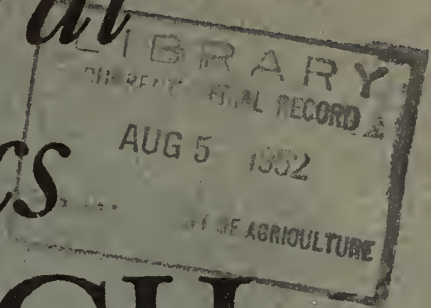


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Agricultural Economics RESEARCH



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UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Agricultural Economics

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AGRICULTURAL ECONOMICS RESEARCH

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Forecasting the Demand for Agricultural Products

By James P. Cavin

Self-appraisal—serious self-appraisal—is often recommended, rarely practiced. But the following article is a serious effort to set down and appraise the process or methods by which the Bureau of Agricultural Economics does develop its appraisal of the general economic situation which plays so important a part in our commodity, price, and agricultural outlook work. This statement was first prepared by James P. Cavin, formerly Head of the Division of Statistical and Historical Research, in the form of a paper which was presented at the annual meeting of the American Statistical Association in New York City on December 29, 1949. Since that time the original statement has been subjected to review by a considerable number of persons both within and without the Bureau of Agricultural Economics, and the current article is a revision, prepared by Mr. Cavin in collaboration with Nathan Koffsky, which also brings the analysis through 1951.

O. V. Wells

AT the Annual Outlook Conference, held in October or November of each year, the Bureau of Agricultural Economics presents an appraisal of the economic prospects for agriculture during the succeeding calendar year. In the months between the outlook conferences, these prospects are continuously reappraised. The Bureau's work in the field of agricultural outlook is now in its 30th year.¹

This paper is concerned with the process by which the Bureau develops its appraisals of the economic factors that are likely to affect agricultural prices and incomes in the relative-

ly near future. A second aspect of outlook work concerns the process by which our economic appraisals actually reach farmers and are interpreted to them in terms of their own individual production decisions. However, this function is mainly a responsibility of agencies other than the Bureau of Agricultural Economics. It may also be appropriate to note that, although these economic appraisals are primarily for the purpose of assisting agriculture, they are public documents available to all, and the Department's nonagricultural clientele is fairly substantial.

In this paper, the terms "appraisal" and "forecast" are used more or less interchangeably, although the former is perhaps somewhat more descriptive of the work. The term "fore-

¹ The development of the Department's outlook activities is described in UNITED STATES DEPARTMENT OF AGRICULTURE, OUTLOOK WORK: THE FIRST 20 YEARS. 24 pp. Washington, D. C. March 1942. [Processed.]

cast" implies a sort of precision which we do not claim and a sort of mechanical method which we do not use. The term "appraisal" implies more of a weighing of the factors involved and admits the possibility of presenting the outlook statements in terms of the most likely alternatives, particularly when the course of economic events does not appear to be clear-cut.

Improved Data an Aid in Forecasting

Economic forecasting has always been a hazardous pursuit. It is unnecessary to go back farther than the immediate postwar period for convincing evidence on this point. Nevertheless, it appears that we are at present in a better position to make useful forecasts than in any previous period. We possess more and better economic series, and for most of the more important series we have reasonably accurate measurements that extend back at least to the middle 1920's. More important is the fact that, with the development of national income data we can observe the economy as a whole in terms of its more significant components and can develop statistical relationships among them. We have also the benefit of large-scale statistical investigations of economic fluctuations, of which the best known are the business-cycle measurements of the National Bureau of Economic Research and the equation systems of the economists associated with the Cowles Commission. Finally, as a result of theories stemming principally from Keynes, together with contributions of his followers and critics, we have a markedly enhanced understanding of the forces that cause the general level of economic activity to rise and fall.

Our formulation of the economic forecast for agriculture has three phases: (1) A forecast of the general level of economic activity in the United States, together with a forecast of the level of foreign demand for goods and services from this country; (2) a translation of this forecast into its meaning for agriculture as a whole, that is, in terms of the anticipated general level of agricultural prices and of farm income; (3) a more detailed forecast of the impact of the general level of demand for agricultural products on the prices to be re-

ceived for and the income to be obtained from the sales of individual crops and livestock products.²

In formulating the forecast of general economic activity, we focus attention on two main questions. First, what is the anticipated level of consumers' disposable income in the United States? We use this measurement because it has proved to be the best over-all indicator of the demand for agricultural products consumed domestically. Second, what is the anticipated level of exports from the United States, particularly exports of farm products?

