dots represent an adjustment for size of bird, size of egg, and the average efficiency level assumed in the hypothetical curve. As indicated above, the results are those obtained from feeding a full ration and 12½ percent and 25 percent less than a full ration. In terms of the production ration the latter two are evidently on the order of 50-percent and 100-percent reductions from a full ration, far more drastic than any restricted feeding that might be considered practical and much below any level used in the Jensen-Woodward study.

The adjusted dots for the full ration and the 87½ percent ration agree reasonably well with the curve we have assumed. The explanation for the output with the 75-percent ration—in theory, sufficient only for maintenance—lies in terms of other unmeasured variables and in any case is outside the practical range of our present interest. For our purposes, the general agreement of the two upper levels is the important consideration. One cannot draw a curve on the basis of two points, but the fact that they do not depart far from the hypothetical curve gives at least some reassurance. They agree sufficiently to be within probable limits of error. Controlled experimental work on more points between the 87.5- and 100-percent levels would be necessary to establish the curve definitely. The conclusion nonetheless stands that the curvature is so slight that the relationship may be treated as a straight line.

Requirements, Allowances, and Farm Records

The preceding discussion suggests the anomalous conclusion that rates of feeding for egg production should never be varied. Although the principle of diminishing physical returns operates, the several obstacles to practical application are insurmountable and the possible gains appear to be too small to be worth while. On the face of it, the excellent technical information assembled by the poultry specialists and the recommendation to feed a full

[12] Heywang, Burt W. The effect of restricted intake on egg weight, egg production and body weight. Poultry Science 19(1):29-34. 1940.

[13] Hansen, Peter L. Input-output relationships in egg production. Jour. Farm. Econ. 31:694. 1949.

ration at all times would seem to answer the economic question once and for all. Are we to conclude that no variations from full feeding are ever likely to be profitable under farm conditions? Before trying to answer this question, let us examine some of the differences between research findings, recommended allowances, and farm-record data.

"Feed requirements" for egg production have been worked out by the poultry nutritionists.[14] These represent careful summaries of the controlled research that has been conducted to measure as precisely as possible the maintenance and production needs for laying hens of given weights. The "recommended nutrient allowances" published by the National Research Council contain an additional margin of about 5 pounds more feed per 100 eggs at all levels of egg production than the strict "requirements."[15] The maintenance allowance is also slightly higher. At the 200-egg level this means about 85 pounds of feed for a hen weighing 4 pounds instead of about 74 pounds, according to Titus.

The National Research Council's "recommended allowances" of pounds of feed for egg production have an interesting history.[16] They trace directly to a study published by Byerly in 1941 in which he developed a formula to summarize the results of the several available studies on feed consumption for egg production.[17] The studies he summarized included not only controlled experiments but several based on data from egg-laying contests. Byerly's findings indicate higher feed inputs than do those of Titus, Brody, and others, mainly because data from egg-laying contests show higher feed inputs than do closely controlled experiments.

Farm-record data usually indicate even higher feed consumption than the recommended allowances. For example, the following tabulation compares the findings from a few selected studies of farm records with the quantities of feed per layer that the recommended allowances would suggest.

		Eggs per layer	Estimated weight per bird	Feed per layer	
				Actual	Recommended
		Number	*Pounds*	*Pounds*	*Pounds*
Minnesota	1949	182	4½	108	86
Indiana	1945-46	154	4½	93	83
New York	1946-47	172	4½	110	85
Utah	1929-31	157	4	78	79

Under farm conditions, variations in waste may be considerable and statistical procedures in computing average feed inputs probably introduce some upward bias in the data. The significant point is that somewhat more feed is usually reported fed under practical farm conditions and this further complicates estimates of actual rates of feeding and average efficiencies of production.

Now let us return to the question of whether variations in rates of feeding are ever profitable. The simplest case is the one that goes on all the time in making poultry and other rations. That is varying the ingredients in mixed feeds to take advantage of changes in the prices of the individual items. Within limits, this can be done without affecting the quality of the ration. But there are definite limits. The example of the recent "high energy" or "high efficiency" rations as compared with standard rations illustrates this point. Such rations have been developed successfully for broiler production and to some extent for egg production, although more research is needed on the latter question.

High-efficiency rations are balanced rations made by combining ingredients that represent the most efficient sources of each of the desirable nutrients. This involves also the elimination of carriers of undesirable quantities and qualities of fiber and other factors. In this way a more concentrated ration of superior quality is provided and the layer is able to consume a greater quantity of digestible nutrients. The hen's effective capacity is increased and average egg production is raised. But the high-efficiency ration usually costs more. So the economic problem is one of estimating whether the value of the additional eggs is more than the additional cost which must be paid for the entire ration.

An analogous problem arises in connection with the use of home-produced grains in the poultry ration. The home-produced grains available on a particular farm may have an "in place (cost) value" that is appreciably less than that of a pur-

[14] Titus, loc. cit. pp. 801-802.

[15] National Research Council. recommended nutrient allowances for domestic animals. no. 1, recommended nutrient allowances for poultry. A report of the Committee on Animal Nutrition. 24 pp. Washington, D. C. Revised March 1950.

[16] National Research Council, op. cit. p. 17.

[17] Byerly, T. C. feed and other costs of producing market eggs. Maryland Agr. Expt. Sta. Bul. A1 (Tech.), 29 pp. 1941.

chased-feed mixture and, although sometimes inferior in productive efficiency, it may be more profitable to feed. Some reduction in output will be profitable if it comes about through using a ration enough lower in total cost. In this respect the hen has an advantage over the cow, because any reduction in average cost of the concentrate ration for the hen is reflected through the whole ration.

The principle involved in feeding laying rations of different values and different efficiencies is the reverse of the principle of the "margin" in feeding beef cattle. Cattle feeders ordinarily make a profit from the fact that the feeding operation improves the quality and price of the entire animal. The additional price applies to the whole weight of the animal, so that what would be an excessive feeding cost if figured only against the additional weight put on, is profitable because of the increased value of the entire carcass. In the case of egg production, it is not the value of output but the value of the input item that is affected, so the margin of profit shrinks very rapidly if the average price of the entire feed input advances.

Let us illustrate with an example of a 4½-pound layer producing 200 eggs. Such a layer might be fed 100 pounds of concentrates under farm conditions. Shifting to a high-energy ration might increase the intake of feed nutrients by 5 percent and the rate of lay 10 percent, with an advance in the price of the ration of, say, 10 percent. If we assume the price of eggs at 50 cents a dozen, standard ration at $5 per hundredweight, and high efficiency ration at $5.50, additional receipts and expenses may be estimated as follows:

Additional Receipts:
20 eggs @ 50 cents per dozen = $ .84
Additional Expenses:
100 lbs. feed @ $5.50 = $5.50
Less 100 lbs. feed @ $5.00 = $5.00 $ .50

Clearly this would be a profitable venture. But if the price of eggs were only 30 cents, the additional receipts would have been only 50 cents, or no more than the additional costs. Or corresponding increases in the prices of feed with the price of eggs unchanged would have a similar effect.

Economy in Use of Feed Through Culling

An important means of controlling the use of feed and the average rate of feeding with hens is through culling. The culling process is far more important with hens than with cows as a means of adjusting profit margins. Under certain conditions of price it may mean the difference between a cash loss and a cash profit. Nonproducing animals are carried at a loss unless there is assurance of later productivity. But the carrying cost is relatively larger for hens than for milk cows because there is not the opportunity for shifting maintenance to home-produced roughage of low cost. Furthermore, low egg production is much more likely to go beyond "the point of no return" than low milk production, because of the large proportion of maintenance charge. A low-producing cow may still pay its way, but a low-producing hen hardly ever does, because it has a relatively larger cash maintenance board bill to meet before showing any net return. Poultry specialists have correctly placed much emphasis on the importance of culling. For example, with eggs at 50 cents per dozen and feed at $5 per 100 pounds it takes about the first 100 eggs per layer to meet the cash costs of feed. Returns above feed costs then rise sharply, so that a 150-egg hen would show a return of about $2.16 per hen and a 200-egg bird about $4.32. The poultryman is something like the small retail merchant who has to own or lease quarters, stock the store, and incur a considerable overhead. He makes no net return at all until the overhead is covered. After that point the profits rise rapidly as his volume increases.

The economic rate of culling will evidently change, however, with different egg-feed price ratios, and with changes in the relative prices of poultry meat. During a single production period many producers do not have much opportunity to add to the number in the laying flock, so that as they proceed through the year, the size of their operations is gradually reduced. This means that the other resources—the buildings, labor, and general overhead are less efficiently utilized. It will not really pay to cull out any hen that is making a return above cash operating costs, taking into account the salvage value for meat purposes currently and later on. This being so, it is clear that changes in relative prices of feed, eggs, and chickens, will affect the economic margin for culling during a production cycle and from season to season. If concentrate feeds become relatively scarce and high priced, one of the first adjustments poultrymen should make is to cull their flocks more carefully and closely. Paradoxically, the statistical ef-

fect of adjusting to such shifts in the economic margin is to increase the average input of feed per layer. Ordinary culling methods are not precise enough to permit a very close adjustment to the economic margin unless some form of trapnesting is feasible for at least part of the time. Consequently many producers may have to be content with culling the obvious low producers in about the same fashion. Frequently the decision as to time of culling turns on the present and prospective level of the price for chicken meat.

Efficiency in Use of Feed Resources

All of the foregoing is pertinent to the most economical use of feed and other resources in the production of eggs. But how well do hens compare with other livestock in the efficiency of converting feed into food products?

As pointed out earlier, Brody concluded from his studies that the net efficiency of energy conversion in the production of eggs was of the same order as that in the production of milk. "Net efficiency" refers to the efficiency with which the production portion of the total ration is used, "gross efficiency" to the over-all efficiency of the whole ration. His actual findings showed a net efficiency somewhat higher for eggs than for milk, but this was considered within expected limits of error. Net efficiency of energy conversion calculated for the experiment at Glendale, Ariz., comes out at about 75 percent, while similar calculations for estimated average feed requirements by Titus are slightly less.[18] If one computes the net efficiency of conversion on the basis of the National Research Council Recommended Allowances of 14 pounds of feed per each 100 eggs, the net efficiency is only about 49 percent.

The gross efficiency of the entire ration is the more important measure when comparisons are to be made with other types of livestock production. Taking whole milk as 100, average outputs of food products are shown in the tabulation in the next column.[19]

In terms of food energy, eggs are only half as efficient as whole milk, but for protein they are nearly three-fourths as efficient. These comparisons are in average terms for the United States and for the total ration including, in the case of cows, considerable roughage with very limited alternative uses. If the averages were computed in terms of the most highly commercialized producing areas, the relative position of egg production might be slightly lower. For example, the average milk production per cow in the five States with the highest production per cow is about 30 percent above the national average whereas egg production per hen for the five States ranking highest for eggs is only about 20 percent above the national level.

Food Product	Food Energy	Protein
	Percent	*Percent*
Milk, whole	100	100
Eggs	45	71
Chickens	33	67
Hogs	140	45

The above comparisons explain why wartime production of whole milk has been especially emphasized in places like the United Kingdom in which a large part of the concentrate feed must be imported. In such times and places eggs and pork are still more concentrated products that can better be imported from abroad. In the United States, scarcities of concentrates have never been great enough to call for stringent allocation between classes of livestock, but attention should be directed to ways of promoting more efficient use and of preventing wasteful use of feeds.

Summary

Technical research in feeding supports the thesis that diminishing physical returns is present in the feed-egg relationship. This may be of the same order as in the case of milk production. But the maintenance part of the ration for laying hens is a much larger proportion of the total ration than is true for cows, and it consists of expensive concentrates instead of roughages of lower price. These circumstances, when coupled with the necessary practice of flock rather than individual feeding, lead to the conclusion that a total curve of diminishing physical returns of the order assumed cannot be distinguished from a straight line. The straight-line assumption of the feeding standard therefore appears sufficiently accurate for practical purposes. This means that full feeding is usually the most profitable for egg production.

[18] Titus, loc. cit., pp. 801-802.

[19] Computed from CHRISTENSEN, RAYMOND P. EFFICIENT USE OF FOOD RESOURCES IN THE UNITED STATES. U. S. Dept. Agr. Tech. Bul. 963, 98 pp. 1948.

Diminishing physical returns therefore does not present the same problem in relation to the economic rate of feeding as it does in the production of milk. But the economic problem does appear in choosing the ingredients that enter a mixed poultry ration and in the choice between "high efficiency" and "standard" rations. The evidence on "high efficiency" rations for egg production is still in the experimental stage but the prospect is that it will be striking. A somewhat similar situation arises in the choice made between farm-produced feeds and purchased concentrates for those who mix their own rations. The general principle involved is a choice between a lower cost and less productive ration on the one hand and a higher cost but more productive ration on the other.