We do not have a self-generating statistical mechanism for producing these estimates. But we have developed a series of basic relationships that are useful in constructing an economic model or framework which provides a rough first approximation of the general economic situation that may emerge in the period with which we are concerned. To do this, we employ a combination of qualitative judgment and statistical estimation, which doubtless involves too much intuition to satisfy the econometricians and too much statistical manipulation for those who believe that predominantly judgmental appraisals are likely to yield the best predictions.

The development of statistics of national income has been an important forward step in economic analysis and in economic forecasting. Use of the gross national product which reflects the total economic activity of the Nation is a much more satisfactory way of describing changes in the economy and relationships within the economy than the old method of relying primarily on indexes of physical output. The index of the Federal Reserve Board, for example, represents only about 25 percent of the Nation's activity. In fact, substantial changes sometimes occur in industrial production with only modest changes in the total level of economic activity. The gross national product for 1950 and 1951, by major components, is shown in table 1. Described

² For a description of methods used by the Bureau of Agricultural Economics during the period 1937-42, see THOMSEN, F. L. and BOLLINGER, P. H., FORECASTING NATIONAL INCOME AND RELATED MEASURES. National Bureau of Economic Research, Studies in Income and Wealth, 6:170-193. New York. 1943.

TABLE 1.—*Gross national product, by half years, 1950 and 1951*
*Seasonally adjusted annual rates*¹

Component	1950		1951	
	First half	Second half	First half	Second half
	<i>Billion dollars</i>	<i>Billion dollars</i>	<i>Billion dollars</i>	<i>Billion dollars</i>
Personal consumption expenditure				
Durable goods	26.4	31.8	28.6	25.1
Nondurable goods	99.4	105.2	111.1	112.6
Services	60.8	63.4	66.0	67.7
Total	186.7	200.4	205.6	205.4
Gross private domestic investment				
New construction	20.8	23.4	23.2	21.2
Producers' durable equipment	20.2	24.8	26.6	28.0
Changes in business inventories	3.2	5.6	13.2	6.4
Total	44.0	53.8	62.9	55.6
Net foreign investment	-1.6	-3.0	-1.4	1.8
Government purchases of goods and services				
Federal	21.6	24.4	35.8	47.8
State and local	19.2	20.0	21.2	21.6
Total	40.7	44.3	56.8	69.2
Gross national product	269.7	295.6	323.8	332.0

United States Department of Commerce.
¹ Totals computed from unrounded data.

briefly below are the major relationships we have found to be useful in forecasting the demand for farm products.

Some Useful Relationships

The first of these relationships is one between total gross national product (or total expenditures) and the non-consumption expenditures in the gross national product. This relationship is shown in figure 1, part 1, with the non-consumption expenditures (that is, gross private investment, plus net foreign investment, plus Government purchases of goods and services) employed as the independent variable. Generally, we have found that consideration of these expenditures as a group, yields more satisfactory results than the use of any one of the components alone. In combination, they accounted for about 30 percent of the total gross national product (GNP) in 1946-50.