The chief economy that is possible in the use of feed for production of eggs still arises from culling the low producers. The culling process may involve economic as well as physical decisions because the rate of culling may be varied profitably under different relative conditions of price, provided practical means are available for measuring egg production from individual hens. This conclusion emphasizes the need for devoting research attention to the problem of providing practical means of identifying individual rates of lay more accurately under the usual conditions of commercial flocks. Some form of trapnesting for limited periods may be feasible in some cases. Perhaps more rapid and accurate methods of manual examination can be developed. Some advances appear to have been made recently with methods involving both internal and external examination. Any such leads may well be vigorously pursued and thoroughly tested.

Conducting a Survey of Ownership of Forest Land in California

By Adon Poli

An extensive type of forest-ownership survey has been under way in California since 1947. This article describes the procedure that was developed for this study and illustrates with a few basic tables the kind of information obtained. The integration of the ownership study with the forest-inventory data obtained by foresters in their regular Forest Survey is an example of the mutual interests of the physical and social scientists.

OWNERSHIP as a factor influencing the management of forest land is a comparatively new line of research among foresters and forest economists. Interest stems mainly from the realization that attitudes of owners influence the use and management of land. All kinds of individuals and public and private agencies own forest land. They acquire it in many ways, including purchase, inheritance, homestead, gift, and grant. They own it in units of varying sizes, in contiguous and noncontiguous tracts, by itself and in combination with agricultural and other kinds of land. They keep it for different reasons, only one of which may be for growing timber.

All these factors combined produce complex patterns of land ownership and complex situations which strongly influence public and private programs for management. Studies in land ownership furnish knowledge about the people who own the land and of the patterns their land holdings make. This knowledge helps those who are responsible for administering land-use and land-manage-

ment policies of forest land to do a better job.

Research in this subject is relatively new and the methods are still somewhat experimental. Most of this research has been done since about 1940. Two of the most recent studies were conducted in the South and in New England;[1] still another is now in progress in California.

This study differs from most other land-ownership studies in that it is an extensive type of survey designed to cover an area involving millions of acres. It was begun in 1947 as part of the regular Nation-wide Forest Survey made by the Forest Service which, in California, is being conducted by the Division of Forest Economics of the California Forest and Range Experiment Station. To obtain a more detailed consideration of privately owned forest land than had been possible in previous forest surveys, the Forest Service entered into a cooperative agreement with the Bureau of Agricultural Economics to have the Bureau assist in the gathering, compiling, and interpreting, of land-ownership data.

The ownership study was originally set up to cover all of the forest, range, and farm-forest land in California, estimated to be about 45 million acres. At the moment, work has been completed for an area of about 19 million acres, and tabulations for statistical and other reports are in progress, by counties and by forest regions.

The tables shown here are typical of a more elaborate series usually prepared for a complete statistical report for a county or forest area. Figures for Mendocino County are used because this county contains a sufficient number of owners of forest land and a forest acreage large enough to be representative of situations typical of certain forest areas in California. Furthermore, a previous and somewhat similar study was made for a large part of this county—but it was on a non-sample basis.[2] Figures from this earlier study were available for comparison with those derived through sampling procedure.

[1] James, Lee M. determining forest land ownership and its relation to timber management. Jour. Forestry. 48(4): 257-260. April 1950.

Barraclough, Solon, and Rettie, James C. the ownership of small private forest-land holdings in 23 new england towns. Northeastern Forest Experiment Station, Upper Darby. Station Paper No. 34. March 1950.

[2] Poli, Adon, and Griffith, Donald T. forest land ownership in northern mendocino county, california. California Forest and Range Experiment Station, Berkeley. (Forest Survey Release No. 5.) June 1, 1948.

Line-Sampling Procedure[3]

Conventional methods of obtaining data on ownership could not be employed because of the vast acreage involved. However, the public records in California, especially those of the assessor and tax collector, are such that an experienced person can derive considerable reliable basic data of the kind desired. But the existence of county plat maps showing the land of all owners in the county mapped in place made possible the line-sampling technique devised for this study. In utilizing these plat maps for the ownership study, parallel lines spaced 2 miles apart are drawn east and west on base maps. Then intercepts of ownership boundaries, as shown on the county plat maps, are marked along the parallel lines, and the proportion of the total line traversing an ownership class is taken as the proportion of the total acreage in that particular class. The acreage so obtained is an estimate of the true area within each ownership class. This acreage can be reclassified further by measuring the intercepts of the various vegetation and timber-stand classifications used in the Forest Survey.

In the regular process of selecting the ownership sample from the county plat maps, intercepts of ownership boundaries are placed on base maps. The names of owners of properties intercepted by the sample lines are recorded on cards and are keyed by numbers to each individual line segment shown on the base maps. Each county tax collector's office in California has an index that lists the names of all recorded property owners and the parcels of land they own in the county. The names of the sample owners are located in this index and each parcel of land is listed. Other related information is then obtained from the regular property-tax rolls which accompany the tax collector's index. By using these property records one can readily obtain the address of the owner, and the acreage, legal description, and assessed value of each parcel of land. Information from this source is used to classify private ownerships and land area by size and individual owners by residence.

The next step is to learn how the land is used, how and why the present owner acquired it, why he holds it, and his principal occupation. To each

[3] For a more complete appraisal of the statistical reliability of the line-sampling technique than is given here, see Hasel, A. A. and Poli, Adon, a new approach to forest ownership surveys. Land Economics 25 (1):1-10. February 1949.

owner, at the address obtained from the tax rolls, is mailed a simple, return-stamped, self-addressed questionnaire card containing a check list on which the questions can be answered with practically no writing. Complete replies were received from about one-third to one-half of the owners selected in each county. Information pertaining to land of nonrespondents is obtained by a field follow-up, in which key informants are questioned in local public offices and in the communities where owners have their land. Sufficient information was obtained from the questionnaire cards and field interviews to classify from 94 to 100 percent of all owners of rural land and the total land area in Mendocino County.

Reliability of Estimates

The earlier, nonsample study provides a check as to accuracy of the estimates.[4] Data obtained then are reasonably comparable with those gained by the present study, although some change has undoubtedly occurred since the first study was made. As size of ownerships seemed the least likely to have changed appreciably during the interval it is given here for comparative purposes.

Table 1 illustrates how figures derived through the line-sampling procedure for the whole county compare, generally, with those obtained from the earlier complete survey of almost two-thirds of the county. Despite the difference in time and area covered by the two surveys there is enough similarity in these distributions to indicate that figures derived by line sampling are generally in line with those obtained by total area coverage. The obvious discrepancy in the percentage acreage figures of the 20,000 to 29,999 size class is explainable, to some extent, by the differences in the size of the areas covered in the two studies. The size classification used in 1944 is based on acreage owned in only two-thirds of the county, whereas the 1948 classification is based on acreage owned in all the county. Some of the large ownerships that had acreages extending into that third of the county not covered by the 1944 survey naturally would shift into the next higher group in the 1948 classification, and would increase the acreage in that group accordingly.

Table 2 compares actual known acreages of three major public ownerships with estimates derived by line sampling, using a 2-mile spacing. These estimates are reasonably close to actual acreages, considering the relatively small area involved in each ownership.

TABLE 1.—*Percentage distribution of private ownerships and privately owned land in Mendocino Co., Calif., by size of ownership, 1944 and 1948*

Size of ownership (acres)	Number of ownerships		Land area	
	1944[1]	1948[2]	1944[1]	1948[2]
	Percent of total	*Percent of total*	*Percent of total*	*Percent of total*
0 - 179	73.2	72.3	10.3	12.0
180 - 379	11.0	11.7	6.1	7.2
380 - 699	6.8	5.9	7.4	7.6
700 - 1,299	3.7	3.6	7.4	6.5
1,300 - 2,599	2.5	3.3	9.4	12.3
2,600 - 4,999	1.3	1.7	9.7	11.5
5,000 - 9,999	0.7	0.7	10.2	8.5
10,000 - 19,999	0.5	0.5	12.0	11.9
20,000 - 29,999	0.2	0.1	12.5	3.1
30,000 and over	0.1	0.2	15.0	19.4
All classified ownerships	100.0	100.0	100.0	100.0

[1] Based on complete coverage of 61.9 percent of the total county area.
[2] Based on line-sampling procedure for the entire county.

Examples of Information Obtained

Two general types of data were obtained in the study of forest ownership. The first pertained exclusively to ownership and included such items as the methods and purposes of acquisition, operating tenure, land use, occupation, and residence of the owner. The second, and probably more significant, were those that integrated the data on ownership with the forest-inventory data that were obtained by the foresters in connection with the regular Forest Survey. These cross-tabulations were greatly facilitated by the use of machine tabulation from punch-cards. Because of the extensive nature of the study, the resulting information is somewhat generalized and should not be used as conclusive evidence of the cause or effect of certain conditions present in a local area. On the other hand, the data can be used advantageously to show the general over-all ownership patterns of the forest regions and to reveal certain localized conditions that are in need of further observation and perhaps more intensive study.

For example, forest-land area by types and sizes of ownership can be segregated into acreages of various kinds of forest land as in tables 3 and 4. Figures from table 3 show that most of the land (including the best timberland) of this county is

[4] Poli and Griffith, op. cit., June 1, 1948.

TABLE 2.—*Difference between estimated and actual land area of major types of public ownerships in Mendocino Co., Calif., 1948*

Type of public ownership	Estimated land area by line sampling method	Actual land area from records of agencies listed	Difference	
	Acres	*Acres*	*Acres*	*Percent*
National Forest	173,552	166,939	6,613	3.96
Public Domain	164,688	162,220	2,468	1.52
State Forest	50,461	52,304	1,843	3.52
All types	388,701	381,463	7,238	1.90

in private ownership. On basis of land acreages controlled, range livestock farming and timber operations are dominant industries, with livestock farmers controlling a large share of the acreage of commercial timberland. The relatively low proportion of timberland remaining in old growth and the high proportionate acreage of young growth as revealed by figures from another table not shown here suggests a past policy of too rapid depletion of physical timber inventories, which may result in an early end of the operations of some of the lumbermen now working there. Similarly, the large proportion of nonstocked timberland of range-livestock farmers who, as a group, control much valuable timber acreage, suggests the existence of land-management policies that are unfavorable to regrowth of timber in a large proportion of the area. A special study might be made to analyze this situation in detail.

Relationships between size of holdings and kind of timberland within each size class were also explored. The largest ownerships consist almost entirely of commercial timberland, but much valuable timberland is found in many ownerships that are usually considered too small for efficient management of timber. This might suggest the consideration of a land program designed to deal with the management of these small holdings of timber.

The ownership of much timberland by many nonresident owners, some of whom live far from the State, discloses the possibility of a special problem in the formulation of unified policies and programs for forest-land management in this county. Communication with nonresident owners is usually difficult, and they are often indifferent toward local programs for land improvement.

The analysis of the data obtained from the questionnaires and field interviews also revealed that purchase, inheritance, and homesteading, were the leading methods by which owners had acquired private lands in Mendocino County. The timber operators had bought nearly all of their land; others had procured theirs by this and other methods. Farming, residence, and recreation were major reasons for getting land, but some owners were also

TABLE 3.—*Major classes of land in Mendocino Co., Calif., by type of ownership, 1948*

Type of ownership	Major classes of land				
	Total land area		Commercial forest land[1]	Noncommercial forest land	Nonforest land
	Acres	*Percent*	*Acres*	*Acres*	*Acres*
National Forest	173,552	7.7	92,598	69,052	11,902
Indian Land	21,036	0.9	10,393	3,981	6,662
Public Domain	164,688	7.3	54,714	102,396	7,578
State Park	600	–	—	62	538
State Forest	50,461	2.2	48,435	1,725	301
Tax Deeded	46,603	2.1	40,592	4,516	1,495
Other State	1,334	0.1	171	334	829
County and municipal	2,848	0.1	1,884	620	344
Timber operating company	330,812	14.7	321,796	4,735	4,281
Timber holding company	76,167	3.4	71,281	3,133	1,753
Timber operating individual	41,596	1.9	35,660	4,574	1,362
Timber holding individual	87,057	3.9	72,865	11,094	3,098
Range livestock farming company	77,686	3.5	37,536	22,845	17,305
Range livestock farming individual	766,493	34.1	333,644	266,689	166,160
Other farmers	127,437	5.7	49,097	38,292	40,048
Recreational property owners	113,247	5.1	71,451	34,023	7,773
Other classified owners	94,204	4.2	53,904	27,618	12,682
Other unclassified owners	70,579	3.1	8,528	14,092	47,959
All types	2,246,400	100.0	1,304,549	609,781	332,070

[1] Commercial forest lands were further classified according to the age class of the timber, recognizing the following classes: (1) Old growth, (2) old growth-young growth, (3) young growth-old growth, (4) large young growth, (5) small young growth, and (6) nonstocked.

TABLE 4.—*Privately owned land in Mendocino Co., Calif., by major classes of land and by size of ownership, 1948*

Size of ownership (acres)	Ownerships		Major classes of land				
			Total land area		Commercial forest land	Noncommercial forest land	Nonforest land
	Number	*Percent*	*Acres*	*Percent*	*Acres*	*Acres*	*Acres*
1 - 179	2,338	72.3	204,914	12.0	116,411	54,838	33,665
180 - 379	379	11.7	122,862	7.2	67,500	35,174	20,188
380 - 699	191	5.9	130,234	7.6	70,012	41,271	18,951
700 - 1,299	117	3.6	110,943	6.5	63,083	30,221	17,639
1,300 - 2,599	107	3.3	211,049	12.4	104,179	67,538	39,332
2,600 - 4,999	54	1.7	197,072	11.5	101,270	56,579	39,223
5,000 - 9,999	23	0.7	146,001	8.5	77,355	40,493	28,153
10,000 - 19,999	16	0.5	203,422	11.9	123,737	44,738	34,947
20,000 - 29,999	2	0.1	52,386	3.1	35,745	10,170	6,471
30,000 - 49,999	4	0.1	133,703	7.8	91,865	28,915	12,923
50,000 and over	2	0.1	197,358	11.5	193,441	1,647	2,270
All classified ownerships	3,233	100.0	1,709,944	100.0	1,044,598	411,584	253,762
Unclassified ownerships	–	–	75,334	–	11,164	15,511	48,659
Total acreage	–	–	1,785,278	–	1,055,762	427,095	302,421

TABLE 5.—*Major land use of privately owned land, Mendocino Co., Calif., 1948*[1]

Major land use	Ownerships	Land area	Average size	Percentage distribution	
				Ownerships	Area
	Number	*Acres*	*Acres*	*Percent*	*Percent*
Timber operations	105	327,122	3,115	3.2	19.1
Farming	1,148	712,695	621	35.5	41.7
Recreation	330	64,919	197	10.2	3.8
Residence	432	26,088	60	13.4	1.5
Idle	1,006	186,832	186	31.1	10.9
Other uses and combinations of 2 or more	212	392,288	1,850	6.6	23.0
All uses	3,233	1,709,944	529	100.0	100.0

[1] Because of space limitations, only a condensed version of the complete tabulation by major land use is given here. The basic tables show both land use and purpose of acquisition by size of ownership classes.

speculators who hoped to resell at a profit. Those who intended to operate timber enterprises generally favored larger holdings; those who had recreation or residence in mind generally got smaller acreages.

Table 5 indicates that many of these owners followed through with their original proposed use, but almost one-third have not as yet achieved their original aim, and so their land is idle. A few apparently have deviated from their original intention and are using their land for other purposes. This is suggested in part by the fact that a larger number of owners now actually have timber operations under way than had originally intended to use the land this way when they bought.

Generalized observations like these, although perhaps not conclusive evidence of "what is" and "what is not," do provide clues as to why certain conditions exist. Extensive surveys like this one are useful in showing the broad general picture of a large county, area, or State, and in revealing critical areas in which further intensive study of ownership and management of forest land is desirable.

Some Relationships Between Agriculture and the General Economy

By Karl A. Fox and Harry C. Norcross[1]

Net farm income is affected by changes in final demand, in marketing charges, and in production costs. BAE publishes data relating to each of these three sets of factors. This article attempts a new combination of these data for a recent year, with agriculture divided into nine major commodity groups. Although the tentative and preliminary nature of the data must be emphasized, information of this kind is needed for several purposes, including estimation of the effect of changes in specific marketing and production cost items upon net income from different commodities. The success of newer approaches to the study of relationships between agriculture and the general economy also depends upon the development of accurate and detailed information of this kind.

STUDIES OF RELATIONSHIPS between agriculture and the rest of the economy must continually weigh the conveniences of aggregation against losses of relevant detail. At one extreme are simple models which treat all agriculture as one enterprise selling a single composite product.[2] But the diversity of conditions within agriculture generally forces us to frame price and production programs in terms of individual commodities. This diversity extends to the distribution of commodities among final uses and to the importance of specific marketing charges and production expenditures in determining net farm income from each commodity.

Each element of marketing charges and cash costs of production is a channel through which influences originating primarily in the nonfarm economy may be transmitted into the net income statements of farm operators. The size of each such element for a given commodity is a presumptive indicator of the vulnerability of its producers to changes in a particular segment of the nonfarm economy. Hence, estimates of these elements for different commodities, even for a single cross-section of time, have a considerable diagnostic value.

Modern techniques of analysis, such as the input-output or "interindustry relations" approach of Leontief[3] and the "linear programming" methods of Dantzig, Koopmans and others[4], are creating a demand for more accurate data of this type. These methods seem to hold much promise for the appraisal of governmental programs and for the general study of interrelationships between different sectors of the economy. Electronic computers can handle the formidable calculations required for such studies, but the accuracy of the final results must depend on that of the basic data.

The new data introduced in this article are preliminary and tentative in character. However, they will serve to illustrate the possibility of combining specialized sets of data into more general frameworks, and the desirability of developing certain data on a less aggregative basis than has been done in the past.

The Data

In connection with the Interindustry Relations Study being carried out by the Bureau of Labor Statistics, an attempt was made by specialists in BAE to allocate each item of production expenditures in the year 1947 among 18 groups of farm commodities. The authors later rearranged these

[1] The basic data for this article were developed under the direction of Harry C. Norcross. Karl A. Fox is responsible for the text.

[2] See, for example, Brownlee, O. H. and Johnson, D. Gale, "Reducing price variability confronting primary producers," *Journal of Farm Economics*, May 1950, pp. 176-193.

[3] Leontief, Wassily W., The Structure of the American Economy, 1919-1939: An Empirical Application of Equilibrium Analysis. (Second ed.) New York, 1951.

[4] Activity Analysis of Production and Allocation, Cowles Commission Monograph No. 13, T. C. Koopmans, ed.; New York, 1951.

TABLE 1.—*Marketing charges, production expenditures, and sources of gross and net farm income, by commodity groups, United States, 1947*[1]

Item	(1) Meat animals	(2) Dairy products	(3) Poultry and eggs	(4) Fruits and vegetables	(5) Food grains	(6) Feed grains and hay	(7) Cotton and cottonseed	(8) Tobacco	(9) Miscellaneous	(10) All commodities
1. Food marketing charges:										
Retail value of farm food products	*Bil. dol.* 11.14	*Bil. dol.* 6.30	*Bil. dol.* 3.75	*Bil. dol.* 6.15	*Bil. dol.* [2]4.52	*Bil. dol.*	*Bil. dol.* *Nonfoods*: "Farmers' share" on retail cotton, wool and tobacco products averaged 12 to 17 percent. Margin concept inappropriate for industrial fabrics, etc.	*Bil. dol.*	*Bil. dol.* [3]2.32	*Bil. dol.* [4]34.18
Less: Food marketing charges	4.02	2.59	1.19	3.63	3.04				1.46	15.93
Trade	2.28	1.73	.93	2.19	1.12				.59	8.84
Transportation (inter-city)	.40	.10	.10	.90	.20				.13	1.83
Processing	1.34	.76	.16	.54	1.72				.74	5.26
Equals: Equivalent farm value	7.12	3.70	2.56	2.52	[2]1.49				[3]84	18.23
2. Sources of cash farm income:[5]										
Sales for food use by domestic civilians[6]	7.18	3.80	2.64	2.56	1.00	0.22	0.19	--	0.64	18.23
Plus: Food use by armed forces	.24	.06	.05	.11	.04	—	—	--	—	.50
Nonfood products and byproducts for domestic use	.40	.01	.09	—	.39	.80	1.60	.68	[7]1.27	5.22
Exports and shipments	.13	.18	.14	.23	1.07	.34	.43	.24	.11	2.87
Inter-farm sales	1.20	—	—	—	.15	1.07	—	—	.24	2.66
Balancing item[7]	.19	—	.01	—.10	.12	—.10	.02	.11	—	.27
Equals: Cash receipts from farm marketings	9.34	4.05	2.93	2.80	2.77	2.33	2.24	1.03	2.26	29.75
3. Gross and net farm income and production expenditures:										
Cash receipts from farm marketings	9.34	4.05	2.93	2.80	2.77	2.33	2.24	1.03	2.26	29.75
Plus: Farm-home consumption	.72	.79	.48	.85	.01	.03	—	—	.22	3.10
Rental value of farm dwellings	.20	.24	.09	.11	.11	.10	.17	.08	.08	1.18
Equals: Gross farm income[8]	10.26	5.08	3.50	3.76	2.89	2.46	2.41	1.11	2.56	34.03
Less: Production expenditures[9]	4.19	3.05	2.48	1.91	1.23	.81	1.09	.39	2.08	17.23
Purchased livestock	1.20	—	.22	—	—	—	—	—	—	1.42
Purchased feed	.92	1.00	1.47	—	—	—	—	—	.30	3.69
Hired labor	.40	.49	.08	.85	.13	.14	.37	.09	.30	2.85
Operation of motor vehicles	.28	.24	.11	.16	.23	.15	.11	.02	.27	1.57
Misc. goods and services	.29	.35	.18	.54	.19	.15	.21	.07	.53	2.51
Taxes, interest, net rent	.68	.40	.24	.16	.34	.20	.21	.07	.28	2.58
Depreciation	.42	.57	.18	.20	.34	.17	.19	.14	.40	2.61
Equals: Realized net income of farm operators[8, 10]	6.07	2.03	1.02	1.85	1.66	1.63	1.32	.72	.48	16.80

[1] Data on marketing charges by function, on sources of farm income, and on production expenditures by commodity groups, are unofficial. [2] Bakery and cereal products. Farm value includes value of other bakery-product ingredients as well as value of flour, corn meal, etc. [3] Food only. Includes some cottonseed oil and corn products (wet process) in addition to products classified as "Miscellaneous" in Sections 2 and 3 of this table. [4] Includes 0.02 billion dollars of marketing taxes, mainly on oleomargarine and sugar. [5] Figures in section 2 of table are equivalent farm values of the respective commodity flows. [6] Same as row above, except that farm values of bakery and cereal products and miscellaneous foods have been redistributed according to farm-product categories of Section 2 and 3. [7] Includes changes in nonfarm stocks, statistical discrepancies, rounding errors, etc. [8] Excluding government payments. [9] Cash expenditures for current operations, plus allowance for depreciation. [10] Includes returns for the labor of farm operators and unpaid family workers, as well as for management and investment.

estimates in conformity with certain regularly published series of BAE. The new figures are not official estimates of the Bureau, but they reflect the informed judgments of competent analysts, and the impressions they give are believed to be reasonably accurate.

Table 1 combines the new estimates of production expenditures by commodity groups with estimates of cash receipts and gross farm income as reported in the *Farm Income Situation;* estimates of the national food marketing bill as published in the *Marketing and Transportation Situation;* and estimates of commodity supplies and distribution, upon which are based the consumption estimates carried in the *National Food Situation* and the various commodity situation reports.

Production Expenditures.—Estimates of production expenditures by commodity groups are shown in the lower section of table 1. As used here, "production expenditures" include cash outlays for current operations plus depreciation charges which, on the average, must also be offset by cash outlays. "Net farm income" includes all returns for the operator's labor and investment, and for the labor of unpaid family workers. It is not to be confused with profits.

The form into which the commodity data are cast is dictated by the requirement that they add up to familiar published totals, such as "cash receipts from farm marketings." For example, the production expenditures allocated to feed grains and hay consist only of the expenses necessary to produce feeds *sold* by farmers. Production expenditures for feed fed on the farms where grown are allocated to the respective classes of livestock that consume those feeds. The result is that a considerable part of the cost of tractor and farm equipment use is allocated to the production of meat animals and dairy products. Similarly, the cost of hired labor used in producing corn on a hog-corn farm is mostly allocated to the meat animal group.