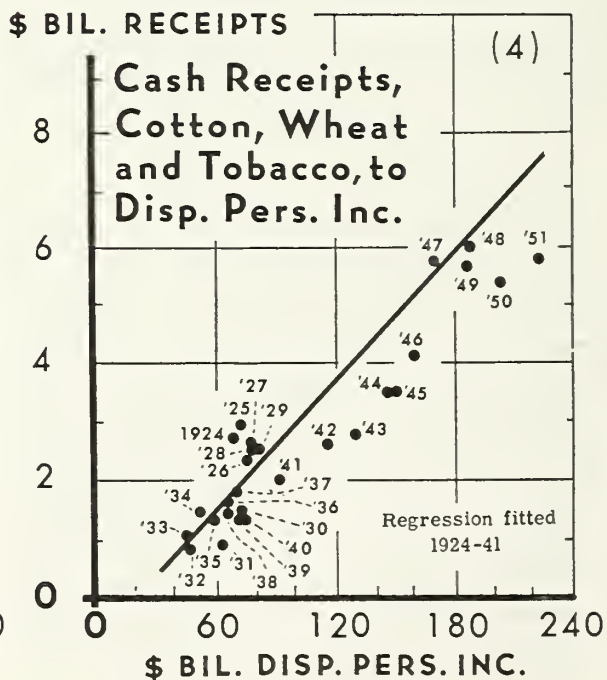
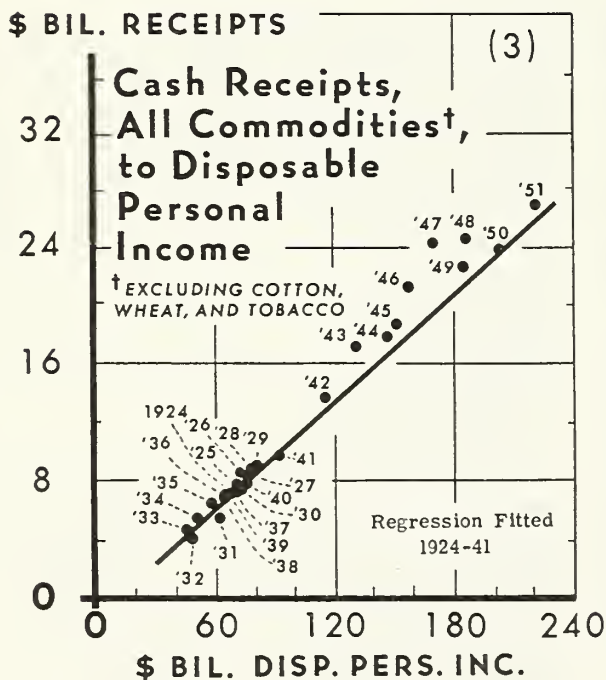
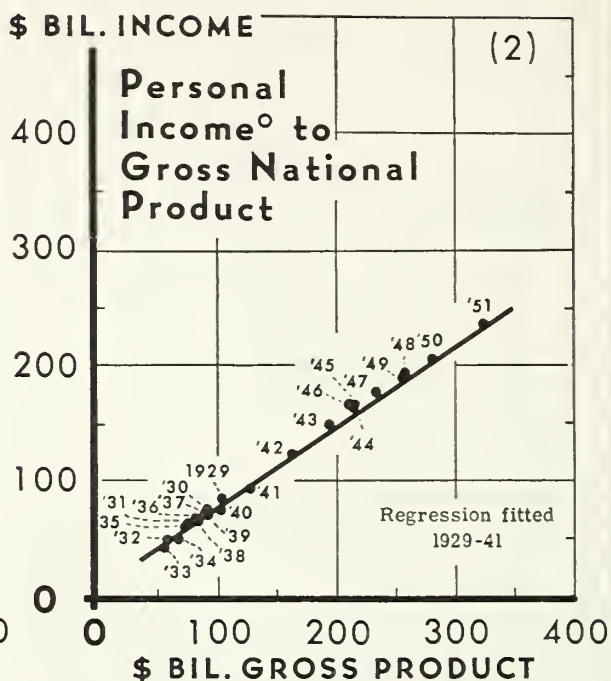
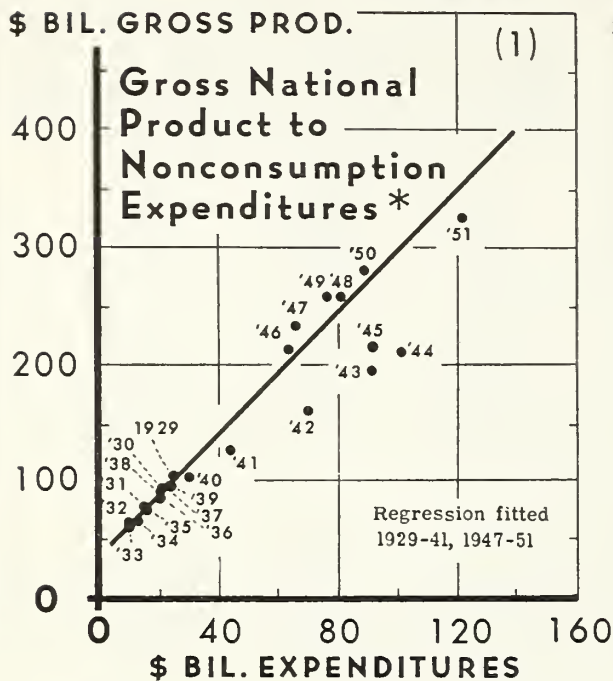
Under normal conditions their effects on the total level of economic activity will be approximately the same. For example, little difference in the short-term effect is found between the purchase of an airplane for commercial use