These concepts are appropriate to the BAE system of national farm income statistics. For production planning, the data might be organized quite differently. Total labor, fertilizer, and other items used in feed production would be recorded as inputs into the feed enterprise. The feed retained on farms would be treated as an input (at imputed prices) into livestock enterprises, along with the other cash and noncash inputs specifically associated with livestock production. This is the organization of data that might be called for by the Leontief input-output or Bureau of Labor Statistics interindustry approach. As a matter of fact, the production expense data underlying table 1 were originally prepared for an interindustry relations study according to specifications formulated by Philip M. Ritz of the Bureau of Labor Statistics. Considerable reworking was necessary to put the data in their present form.

Even in this framework of farm income statistics, table 1 does some violence to the dairy enterprise, as sales of dairy animals for slaughter are credited to "meat animals." Cash production expenditures allocable to dairy stock sold for slaughter are also transferred to the meat animal group. But the size of the dairy enterprise is understated by perhaps 1½ billion dollars, and the size of the meat animal enterprise correspondingly overstated, when we define the dairy "industry" in terms of cash receipts from milk and butterfat only. Also, since the ratio of net farm income to gross in 1947 was higher for meat animals than for dairy products, the relative profitability of the dairy enterprise is somewhat understated in table 1.

Table 2 shows the percentage distribution of each category of production expenditures among commodity groups. For example, the table indicates that about 25 percent of total expenditures for purchased feed were made in behalf of meat-animal production; 27 percent was for feed fed to dairy cattle; 40 percent of the purchased feeds by value went to poultry; and 8 percent went to other classes of livestock, chiefly horses and mules. In the case of hired labor, about 30 percent of the total farm-wage bill was paid by fruit and vegetable producers, 13 percent by cotton farmers, and 17 percent by dairy farmers. The shares of the total farm wage bill paid by cotton, fruit, and vegetable producers were two to three times their shares of total production expenditures. The differences in the distribution of other categories of expenditures in most cases were not so pronounced as in those of feed and labor.

At least one analytical application of the figures in table 2 suggests itself. If we wished to make an index of the demand for purchased feed, the figures in column 2 would provide appropriate weighting data for the respective classes of livestock products in such an indicator. Thus, poultry and eggs would have a considerably larger weight than either meat animals or dairy products, even though cash receipts

were considerably smaller from poultry and eggs than from dairy products and were only one-third as large as for meat animals. An index of the demand for hired farm labor might be based on weighting data from column 5. In this case, fruits and vegetables and cotton would get considerably larger weights than would be suggested by their shares of cash receipts or gross farm income.

Table 3 shows the break-down of total production expenditures for each commodity group. For example, nearly three-fifths of such expenditures for poultry and eggs in 1947 were for purchased feed, whereas this item accounted for only one-third of the production expenditures for dairy products and between one-fourth and one-fifth of those for meat animals. A 10-percent increase in prices of all purchased feeds would have had a much greater impact on net income from poultry and eggs than on income from milk or meat animals.

Also in 1947, wages accounted for about 45 percent of the cash costs of producing fruits and vegetables and 34 percent of the cash costs of producing cotton. The operation of motor vehicles was relatively a much larger expense item in connection with food grains and feeds than with other commodities. Depreciation was relatively high for tobacco, dairy products, and grains. Financial items (taxes, interest, and net rent to nonfarm landlords) were relatively higher for food and feed grains and cotton than for other commodity groups.

Table 3 also has at least one analytical application. The percentages for each category of production expenditures might be used as weights in indexes of prices of goods and services used in production. For poultry and eggs such an index would give a very heavy weight to prices of purchased feeds and relatively small weights to the operation of motor vehicles and to wages of hired farm labor. A similar index for fruits and vegetables would give predominant weight to farm wage rates and considerable weight to such items as containers and the materials for making them. An index of cash production costs for food and feed grains would give very heavy weight to operation of motor vehicles, depreciation, and various money payments in the form of taxes, interest, and rent.

The importance of the several items of cash production costs relative to *gross farm income* may differ from their share in production expenditures. Table 1 indicates that, in 1947, total production expenditures were equivalent to 33 percent of gross farm income from feed grains and hay, 41 percent in the case of meat animals and 71 percent in the case of poultry and eggs. These relationships would vary, of course, with changes in the relative prices of the different commodity groups. In 1947, poultry and eggs had one of the smallest percentage margins (differences between gross farm income and production expenditures) of any commodity group. Feed grains had perhaps the largest margin of any major group, as prices for feed during most of the year were at all-time record levels.

The figures discussed in this section suggest the possibility of obtaining rough estimates of the net farm-income positions of different commodity groups for a few years prior to and following 1947.

TABLE 2.—*Percentage distribution of major categories of production expenditures by commodity groups, United States, 1947*

Commodity group	Expenditures by farm operators for						
	(1) Total production expenditures	(2) Purchased feed	(3) Operation of motor vehicles	(4) Depreciation on vehicles, equipment and buildings	(5) Hired labor	(6) Taxes, interest and net rent to nonfarm landlords	(7) Miscellaneous (including purchased livestock)
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
All commodities	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Meat animals	24.3	24.9	17.8	16.1	14.0	26.4	[1]37.9
Dairy products	17.7	27.1	15.3	21.8	17.2	15.5	8.9
Poultry and eggs	14.4	39.8	7.0	6.9	2.8	9.3	[2]10.2
Fruits and vegetables	11.1	—	10.2	7.7	29.8	6.2	13.7
Food grains	7.1	—	14.6	13.0	4.6	13.2	4.8
Feed grains and hay	4.7	—	9.6	6.5	4.9	7.8	3.8
Cotton and cottonseed	6.3	—	7.0	7.3	13.0	8.1	5.3
Tobacco	2.3	—	1.3	5.4	3.2	2.7	1.8
Miscellaneous	12.1	8.2	17.2	15.3	10.5	10.8	13.6

[1]Includes 30.5 for purchased livestock.
[2]Includes 5.6 for purchased livestock.

Gross farm income could be adjusted by an index of prices received by farmers for the commodities in each group. Production expenditures could be adjusted by a similar index of prices of production goods and services weighted appropriately for each commodity group. But if the ratios of various purchased inputs to physical output of a commodity group were highly unstable, this price-index approach would break down. This might happen if unit costs varied substantially with yields and if yields themselves fluctuated violently because of weather.

It must be recognized that the nine commodity groups here considered still represent a high level of aggregation. The production process for hogs is greatly different from those for beef cattle and lambs within the meat animal group. Farm chickens and commercial broilers are produced under different conditions and the broilers are much more dependent on purchased feed.

The data are highly aggregative in a geographical sense as well. For example, in some parts of the Middle West dairy farmers buy little feed. At the other extreme are "dry lot" dairies in metropolitan areas; they have no pasture and buy all their feed, including hay. Intermediate are the conditions of milk production in the Northeast where dairy farmers grow most of their roughage but buy a substantial part of their feed concentrates. This suggests the desirability of developing data of the kind presented here, by broad regions and by major farming types within regions, in such a way that they can be aggregated into commodity and area totals. Data are already available for selected types of family-operated farms in certain regions, but this material has not been assimilated into the framework of national farm income estimates.

Market Margins.—The upper part of table 1 shows the distribution of food marketing margins by major commodity groups and by three main categories of marketing functions.

The retail values, farm values, and total marketing charges for each of the six commodity groups have been published in the *Marketing and Transportation Situation*. The break-down of the marketing bill by major functions was based partly on relationships in 1939 between processing and distributing margins. Some possible uses of these data are brought out by means of special-purpose tables.

Table 4 expresses marketing charges by major functions for each commodity group as percentages of its total marketing bill. In general, the variations reflect differences in the services needed to move each group in the forms required between the farm and the consumer. Intercity transportation is over twice as important with fruits and vegetables as with any other commodity group. Many fruits and vegetables are shipped long distances, as from the Pacific Coast, Texas, and Florida, to the major consuming centers. More than half of the total retail expenditures for dairy products go for fluid milk which is produced within very short distances of the consumers. Consequently, intercity transportation makes up a smaller proportion of the total marketing bill for dairy products than for any other food group.

Table 3.—*Percentage distribution of production expenditures for major commodity groups, by expenditure categories, United States, 1947*

Commodity group	Expenditures by farm operators for						
	(1) Total production expenditures	(2) Purchased feed	(3) Operation of motor vehicles	(4) Depreciation on vehicles, equipment and buildings	(5) Hired labor	(6) Taxes, interest, and net rent to nonfarm landlords	(7) Miscellaneous (including purchased livestock)
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
All commodities	100.0	21.4	9.1	15.1	16.5	15.0	22.9
Meat animals	100.0	22.0	6.7	10.0	9.5	16.2	[1]35.6
Dairy products	100.0	32.8	7.9	18.7	16.1	13.1	11.4
Poultry and eggs	100.0	59.3	4.4	7.3	3.2	9.7	[2]16.1
Fruits and vegetables	100.0	—	8.4	10.5	44.5	8.4	28.2
Food grains	100.0	—	18.7	27.6	10.6	27.6	15.5
Feed grains and hay	100.0	—	18.5	21.0	17.3	24.7	18.5
Cotton and cottonseed	100.0	—	10.1	17.4	33.9	19.3	19.3
Tobacco	100.0	—	5.1	35.9	23.1	17.9	18.0
Miscellaneous	100.0	14.4	13.0	19.2	14.4	13.5	25.5

[1]Includes 28.6 for purchased livestock.
[2]Includes 8.9 for purchased livestock.

TABLE 4.—*Farm food products: Charges for major marketing functions as percentage of total marketing bill, by commodity groups, United States, 1947*

Commodity group	(1) Total marketing bill	(2) Trade[1]	(3) Intercity transportation[1]	(4) Processing[1]
	Percent	*Percent*	*Percent*	*Percent*
All food products	100	56	11	33
Meat products	100	57	10	33
Dairy products	100	67	4	29
Poultry and eggs	100	78	8	14
Fruits and vegetables	100	60	25	15
Bakery and cereal products	100	37	7	56
Miscellaneous	100	40	9	51

[1]Unofficial estimates, based partly on 1939 relationships.

As poultry and eggs require relatively little processing, charges for this work were something like 14 percent of the total marketing bill for the group. On the other hand, cereal products and miscellaneous foods (including sugar, vegetable oils, and wet-process corn products) require substantial processing to put the raw farm products into the forms in which they are customarily sold at retail. Processing charges for these two food groups reached a half or more of their total marketing bills. Processing charges seem to have been slightly more important for meats than for dairy products.

Table 5 looks at the same basic data from a different viewpoint. For example, fruits and vegetables accounted for some 50 percent of the total intercity transportation bill for farm food products, meat animals and meats for about 22 percent, and bakery and cereal products about 11 percent. Dairy products and poultry and eggs, combined, accounted for only 10 percent. These figures might be regarded as weights in a demand indicator for long-haul transportation services. Similarly, if we combine the costs of wholesale and retail distributive services and those of country assemblers, it appears that fruits and vegetables accounted for about 25 percent of the total gross income of such agencies; meat animals and meats about 25 percent, and dairy products about 20 percent.

The figures on marketing costs can be interpreted similarly to those on production expenditures. If retail prices remained constant, a uniform percentage increase in freight rates would hit fruits and vegetables much harder than any other group of farm commodities. On the same assumption, an increase in costs of construction, machinery, and types of materials and services used by processors would bear most heavily upon producers of grains, sugar crops, and oilseeds.

In 1947, the total marketing bill was a smaller percentage of retail store value for some commodity groups than for others. For example, marketing charges were 32 percent of the retail store value for poultry and eggs, compared with 67 percent for bakery and cereal products. The corresponding percentages for other groups were meats, 36 percent; dairy products, 41 percent; fruits and vegetables, 59 percent; and miscellaneous foods, 64 percent. These percentages are complements of the more familiar figures on "farmers' shares" of the retail food dollar.

TABLE 5.—*Farm food products: Percentage distribution of major types of marketing charges among commodity groups, United States, 1947*

Commodity group	(1) Total marketing bill	(2) Trade[1]	(3) Intercity transportation[1]	(4) Processing[1]
	Percent	*Percent*	*Percent*	*Percent*
All food products	100	100	100	100
Meat products	25	25	22	26
Dairy products	16	20	5	14
Poultry and eggs	8	10	5	3
Fruits and vegetables	23	25	50	10
Bakery and cereal products	19	13	11	33
Miscellaneous	9	7	7	14

[1]Unofficial estimates, based partly on 1939 relationships.

SOURCES OF DEMAND FOR FARM PRODUCTS.—The previous section was concerned with decidedly the largest flow of farm products—sales for food use by domestic civilians. In addition there were large sales of nonfood products for domestic use, including cotton, tobacco, shorn wool, flaxseed, and others. To these may be added the value of byproducts such as hides, pulled wool, wheat millfeeds, and oilseed meals, which have not been included in the equivalent farm value of food products, and (for convenience) the value of feed grains processed by manufacturers of commercial feeds. In 1947, the farm value of nonfood items for domestic use totaled about 5 billion dollars (table 6).

The retail values of selected cotton, wool, and tobacco products, in 1947, averaged from six to ten times the equivalent farm values. Some cotton went into industrial uses for which a "farm-to-retail" calculation would be meaningless. Marketing

TABLE 6.—*Sources of cash farm income, United States, 1947*

Source	Cash farm income[1]	
	Amount	Percentage of total
	Bil. dol.	*Percent*
Total cash receipts from farm marketings	29.75	100.0
Sales for food use by domestic civilians	18.23	61.3
Food use by armed forces	0.50	1.7
Nonfood products and byproducts for domestic use	5.22	17.6
Inter-farm sales	2.66	8.9
Exports and shipments	2.87	9.6
Balancing item[2]	.27	0.9

[1]Equivalent farm values of commodity flows.
[2]Includes changes in nonfarm stocks, statistical discrepancies, rounding errors, etc.

charges on processed feeds bought by farmers were of about the same order of magnitude as their equivalent farm values.

In 1947, the equivalent farm value of food used by the U. S. armed forces was approximately 0.5 billion dollars, concentrated rather heavily in the meat and fruit and vegetable groups. The farm value of sales for export and shipment to territories was about 3 billion dollars. Food grains made the largest single contribution to the export total in that year. Exports of cotton were relatively small. Three crops—cotton, wheat, and tobacco—accounted for some 60 percent of the farm value of agricultural exports.

Cash receipts from farm marketings include receipts from sales to other farmers. The largest single flow of interfarm sales is the shipment of feeder and stocker cattle from range States to feeders in the Corn Belt and other areas. The other major interfarm flow consists of sales of feed grains and hay.

The proportion of total equivalent farm value of each commodity group obtained from sales to different outlets is an approximate indicator of the vulnerability of the farm prices of these produets to changes in the different sources of demand. Exports are of great importance to producers of wheat, cotton, and tobacco. The prosperity of producers of livestock products, fruits, vegetables, and feed grains depends primarily on the prosperity of domestic consumers. Prices paid for feeder cattle and for both raw and processed feeds are influenced by prices received for slaughter cattle and other livestock products, which in turn depend on consumer income.

Implications for Further Analysis

Table 1 suggests some of the major connections between agriculture and the rest of the economy. If we have information as to coming changes in certain segments of the nonfarm economy, this table can help us to estimate their direct effects upon agriculture. Statistical demand analyses in some cases enable us to predict with reasonable accuracy the effects of changes in production and changes in consumer income upon retail food prices. Average relationships between retail and farm prices may enable us to estimate the corresponding effects at the farm level. However, information about prospective changes in freight rates, wage rates of food marketing employees, costs of containers and other specific items, should help us to estimate these effects more accurately.

In the case of export crops, we may be able to derive export demand curves on the basis of past relationships, supplemented with judgments as to peculiarities of the current situation. We may conceive of the farm price of wheat as being determined by separate demand curves for domestic food use, for export, for feed, and for reserve stocks. For most purposes, the slopes and shapes of these demand curves can be approximated with usable accuracy. These demand curves constitute the major part of an economic model of factors affecting the price and utilization of wheat.

One goal of applied economics should be to develop similar models for as many as possible of our major farm products. These models should reflect competitive relationships between commodities in such groups as meats and poultry, oilseeds, and feed grains. They should also "explain" the demand for feeds (and for feeder cattle) in terms of prices, numbers, and other factors relating to each major class of livestock and livestock product. Supply responses, as of pig crops to corn supplies or hog-corn ratios, should also appear in these models.

If we are tracing the impacts of changed conditions upon one farm commodity at a time, we may generally regard changes in domestic and foreign demand as determined outside of the agricultural economy. But if we add up these direct impacts for all farm products we begin to recognize the incompleteness of the individual commodity models. For example, during 1922-41 a year-to-year change of 10 billion dollars in U. S. disposable income was associated with an average change of more than a

billion dollars in cash receipts from farm marketings. But production expenditures also tended to increase with cash receipts. For each billion-dollar change in cash receipts from one year to the next, farm purchases of livestock and feed tended to change by more than 100 million dollars. The farm-wage bill changed an average of 80 million dollars per billion-dollar change in cash receipts. Farm wages were influenced by the prevailing level of nonfarm wage rates and the ease with which nonfarm employment could be obtained.

There are other production items the prices of which are largely determined outside of the agricultural economy. Prices of motor vehicles, gasoline, and oil, are examples, for only moderate proportions of the total outputs of these items are used in farm production. Most types of farm machinery are not usable for other purposes. Nevertheless, prices of steel, rubber, and other materials used in farm equipment, as well as factory wage rates, are determined in a very broad competitive area; and prices of the farm machinery itself may not be very responsive to changes in farm income. During 1922-41 cash outlays for production requisites excluding feed, livestock, and hired labor and including net investment in farm buildings and equipment changed about 300 million dollars in association with year-to-year changes of a billion dollars in cash receipts. This association may be regarded in large part as a "back-effect" of farm income upon the nonfarm economy.

As an average during 1922-41, the realized net income of farm operators rose nearly 700 million dollars in response to a year-to-year increase of 1 billion in cash receipts from marketings.[5] Of this, over 100 million dollars represented net new investment in farm buildings and equipment, an item mentioned in the preceding paragraph. The remainder also had its back-effects on the nonfarm economy through increased expenditures on goods and services for family living.

Hence, if we try to trace the ultimate effects of an initial increase in consumer income (due perhaps to an increase in the rate of defense expenditures) we are led through a series of approximations. The "first round" increase in farm cash receipts leads to a secondary increase in nonfarm income (perhaps no more than 10 percent of the initial one). This leads to a secondary increase in farm income, which produces a third-order effect on nonfarm income (perhaps no more than 1 percent of the initial increase).

But we must also consider another stream of influences. The bulk of the initial increase in consumer income will be spent for nonfarm goods and services. This expenditure leads to an increase in nonfarm employment and income, which reinforces the original one and leads to a further (but smaller) expansion in expenditures. If, for example, a defense program increased the rate of wage, salary, and other income payments *directly* by 10 billion dollars while the rate of private investment remained constant, the total increase in income (in the absence of controls) might be around 20 billions.[6] If so, farm cash receipts would tend to increase by twice the amount suggested by the initial impact, rather than by 1.11 times that amount as suggested by considering back-effects through farm income only.

In the last few paragraphs we have fallen back, for simplicity, on a highly aggregative type of analysis. This analysis may be sufficient for some purposes. But if we are interested in anticipating changes in the farm economy at the level of commodity detail that is important for farmers themselves, or for national policy, we must work toward an economic model which places individual farm commodities in the context not only of agriculture as a whole but of the entire national economy, recognizing its interconnections (through trade) with other parts of the world.

Some concept of what is involved can be obtained if we visualize the data in table 1 as being rearranged in a larger table of (say) 50 rows and 50 columns, representing a classification of the entire economy into 50 industries. The first 9 rows would record the distribution of farm products to different industries (including "households" and "for-

[5]The sum of net income and production expenditures (including depreciation allowances) is equal to gross farm income. Gross income is larger than cash receipts by the imputed rental value of farm dwellings and the value of home-grown products consumed by the farm family. The latter value changes directly with cash receipts, as the price components of the two series are quite similar. As a result, gross farm income during 1922-41 changed about 1.1 billion dollars per billion-dollar change in cash receipts. Production expenditures (including depreciation allowances) accounted for a little more than 400 million and net income for a little less than 700 million dollars.

[6]Magnitude based on Smithies, A. R., "The Multiplier," *American Economic Review*, Proceedings Number, May 1948, pp. 299-305.

eign countries'') in which they were transformed or consumed; the first 9 columns would record inputs used in farm production according to the industries from which they originated. (Production expenditures would be more finely subdivided than in table 1, so that motor vehicles, petroleum products, fertilizer, farm machinery, and other major inputs would be represented by separate industries.) Thus, the *direct* relationships of agriculture with its major suppliers and purchasers would be represented by a Γ-shaped array of figures occupying 9 rows and 9 columns. The other 41 rows and columns would record the relationships between nonagricultural industries, including those that supplied inputs to agriculture as well as those that had no direct contact with it.

In a complete system of this kind the ramifications of a change in one industry can be traced throughout the economy and the final effects upon each industry measured, granted certain assumptions. An increase in the output of a given industry would require increased inputs from its suppliers. But this would mean corresponding increases in the total outputs of these industries. Each such increase would constitute a further requirement for inputs (hence outputs) from the appropriate supplying industries. The size of the second, third, and higher order effects would diminish progressively as the system approached a new equilibrium. The steps in this process are analogous to those of the ''income multiplier'' analysis on the preceding page. The ratio of the final to the initial change in output from a given industry may be regarded as an ''interindustry multiplier'' implicit in the system of input-output relationships in the economy.

The assumptions underlying both types of multiplier analysis are still highly restrictive. But in the absence of a self-consistent model of some kind, discussions of interaction between agriculture and the general economy tend to suffer from oversimplification and from unverified assumptions about quantitative relationships.

For this reason, agricultural economists should take an active interest in the interpretation, application, and further development, of the interindustry relations approach most recently exemplified by the Bureau of Labor Statistics study of the U. S. economy in 1947.[7] The interindustry approach is highly instructive in itself if we are concerned with physical relationships between outputs and inputs, as in many aspects of mobilization planning. But, in general, a change in money demand for the products of a given industry sets up reverberations not only through the input-output structure of the economy, but also through the whole system of demand and supply relationships which together determine changes in prices and incomes as well as in production and consumption.

As time goes on, we need to supplement the input-output approach with one that permits us to use, among other things, our knowledge of demand and supply curves for agricultural commodities. Conceptually, this leads us into a very large system of simultaneous equations—a sort of ''econometric map'' of the agricultural economy in the framework of total economic activity.[8] Our single-equation demand analyses, and sub-models of moderate complexity, would be as useful as ever. But the over-all model would force upon us a keener awareness of the nature of the approximations we were making, and of the variables or sets of economic relationships that we were assuming constant.

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[7]A 42-industry table based on this study appears in an informative article by Wassily M. Leontief: ''Input-Output Economics,'' *Scientific American*, October 1951, pp. 15-21. In this table ''agriculture and fisheries'' are treated as a single industry. It is expected that larger, more detailed tables from the 1947 study will be available soon.

[8]For further insight into the usefulness of such an undertaking, see Haavelmo, Trygve, ''Quantitative Research in Agricultural Economics: The Interdependence Between Agriculture and the National Economy''; *Journal of Farm Economics*, November 1947, pp. 910-924.

Book Reviews

Economics of Employment. By Abba P. Lerner. McGraw-Hill Book Co., New York. 397 pages. 1951.

IN ADDITION to his reputation as an original penetrating economic analyst, Professor Lerner is widely known as an indefatigable and persuasive expositor of the economics of John Maynard Keynes. Although this book, one of the Economics Handbook Series edited by Seymour E. Harris, deals with a number of problems not treated explicitly by Lord Keynes, it is essentially, as the editor states, "a lucid and elementary account of Keynsian economics."

The book has seven parts. Part I discusses the meaning and importance of full employment, and advances the central thesis that "depression and inflation can be prevented by regulating the rate of spending." Part II explains fluctuations in the level of employment in terms of the Keynsian mechanism. Here one will find an extremely simple and nontechnical explanation of the relationships among income, spending, consumption, saving, investment, interest, and money. The last chapter in Part II, Functional Finance, explains how the government can regulate the level of employment and income through its powers to buy and sell goods, to subsidize and tax, and to borrow and lend.

As the whole matter seems simple and obvious, why are not the principles and practices of Functional Finance readily adopted as a means of ensuring continuous full employment? Professor Lerner thinks this is due to deep-seated intellectual and emotional resistances, which he analyses in Part III. Although his analysis is penetrating, it will hardly be convincing to the skeptics, but he finds it "necessary to remind almost everyone that the human race is not noted for the promptness with which it acts collectively to adopt reasonable methods of dealing with its problems."

Part IV faces up to the fact that, even if a full employment economy can be created through Functional Finance, this economy is constantly threatened by inflation, which Lerner ascribes primarily to excessive rises in money wage rates brought about by the disproportionate bargaining power of labor. The theoretical answer to this problem would be perfect wage and price flexibility combined with Functional Finance.