and for military use. This group of expenditures can be estimated with a minimum of guesswork, relative to other components of the GNP. They may be considered as the principal "exogenous" variables of the system in that the predicted magnitudes are not derived from our basic set of regressions, but are determined independently by a process which involves a considerable element of judgment, and then introduced into an estimating process as the independent variable in the regression shown in figure 1, part 1.

This relationship between non-consumption expenditures and total gross national product involves an assumption of stability between them. Under normal peacetime conditions this appears to be true, but it may not hold in certain periods when the pattern of consumption expenditures relative to income is distorted by shortages of consumer goods, price controls, and buying waves induced by international complications. In such cases it is necessary to make special adjustments for these conditions.

Estimation of non-consumption expenditures is a relatively simple and straightforward pro-

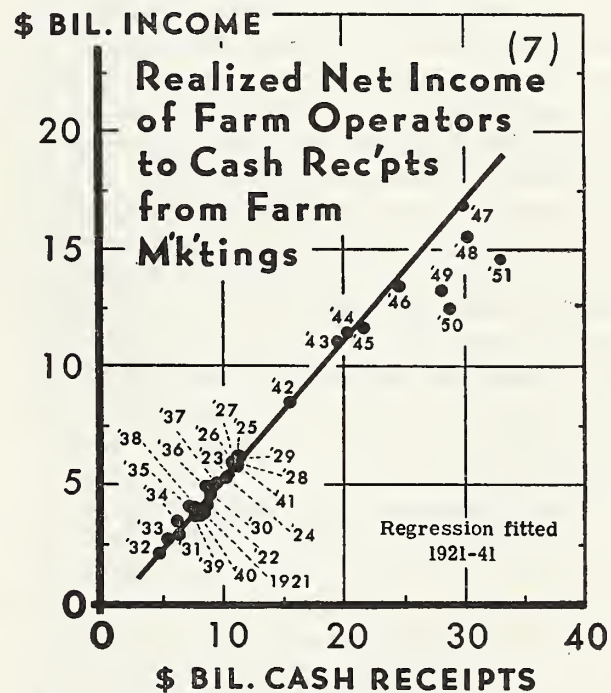
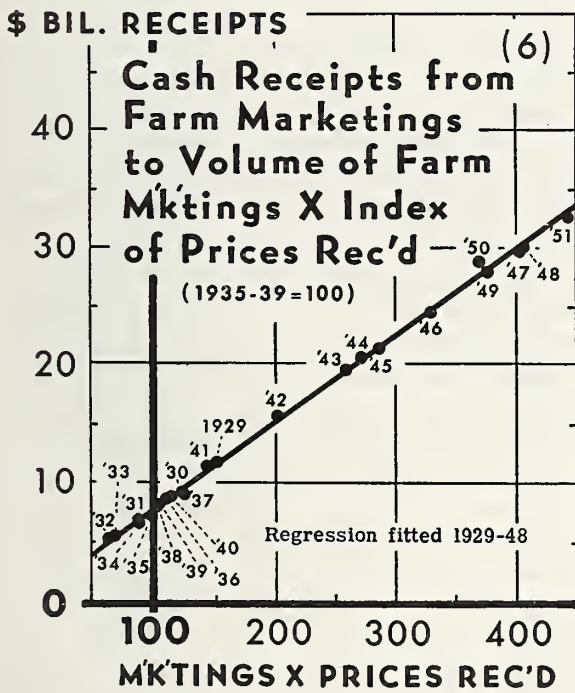