But since this flexibility appears to be practically unattainable, he proposes a wage policy that would permit most money wages to rise with average national increases in labor productivity, would prohibit increases where wages are higher than necessary to attract adequate supplies of labor, and would permit larger increases where wages were not sufficiently high. I think Lerner's proposals contain some flaws, but space does not permit appraisal of their soundness or practicability. They merit consideration as concrete proposals designed to cope with a real problem which few economists have attempted to grapple with in specific terms.

Part V returns to some of the problems raised in Part II. The topics include the national debt, the business cycle, and the relation of Functional Finance to socialism and capitalism. I believe the best chapter in this part is that dealing with the interrelations of saving, thrift, and the multiplier, which form the most difficult part of the Keynsian system to explain satisfactorily, particularly to students who are studying it for the first time. Part IV brings the problems of international trade, capital movements and exchange rates into the picture; Part VII consists of a single chapter, Economics, Politics and Administration.

It is my opinion that Professor Lerner has been unusually successful in producing a simple and nontechnical, but essentially complete, statement of the Keynsian system, together with an equally simple and nontechnical analysis of the main problems involved in maintaining full employment. The book is addressed to the intelligent general reader without previous economic training, but I am inclined to think that it is somewhat too long and formal to attract this elusive citizen in very large numbers. Probably its greatest appeal will be to economists who have not yet got around to taking a serious look at Keynsian economics, and to instructors who would like to introduce their students to

Keynes through a less difficult medium than the *General Theory,* but who find many of the textbook statements to be incomplete.

Finally, Lerner's book may be of more interest to agricultural economists than might appear at first glance. It is now evident, or should be, that the problem of maintaining agricultural prices and incomes involves more than the simple question of whether or not parity is being achieved. Spending for agriculture has implications for total income and employment, and the level of prices received by farmers and wages received by workers are more than casually connected. The attempt to develop a satisfactory wage and price stabilization program since the Korean hostilities certainly bears this out.

James P. Cavin

Econometrics. By J. Tinbergen. The Blakiston Company, New York. 258 pages. c. 1951.

ECONOMETRICS made easy. This is the subject discussed by Dr. Tinbergen, of the Netherlands School of Economics. Parts of this small book, particularly Appendix A on The Use of Correlation Analysis in Economic Research, are excellent. Others, such as Part III on Results of Econometric Research, are disappointing. At the end of Part III, the author says, "In this book we have tried to make the reader acquainted with the way of thinking, the methods, and the results of econometric research. We have made it our task to do this without calling into use what is sometimes called higher mathematics. It goes without saying, therefore, that only the contours of econometrics could be indicated. We have only gone very briefly into the most important investigations; insofar as possible only the principle has been discussed in every instance, together with the most important results." The use of mathematics *has* been held to a minimum. Unfortunately, this has meant that many of the more interesting aspects of econometrics have been left untouched.

Tinbergen defines econometrics as both the mathematical formulation of economic hypotheses with a view toward their statistical testing and the actual process of subjecting these hypotheses to a statistical test. This definition gives equal emphasis to the theory and the practice of measurement, and is, in this reviewer's judgment, a wholesome orientation. Rightly or wrongly, most economists in this country think of econometrics as being concerned mainly with mathematical formulations. It is perhaps for this reason that many of the examples cited here seem overly simplified. Many of these, as described, are not up to the current level of practice among agricultural price analysts in this country.

Many valuable ideas are presented and many statistical-economic concepts are defined and clarified in simple language. The importance of cooperation between statisticians and economists is emphasized. An economist should formulate his theories so as to permit measurement, and the statistician should develop "a desire to measure relevant things." The analysis of the four ways in which time-concepts enter into an economic study, of complete economic systems, of stable and unstable equilibria, and of the principle of "repeated samples" as applied to time series are of particular interest. Distinctions between macro- and micro-economic relationships, static and dynamic studies, and simultaneous-versus single-equation approaches (including the use of reduced form equations) are covered simply yet adequately. Appendix A contains an interesting discussion of the differences in basic assumptions made by R. A. Fisher, R. Frisch, and T. Koopmans in developing their respective methods of handling multiple correlation. References to the European literature, in addition to that in the United States, are given.

Mention is made of a number of cases in which equations involving a single independent variable may give satisfactory results. It is stated that with agricultural products "an income index only rarely has to be included among the explanatory variables." Price and consumption analyses made in this country indicate that these statements are rarely justified (see, for example, the paper by Fox in the July 1951 issue of this publication).

In summary, the reader will find much of interest in this book. The reading of it alone, however, will not make him an econometrician.

R. J. Foote

Scientific Research: Its Administration and Organization. Edited by GEORGE P. BUSH and LOWELL H. HATTERY. American University Press, Washington, D. C. 190 pages. 1950.

THE opening sentence sets the theme: "Science can no longer be romantically defensive about the lone-wolf researcher to the neglect of organized, cooperative research and development." Throughout, this theme is played over and over, with variations; that science and scientific research is now big business, so those administering it and those conducting it must recognize that the principles of administration have a degree of applicability to research which must be carefully considered by all concerned.

When deciding whether to read the book, the last chapter or the last five pages will help. Bush summarizes the contents of the preceding chapters in easily understood form, and at the same time clarifies the relationship of the principles of administration to the conduct of scientific research. There are a few instances in which the early chapters do not seem to have the same emphasis as the conclusions drawn by Bush, but this difference could be the result of the development in discussion of attitudes which differed from the initial presentation or it could result from the very nature of the volume.

The book is a report on the initial Institute on the Administration of Scientific Research, held at American University. The papers were delivered by outstanding authorities in the field of scientific research. These men represented both industry and Government, and were representative of administrators, scientists, and those with responsibilities of management. Books of this kind can easily be disjointed and may appear to have no central theme. This is not the case in this instance because, to a surprising extent, the authors have presented related aspects of a single problem with many facets. The papers are well written and rather easy to read.

The challenge which large-scale scientific research presents to administration, as set forth by Hattery in the opening chapter, is organized into five major subject areas: (1) Research organization, (2) administrative process, (3) research personnel, (4) aids to research, and (5) research product. The summarizing chapter by Bush applies the principles of administration in the research environment.

Some of the interesting and at times controversial opinions set forth would, if adopted, change the time-honored attitudes of both the scientists and those administering research programs. For example: Replication of effort is mandatory because, unlike duplication, it can be an economy—is not necessarily wasteful; the unilateral attitude that Government procedures and policies transcend those of a contracting agency is unhealthy; it is desirable for the creative minds to be protected from the buffeting that comes from the overuse of red-tape but they are being buffeted by administrative problems of their own creation. Other opinions include: The scientist is not above accounting for the way he spends his time; scheduling is not feasible in pure research but it is very useful in applied research; it is possible to develop estimating standards for research in terms of total costs per man; some kind of accounting for time spent on projects is a necessity if cost estimates and statements are to mean anything.

The primary function this book will serve, in my opinion, is to help bridge the gap between the thinking of the scientist, the administrator, and the administrative technician. Since all must have the same aims, a book that will demonstrate to all concerned that the principles each holds to are not incompatible, will help toward solving the problems here set forth. It should help the administrative technician to understand the researcher's viewpoint better, and it should help him if the scientist does as the book suggests—use in the administration of research the scientific methods he uses in research work. It should help the administrator to get the problems of administering research in better focus. It should help the scientist to understand that the others are trying to help him do his job. The book is well worth reading.

William T. Wolfrey, Jr.

The American Cigarette Industry. A Study in Economic Analysis and Public Policy. By Richard B. Tennant. Yale University Press, New Haven. 411 pages. 1950.

VOLUME I of the Yale Studies in Economics gives the series a good beginning. The dual purposes cited for the volume are "to evaluate present public policy and to suggest possible new lines of approach" and "to contribute to the development of economic theory." Dr. Tennant's contribution to the theory of oligopoly may appear less impressive as rewritten for publication than as presented as a doctoral dissertation in 1948 but obviously the available material on the industry has been examined and a wealth of valuable information has been condensed and analyzed.

As a background for evaluation of public policy, the author traces the development of the industry and endeavors to determine the basis for its institutional peculiarities and to explain "historical accidents" that have affected it. The survey of the development of the industry and its present status, market policy, competitive relationships, and profits, serves as a frame of reference for investigations of aspects of structure and behavior.

Professor Tennant concludes that advertising is the most significant influence on market structure and the principal instrument in market tactics. Sales volume is not a simple function of advertising and its tendency to shift the demand curve to the right is offset to some extent by opposing advertising. The study indicates that the conditions of supply and method of sale of leaf-tobacco do not afford a substantial advantage to the large manufacturer over the small. Interesting is the lack of association found between production costs and size. The position of the large firm depends primarily on its ability to dominate the market through selling pressure; the author considers the effects of other efficiencies to be minor and uncertain compared with those of large-scale advertising. Interesting but unexamined is the fact that despite more thorough and extravagant advertising in this country than in any other, people here adopted cigarettes more slowly than did those in other countries though we had lower prices for them and a higher average income.

In general, price has been significant in its effect upon competition only as it affected a firm's ability to advertise. But the author concludes that the very high level of profits over so long a period suggests that prices have been adjusted to the manufacturers' benefit; during the prewar period "the greater part of these profits represented monopoly control and monopoly pricing." But he finds that rigid prices cannot be regarded as evidence of collusion, because the market situation is such that there would be identical prices even in the absence of agreement among competitors. He finds little evidence of agreement and finds no difficulty in explaining observed behavior in noncollusive terms. Although relatively unconcerned as a social observer about the effects of the practices of the industry, he finds the economic results of its behavior are the same whether explained on collusive or noncollusive grounds. This behavior brought a 1946 decision by the Supreme Court that three major cigarette companies, one subsidiary, and numerous officers, were in criminal violation of the Sherman Act. He reasons from the conviction that "not only may rational oligopoly behavior and explicit collusion yield the same market results but both may be equally subject to the law." In examining the possibility of reform he concludes that although the major companies constitute an effective monopoly, the political and social objections normally associated with a monopoly do not apply to this industry. Specifically he finds a flat rather than a U-shaped cost curve and little evidence of excess capacity or misallocation of resources.

An evaluation of the present situation in view of the continuing threat of further action by the Department of Justice indicates possible reforms and the limits of effective Government intervention. Two proposals are made: (1) prevention of future bonanza earnings and (2) a limitation on advertising which "would strike directly at the principal waste of the industry." The conclusion that an excise tax graduated on the basis of price would not have a significant net effect upon the industry's structure seems questionable.

Some readers will be disappointed that the author did not calculate the elasticity of demand for cigarettes and give a fuller discussion of the problems of developing such a demand analysis. But this is a fully documented, well-indexed book, written in readable style.

George L. Robbins

Economic Resources and Policies of the South. By Calvin B. Hoover and B. U. Ratchford. The Macmillan Company, New York. 464 pages c. 1951.

THESE AUTHORS discuss in detail the adjustments and improvements that must be made in the use, development, and conservation of the South's natural resources and the adjustments that must be made in the population, by migration out of agriculture into industry and out of the South, and by improvement in technical competence. Its nearest approach to doctrine is that there must be an increase in the factors of land, capital, and management per man working unit, if higher incomes and levels of living are to be obtained.

Readers who are well acquainted with the South, or with the scientific or popular literature on the South, will find that the first nine chapters which deal with economic factors and conditions do not contribute greatly to his knowledge. Even so, he reads these descriptive chapters in order to appraise the chapters on policy.

Because low productivity in the South is chiefly due to the low ratio of economic resources, and possibly the low level of management efficiency to man work units, the changing industrial pattern tends "to give the region a better balanced industrial structure with higher wage levels." This is of major importance because of the increasing part industry is destined to play in the South's economy. But more capital resources are also essential to improvement in both agriculture and industry. The point is made that this capital cannot be mobilized wholly from personal savings and their reinvestment. Considerable must come from outside, from wholly new industries to be established in the South, from branch industries and other establishments, from Southern located central banks, and from insurance companies.

Concerning the human factor, agriculture at least needs to lose some of its population. Efficiency of the people can be improved by Federal aid for education and by offering better education in technology and science in Southern institutions of higher learning.

Because panacea solutions have been so often proposed, the authors consider them carefully, though they give little credence to most of them. They say the policies "must operate to overcome the causes of low income, namely, poor terms of trade and the more basic pattern of higher ratios of land and capital." Improvement in farm income is being made by enlargement of farms, substitution of other farm enterprises for cotton, higher yields, increased mechanization, and migration of labor out of agriculture. The authors doubt that the use of Government power to raise agricultural income hastens these trends. Increased industrialization will hasten them by increasing the jobs for displaced farm workers. Furthermore, it will increase total income by making available more capital equipment per worker.