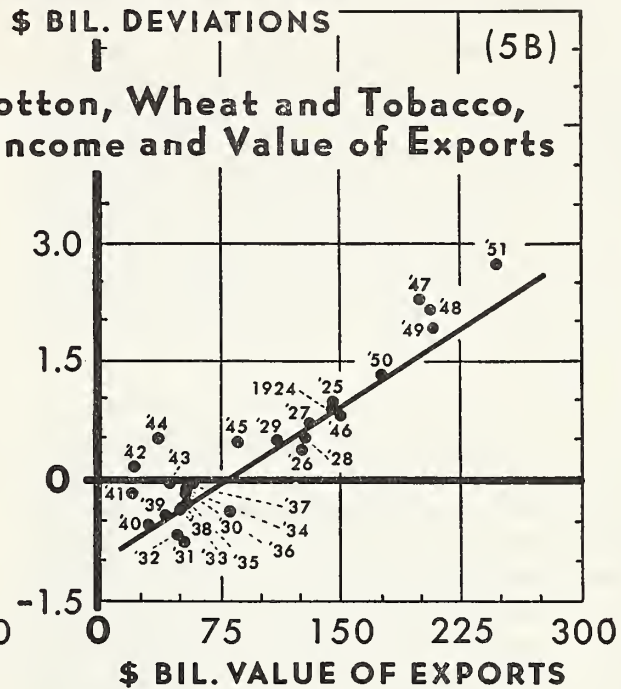
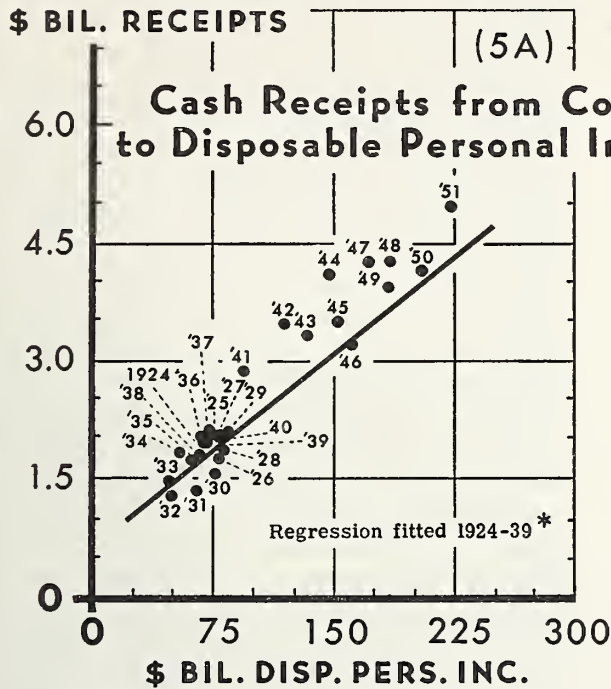
BASIC ECONOMIC RELATIONSHIPS AFFECTING AGRICULTURE



* NONCONSUMPTION EXPENDITURES EQUALS GROSS NATIONAL PRODUCT LESS PERSONAL CONSUMPTION EXPENDITURES

^o PERSONAL INCOME ADJUSTED EQUALS PERSONAL INCOME LESS GOVERNMENT AND BUSINESS TRANSFER PAYMENTS AND GOVERNMENT INTEREST PAYMENTS

BASIC ECONOMIC RELATIONSHIPS AFFECTING AGRICULTURE



*NET REGRESSION OF CASH RECEIPTS ON DISPOSABLE INCOME

cedure. With respect to Government purchases of goods and services, we usually know, by the time of our Outlook Conference, the total amount of Federal Government appropriations for the current fiscal year. We can gauge the lag between expenditures and appropriations on the basis of past relationships. We can approximate the relatively slower changes in State and local expenditures on the basis of recent trends. From this total of all Government expenditures, we can arrive at a fairly respectable estimate of the Government contribution to gross national product. With the defense program expanding, Government expenditures for goods and services accounted for about one-fifth of the total gross national product in the second half of 1951.