For increased industrialization to accomplish the major role it should play in the South, industrial development must be in those types of industry "which carry further the processing of goods." This requires the development of skilled workmen, technical training, and research. Financial and credit institutions must be tuned to industrial operation and some State laws changed. Labor and wage policy should be part of the program but wages should be increased by increased productivity of laborers rather than by the arbitrary abolition of wage differentials. Southern wages have increased whenever and wherever major industrial output per man has been made possible by superior industrial equipment, which means adequate working capital per wage worker. In all of this it is clear that the South's economic development depends on the relationship of the Southern economy to the national economy, including its international trade.

If one were to attempt to state briefly what the authors' conclusions are in terms of the title of this treatise, he would say that a successfully functioning and efficient economy consists of its natural resources and the people who use them; that per capita income and therefore levels of living are resultants of the ratio between these two factors. This ratio can be changed in the long run only by producing economically more valuable products of resident natural resources and dividing the income from them among fewer people. This is not an exciting prescription but is probably a sound one.

Carl C. Taylor

Forests and Men. By William B. Greeley. Doubleday and Company, Inc., Garden City, N. Y. 255 pages. c. 1951.

AN INTERESTING STORY from a forester's viewpoint of how leaders among men—foresters, lumbermen, politicians, and others — have influenced the policies and practices affecting the use, protection, and management of our forests.

Emphasis is placed upon those phases with which the author has had closest association—public interest during the first part and private interest in the latter part of the first half of the twentieth century. Western examples predominate as case illustrations. Ideologically, it presents the "anti" side of the forest-regulation issue.

Beginning with accounts of historic holocaust fires he sets the stage for his stated conviction that "smoke in the woods" is the yardstick of progress in American forestry, that fire prevention is job No. 1, that effective fire-control legislation is fundamental to accomplishment of acceptable results.

The nomad lumber industry is traced in its trek from one virgin forest to another, "like a threshing machine from one ripe wheat field to the next," as the per-capita consumption of wood mounted to a 1907 peak exceeding 500 board feet per year.

The influence of economics is shown on the actions of early owners of the woods. Taxes and carrying charges, mill investments to be liquidated, and stockholders' demands for dividends, were the competitive ruthless economic gears of the liquidation approach in which the forests and the industry seemed caught in "devastation" days.

A development of a concern by all the people in what is done with the Nation's forest resource, regardless of ownership, is outlined. The lasting influence of Theodore Roosevelt and Gifford Pinchot as dynamic and forest-minded men of idealism and action is brought out by recounting of anecdote and deed. Secretary of Agriculture James Wilson's aim "to serve the greatest good of the greatest number in the long run" as the policy for administration of the National Forests is cited as reflecting the Forest Service philosophy of use for all forest lands.

The Forest Service is portrayed as a realistic and sincere organization, with a field viewpoint, searching for new ideas. Its approach to a problem is a demand for the facts. Information and leadership it has furnished lumbermen have widely and deeply influenced the trend toward applied forestry on private lands.

Recognition is given to the important and growing role of the States in cooperative forestry endeavors and in control of forest-cutting practices in the public interest; the stabilizing and protective role of public forests—National, State and community; the contribution from the forest schools, the research stations, centers, and laboratories; and the efforts of the lumber and pulpwood industry to apply forestry in the woods and plants.

The CCC is credited with a volume of forest conservation work that stands above all else in this domain, the world over, and the Prairie States Forestry Project and WPA with extensive establishment of shelterbelts and farm woodlots.

The author admits that as a nation we are still supplying our needs for wood in part by deficit spending from the capital account of virgin timber but he points out that the rate of replacement has more than doubled since 1920 and that total drain now exceeds total growth by only 2 percent. He sees a bright future with adequate supplies of wood. He believes that probably the most important of all factors in the long-range productivity of our forests is the economic incentive to grow trees—that it is now good business to grow timber.

The book brings out the advocacy by the Forest Service of a strong system of National Forests and of public cooperative efforts to encourage application of good forest-management practices on private forest lands and emphasizes the author's, industry's and public's support of them. It tells of the advocacy by Forest Service Chiefs Pinchot, Graves, Silcox, Clapp, and Watts of public controls over cutting practices on private lands to assure their maintenance in productive condition and of the opposition of the lumber industry and the author to this approach. He acknowledges the toughness of the job of getting full timber crops from small woodlands and that the management of many larger holdings leaves much room for betterment, but he is convinced "that more trees will be grown by working with the forces and incentives indigenous to the United States than by copying the police controls of other countries."

The factual statements in the book will raise few questions, except in interpretation, but there are bound to be diverse reactions to its ideological contentions.

George R. Phillips

Index Numbers. By Bruce D. Mudgett. John Wiley and Sons, Inc., New York. 135 pages. c. 1950.

PROFESSOR MUDGETT has clearly and concisely restated his views of long standing on the index-number problem. Those who are engaged in constructing index numbers, particularly index numbers representing average price changes for fairly long periods, will find his views provocative for at some points he departs from the general practices of index-number construction as we know them in our major price and production indexes. Chapter 7 on long-distance comparisons is particularly in point.

To the users of price indexes the book will bring an appreciation of the limitations of index numbers as portrayers of changes in price levels through the years. Chapter 6, on the components of error in index numbers, is especially well done.

All readers might well refer to the publication, *Research in Agricultural Index Numbers,* issued by the Social Science Research Council in March 1938, which contained the views of Professor Mudgett substantially as they are today and the opposing views of some "giants" in index-number literature.

The major dilemma in index numbers is encountered in measuring price level (or production) changes over a long period. There are two extreme views on how this should be done. On one hand are the proponents of a fixed-base weighting system for all the years covered by the index. The concept of a fixed bill of goods or market basket is simple and easily explainable, and the index itself is generally computed with a minimum of effort. Some major Government indexes are computed on this basis. Before January 1950, the Bureau of Agricultural Economics computed its indexes of prices received and prices paid by farmers with fixed weighting systems that reflected farmers' sales and purchases in 1924-29. The major weakness of this type of index is that, with the passage of years, it becomes outmoded. Patterns of production and consumption change as technology advances. The fixed bill of goods that represents a production or consumption pattern some 15 or 20 years ago becomes less and less representative of current patterns and less and less reliable as a measure of over-all price movements. But this weakness can be largely overcome by revising periodically the weighting structure and the weight base period so that they are more representative of the current pattern.[1]

At the other extreme is Mudgett's proposal for shifting weights to a current basis each year and maintaining continuity with the base period by chaining together the year-to-year changes in average prices. In theory, his method of reweighting continuously would tend to give more accurate approximations of changes in the price level from one year to the next. He agrees that no price index, no matter how constructed, would give an accurate measurement of the "pure" price change over the longer period, say between 1910 and 1950. But he argues that the chain method applied to year-to-year price changes provides a better approximation of the direction of change between two periods that are far apart than does the fixed weighting system.

The weaknesses in this proposal are primarily practical considerations, but not entirely. First, current weights are rarely available. In some instances they may be very expensive to obtain, as the data on expenditures necessary for weighting the Consumer Price Index and the Index of Prices Paid By Farmers. In the case of the latter, funds are not yet available to provide weights for any period since World War II.

Second, Mudgett's proposal for determining the price change from one year to the next involves the use of the weighting pattern of the previous year for both years. Because of the lag in collecting data and preparing weights, it seems more likely that the latest weighting data for current price changes might be for 2 years previous. Even if weights could be obtained for the previous year, it is conceivable that they might not be representative for the current year. That would depend on the phase of the business cycle, on whether the economy is moving from war to peace, or vice versa. Last year's weights may be just as unrepresentative for the current year as the fixed-base weight period.

Third, annual weights may not be necessary. Some tests have indicated that over a fairly substantial number of years, when there have been no marked disturbances in the economy, changes in

[1] (For example, note the construction of the new indexes of prices received and paid by farmers in Agricultural Economics Research, Vol. 2, No. 2, April 1950.)

weighting patterns have had a negligible effect on the index.

Finally, the author underrates the importance of being able to "explain" an index to those who are not technicians. He underrates economy in computation and this is particularly in point when the index is involved in legislation and when the budget is slim.

In three chapters Professor Mudgett describes the evolution of the Bureau of Labor Statistics' indexes of wholesale and consumer prices. His appraisal is that they are good indexes but not good enough.

Nathan M. Koffsky

Subsidies for Farmers. Compiled by Robert E. Summers. The H. W. Wilson Company, New York. 208 pages. 1951.

THE WHOLE BROAD FIELD of direct Federal aid to agriculture rather than the narrower field of subsidies as such is covered by this compilation. According to the publisher's announcement it is "a compilation of interesting arguments expressed by authorities with widely differing beliefs."

Material used in the compilation has been selected from newspapers, magazines, books, and other sources. The selected material has been divided into major sections: The Farm Problem, The Role of Prices, Price Supports, The Parity Concept, The Subsidy Question, The Brannan Plan, Looking Ahead at Farm Policy, and The Current Crisis. Each section is introduced with brief comments by the editor.

Direct Federal aid to agriculture has been a part of our national policy since the passage of the Agricultural Marketing Act of 1929 which, among other things, brought the Federal Farm Board into being. The great depression brought further efforts to assist farmers as a part of a general program of economic recovery. Since then, the people of this country through their Government have been accepting an increasing responsibility for the protection of all the people from the harsh winds of economic adversity. Farmers have shared in the protection as have other groups.

I think it unfortunate that the editor chose "Subsidies for Farmers" as his title. The Farm problem would have been a more accurate title and to me at least would seem more objective. A brief quotation from Webster will illustrate the point: ". . . in ordinary usage subsidy is the more general term and often carries a derogatory implication."

In the introduction to the section on The Subsidy Question, the editor points out that apparently no two people think alike on what is meant by subsidies or the desirability of their use for any purpose.

In discussing wartime food subsidies he raises the question of whether cash payments to food processors to keep consumer prices down were *farm* subsidies. With equal appropriateness he might have raised the question whether these payments as well as other payments made directly to farmers were subsidies to consumers generally, rather than subsidies to farmers.

The editor's definition, which indicates that any measure that permits farmers to receive a price higher than that which would result from the operations of supply and demand in the open market involves a subsidy, leaves troublesome questions unsolved. Over what length of time is the comparison to be made? One month, one season, or several seasons? Further than that, if operations of the Government result in farmers receiving less than they could have obtained in a free market, as usually happens in periods of price control, is this a subsidy from farmers to the rest of the economy?

I shall look forward to any similar compilations on subsidies in other segments of the economy which the publishers of this volume may decide to issue.

C. Kyle Randall

The Foundations of Economics. History and Theory in the Analysis of Economic Reality. By Walter Eucken. University of Chicago Press, Chicago, Ill. 358 pages. 1951.

EVER SINCE the Physiocrats — 1756-76 — declared that there were natural laws which governed the operation of the economic system, economists have sought to discover what these laws were. We have seen a procession of theoretical systems — classical, Austrian, neoclassical, imperfect competition, Keynesian — each having its day and then yielding to another. Some of these schools had hoped to create permanent systems of economic thought that would have universal validity.

The historical school denied the existence of economic laws; the relativists declared it was impossible to construct a body of theory universally true in both time and space. Each system of thought, they held, was valid only for a particular and definite economic order. As one result of all this, today, economic theory is in a chaotic state—the despair of the professional economist and the laughing stock of the market place.

Eucken steps into this breach with a basic contribution—an entirely new approach and concept —to the subject. The task he sets himself is to resolve the "Great Antinomy" between facts discovered by "individual-historical" research and the necessity of formulating the "general-theoretical" problems which govern the relationships existing in an economic system.

Eucken maintains that the problem has not been, and cannot be, solved, as the historical school has attempted, by recourse to "stages" and "styles" of economic development which give a kaleidoscopic economic theory, shifting with each change in the economic order. It is possible, he argues, to construct a type of theory which is universal in both time and space. Further, the classification of economic systems into stages and styles is based on an oversimplification of economic history.

To resolve the problem, Eucken has recourse to the methods employed in some of the natural sciences; his approach is morphological. These sciences are based, in part, upon a rational classification of their elements and forces and upon an analysis of structure or the way in which these elements hang together and operate.

According to Eucken, economic life generates data and empirical rules and may be divided into "pure types." The data are stocks of already produced consumers' and producers' goods, land and natural resources including labor, technical knowledge, legal and social organization. The empirical rules include Gossen's first law of diminishing utility, the law of diminishing returns, the "roundabout process of production" or the division of resources between the production of consumers' and capital goods.

These data and empirical rules operate in different "pure types" of economic systems such as the centrally directed economy which is either totally centralized or centrally directed with free exchange of goods or the exchange economy with either "open" or "closed" forms of supply and demand including, in varying degrees, competition, oligopoly or oligopsony, monopoly or monopsony. In addition, the two main forms of monetary economy—where money and the unit of account are separate and where money is both a medium of exchange and a standard of value—as well as the types of monetary system employed, constitute other elements of the economic structure.

According to Eucken, these elements of economics, like those of the natural sciences, are universal in both time and space. In different combinations, in different relationship one to the other, these constitute the basic structure of the economic systems and institutions of all times and places. Analyses of the nature and properties of these elements, the ways in which they combine, the relationship they bear to other forms and to one another, provide the organizational framework in which economic theory may be fruitfully constructed.

Eucken sketches in rather broad outlines the application of his method to various types of economies, modern Japan, Germany in 1930 and in 1940, the Jesuit Community in Paraguay, 1609-1767, several systems of the Middle Ages, to cite but a few. He leaves to others the detailed task of preparing the morphology of specific events and situations so that, in the end, we do not know just what type of economics Eucken's system would yield.

To those who are appalled by the mountainous

volume of economic data and the molehill of theory it has yielded, by the fact that economic theory is not systematic and that it virtually fails to explain economic relationships, Eucken's thesis holds a bright ray of hope.

The book does not attempt to answer these questions: Are these elements of the problems homogeneous? Is a centrally directed farm in the Middle Ages comparable with a centrally directed farm today? Are the banking institutions of the Fuggers comparable to banking systems today? If these elements are essentially the same at all times and places, we can borrow the methods of the natural sciences whose elements do possess homogeneity—if not, we cannot copy the methods. The validity of Eucken's system must stand or fall on the truth of that hypothesis.

To test this validity, much analytical work, applying his proposed methods, must be done. And the promise that his program holds out should make this effort well worth the trouble.

Max J. Wasserman

Wartime Food Procurement and Production. By Benjamin Baker. King's Crown Press, Columbia University, New York. 219 pages. 1951.

A DESCRIPTION of the administrative procedures and techniques used by the War Food Administration and predecessor agencies in the administration of food procurement and production programs during World War II is the author's major objective. He also outlines organizational changes and gives other background information relative to the procedures described.

Dr. Baker's work in the Department of Agriculture and the War Food Administration gave him first-hand knowledge of the administrative problems here discussed. The book is carefully documented by extensive references to published and unpublished sources.

The author concludes that, despite necessary shifts in objectives to meet wartime demands, the underlying administrative practices, with a few refinements, remained the same as those that had been used before the war to handle crop-control and surplus-disposal programs. The competent staff acquired and the extensive knowledge of production and distribution gained during the prewar period enabled the Government to meet successfully the wartime administrative problems. This experience with surplus problems although providing the necessary knowledge for handling war problems had the unfortunate effect of tending to deaden the sensitivity of the administrative machine to the need to gear production for something approaching all-out effort once the war had begun. But the author concludes that, despite this psychological handicap, "the Department of Agriculture and the War Food Administration played a signal part in coordinating the forces that made possible the maximum utilization of available production resources."

The criteria for evaluation of the success of Government programs and for the major "difficulties" are not clearly defined. The complexity of the administrative organization and the reasons for organization change are at times oversimplified. The author's major concern, however, is to describe. This description, not provided in previous books, should prove valuable to Government officials, political scientists, and historians.

Gladys L. Baker

Selected Recent Research Publications in Agricultural Economics Issued by BAE and Cooperatively by Other Federal Agencies and the State Colleges[1]

BAKER, HAROLD L., and POLI, ADON. AREA AND OWNERSHIP OF FOREST LAND IN TRINITY COUNTY, CALIFORNIA. Calif. Forest and Range Expt. Sta. Forest Survey Release No. 9, 23 pp., illus. April 1951. (BAE cooperating.) (Processed.)

The second of a series of county statistical reports on area and ownership of forest land in California. It is from the Forest Survey, a national project of the Forest Service.

BITTING, H. WAYNE, and BADGER, HENRY T. MARKETING CHARGES FOR APPLES SOLD IN PITTSBURGH, DECEMBER 1949-MAY 1950. U. S. Dept. Agr. Agr. Inform. Bul. 47, 27 pp., illus. June 1951. (RMA)

Marketing charges made at each step in the course of selling apples, from farmers to consumers.

CALIFORNIA AGRICULTURAL EXPERIMENT STATION. Mimeographed Reports. (BAE and Calif. Farm Bur. Fed. cooperating.) (Processed.)

FISHER, WALTER D. CALIFORNIA FRESH TOMATOES—MARKETING CHANNELS AND GROSS MARGINS FROM FARM TO CONSUMER—SUMMER AND FALL, 1948. Mimeo. Rpt. 113, 44 pp., illus. June 1951.

FOYTIK, JERRY. CALIFORNIA ASPARAGUS: MARKETING CHANNELS AND FARM-TO-RETAIL MARGINS, 1949. Mimeo. Rpt. 116, 29 pp., illus. June 1951.

————. CAILFORNIA CARROTS: MARKETING CHANNELS AND FARM-TO-RETAIL MARGINS, 1948-1949. Mimeo. Rpt. 118, 29 pp., illus. July 1951.

————. CALIFORNIA CELERY: MARKETING CHANNELS AND FARM-TO-RETAIL MARGINS, 1948-1949. Mimeo. Rpt. 117, 29 pp., illus. June 1951.

————. CALIFORNIA THOMPSON SEEDLESS GRAPES: MARKETING CHANNELS AND FARM-TO-RETAIL MARGINS, 1948. Mimeo. Rpt. 115, 28 pp., illus. June 1951.

Parts of a larger study designed to provide a basis for suggesting possible improvements in the marketing of fresh fruits and vegetables produced and consumed within California.

GOOCH, DONALD W. BIBLIOGRAPHY ON THE MARKETING OF LIVESTOCK, MEAT, AND MEAT PRODUCTS. U. S. Dept. Agr. Bibl. Bul. 15, 209 pp. June 1951. (RMA, U. S. Dept. Agr. Library and BAE cooperating.)

Selected references, with annotations, to literature in English for the period January 1, 1932 to July 1, 1950 on the marketing of beef cattle, sheep, and hogs for meat and for stock feeding, on the marketing of meat and meat products, and on frozen-food lockers. Emphasis is on the United States and Canada, but material on other countries is also included.

HOWELL, L. D. COST OF MANUFACTURING CARDED COTTON YARN AND MEANS OF IMPROVEMENT. U. S. Dept. Agr. Tech. Bul. 1033, 192 pp., illus. August 1951. (RMA contract report by the RALPH E. LOPER COMPANY.)

Research designed to show the most feasible means of increasing the efficiency and of reducing the costs of manufacturing carded cotton yarns reveals the possibilities of making substantial reductions, particularly in labor costs.

KRISTJANSON, BALDUR H., and VOELKER, STANLEY W. LEGAL ASPECTS OF RENTING FARMS IN NORTH DAKOTA. N. Dak. Agr. Expt. Sta. Bul. 368, 17 pp. June 1951. (BAE cooperating.)

Attempts to answer in everyday language questions regarding legal aspects of the landlord-renter relationship in North Dakota.

PHILLIPS, REED A., and DELOACH, D. B. MARKETING DRY EDIBLE BEANS AND PEAS. U. S. Dept. Agr. Tech. Bul. 1044, 105 pp., illus. June 1951. (RMA contract report by Alderson and Sessions.)

The primary purpose is descriptive, but several basic issues are raised concerning the nature of marketing efficiency and the problem of increasing efficiency in marketing dry beans and peas.

RAPER, ARTHUR F., and RAPER, MARTHA J. GUIDE TO AGRICULTURE, U. S. A. U. S. Dept. Agr. Agr. Inform. Bul. 30, 82 pp., illus. (Office of Foreign Agricultural Relations and BAE cooperating.)

To introduce foreign visitors, and our citizens, to general facts about the land and how it is used, the major crops and where they are grown, and principal livestock products. Especial attention is given to farm families.

[1]Processed reports are indicated as such. All others are printed. State publications may be obtained from the issuing agencies of the respective States.

RASMUSSEN, WAYNE D. A HISTORY OF THE EMERGENCY FARM LABOR SUPPLY PROGRAM, 1943-47. U. S. Dept. Agr. Agr. Monog. 13, 298 pp. September 1951.

One of the war records monographs that present the history of the Government's activities in World War II.

REIZENSTEIN, H. H., and BITTING, H. W. FARM-TO-RETAIL MARGINS FOR APPALACHIAN APPLES MARKETED IN PITTSBURGH, 1949-50 SEASON. U. S. Dept. Agr. Agr. Inform. Bul. 44, 26 pp., illus. April 1951. (RMA)

Emphasis has been placed on the margins taken for packing-shed and shipping-point services performed before the fruit was shipped to market. These services accounted for 30 percent of the consumer's dollar spent for fresh Eastern apples in Pittsburgh during this study.

SABIN, A. R. FARM-TO-MILL MARGINS FOR COTTONSEED AND COTTONSEED PRDUCTS IN TENNESSEE, SEPTEMBER 1946-JULY 1950. U. S. Dept. Agr. Agr. Inform. Bul. 61, 16 pp., illus. June 1951.

Margins were derived from records of prices at which the cottonseed was bought and sold at each level in the trade channel, from the farm to the crushing mill.

SCOVILLE, ORLIN J. RELATIONSHIP BETWEEN SIZE OF FARM AND UTILIZATION OF MACHINERY, EQUIPMENT AND LABOR ON NEBRASKA CORN-LIVESTOCK FARMS. U. S. Dept. Agr. Tech. Bul. 1037, 71 pp., illus. September 1951.

Hypothetical budgets were developed in which only those inputs and outputs were allowed to vary for which it is reasonable to expect variation with changes in size of farm. Four sizes of farms are compared.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. MEN'S PREFERENCES AMONG WOOL SUITS, COATS, AND JACKETS. U. S. Dept. Agr. Agr. Inform. Bul. 64, 100 pp., illus. September 1951. (RMA)

A report on research designed to explore the psychological determinants of consumer buying behavior to help wool producers, manufacturers, and retailers in interpreting the significance of trends in wool consumption.

VOELKER, STANLEY W. SETTLERS' PROGRESS ON TWO NORTH DAKOTA IRRIGATION PROJECTS. N. Dak. Agr. Expt. Sta. Bul. 369, 63 pp., illus. June 1951. (BAE cooperating.)

One of several studies being made cooperatively by BAE and State agricultural experiment stations in the Missouri Basin, dealing with the economics of resource development.

Statistical Compilations

BARBER, E. LLOYD. VARIABILITY OF WHEAT YIELDS BY COUNTIES IN THE UNITED STATES. U. S. Bur. Agr. Econ. 74 pp., illus. September 1951. (Processed.)

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. CITRUS FRUITS: ACREAGE, PRODUCTION, FARM DISPOSITION, VALUE AND UTILIZATION OF SALES, CROP SEASONS 1948-49 TO 1950-51. 11 pp. October 1951. (Processed.)

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. FARM COSTS AND RETURNS, 1950 WITH COMPARISONS, 16 COMMERCIAL FAMILY-OPERATED FARMS IN 8 MAJOR FARMING REGIONS. F. M. 82, 18 pp., illus. May 1951. (Processed.)

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. FRUITS (NONCITRUS): PRODUCTION, FARM DISPOSITION, VALUE, AND UTILIZATION OF SALES, 1949 AND 1950. 33 pp. July 1951. (Processed.)

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. STATISTICS ON COMMERCIAL PEANUTS, BY SEASONS, 1938-39 TO 1949-50, AND BY MONTHS, 1945-46 TO 1949-50. 25 pp. June 1951. (Processed.)

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. STATISTICS ON COTTON AND RELATED DATA. U. S. Dept. Agr. Statis. Bul. 99, 410 pp. June 1951.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. TREE NUTS: ACREAGE, PRODUCTION, FARM DISPOSITION, VALUE, AND UTILIZATION OF SALES—1948, 1949 AND 1950. 9 pp. August 1951. (Processed.)

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. UNITED STATES COTTON STATISTICS, 1909-49, BY STATES. 39 pp., illus. July 1951. (Processed.)

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AGRICULTURAL ECONOMICS
RESEARCH

Is published quarterly by the Bureau of Agricultural Economics, U. S. Department of Agriculture. The printing of this publication was approved by the Director of the Bureau of the Budget, May 31, 1949.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 20 cents a single copy, 75 cents a year, domestic, $1 foreign.