Determining Gross Private Investment

The contribution of gross private investment is somewhat more difficult to estimate. This component includes business expenditures for plant and equipment, other private construction (principally residential), and business expenditures for inventories. In recent years, we have considerably improved our ability to estimate levels of expenditure for business plant and equipment, which normally account for about two-thirds of all private investment expenditures. Our principal tools are the Securities and Exchange Commission—Department of Commerce surveys of anticipated capital expenditures. These are supplemented by private surveys, such as those of McGraw-Hill and other private concerns, most of which do not get into print. With respect to residential building prospects, we rely more on the judgment of specialists in the construction field, but we have also the benefit of the Federal Reserve Board's surveys of consumer intentions, which constitute a useful piece of evidence in appraising the outlook.

Annual forecasts of expenditures for plant and equipment and private construction are aided also by the fact that trends in these activities, once established, do not usually undergo substantial changes in relatively short periods. This generalization does not hold true for the third element in business expenditures—business inventories. We had a convincing demonstration on this point during 1949 and

again after the hostilities in Korea broke out. In estimating this component, we must fall back largely on qualitative considerations, though we do have a few clues, such as ratios of inventories to sales, rate of consumer expenditures relative to production, and behavior during earlier periods of cyclical change.

Private net foreign investment, the remaining component of non-consumption expenditures, is not important in the total. Recently it has accounted for less than 1 percent of these expenditures. The total export gap has been almost entirely financed by the Economic Cooperation Administration and other foreign-aid expenditures of the Federal Government. As long as this continues, we are not likely to be greatly in error by judging the size of this component on the basis of recent trends. When this situation changes, we shall face a more difficult estimating problem, to which I shall refer shortly in connection with our forecast of foreign demand.

Having constructed our forecast of non-consumption expenditures, we proceed via the foregoing relationship, together with such adjustments as may be necessary in a mobilization period, to an estimate of the gross national product. As the relationship between this and the income disbursed from the productive activity of the economy is fairly close, we can proceed further to an estimate of the latter by the use of an estimating equation in which GNP is regarded as the independent variable. This relationship is shown in figure 1, part 2. But a number of adjustments to income disbursed are necessary before we arrive at income in the hands of consumers available for spending (disposable income), which is the central objective in our appraisal of the over-all level of domestic economic activity. Major adjustments required are: (1) addition of Government interest payments and transfer payments, including social security benefits, unemployment compensation, and payments to veterans (such as the 2.8 billion insurance refund made in 1950); and (2) deduction of estimated personal income taxes. These adjustments can be partially estimated by reference to the anticipated levels of general economic activity, but in any given year they may depend significantly on current legislation.

Estimating Foreign Demand Simplified by Role of Government Aid

So much for the forecast of domestic demand. The problem of estimating the level of foreign demand, in terms of the value of exports, has been simplified in recent years by the important role of Government aid in financing United States exports. The value of Government-financed exports is essentially a byproduct of the forecast of the Government contribution to GNP, already mentioned.

The extent of Government aid has a particular bearing on the foreign market for United States farm products, as about two-thirds of our total agricultural exports were financed during 1948-50 under the Economic Cooperation Administration and Army aid to civilians in occupied areas. More recently this proportion has dropped, as high U. S. demand for imports has furnished dollars for expanding trade outside of foreign-aid programs.

In addition to a fairly good idea of the total amount of aid that is to be used in financing agricultural exports, the programming activities of the administering agencies provide some indication as to how that aid is likely to be distributed among the principal agricultural products. Thus we are able to formulate our forecast of Government-financed exports, not only in terms of a total, but also in terms of the major items that comprise that total.

To this estimate of Government-financed exports, we must add an estimate for commercial exports. At present, this can be approximated by treating these exports as a function of our forecast of the general level of domestic economic activity. But as Government-financed exports become less important, more work on export and import elasticities as a means of forecasting changes in foreign trade will be necessary. If the volume of United States private investment abroad again becomes important, some way of estimating this factor must be developed. These estimates will also be necessary in forecasting the private net foreign investment component of non-consumption expenditures.

These constitute the highlights in our procedure of estimating anticipated levels of consumer income and the value of agricultural

exports. Although they are our key estimates, we work out a rather detailed break-down of employment, production, and prices, which provides us with a fairly complete model of our forecasted economic situation.

Experts in Other Agencies Review BAE Model of Forecast

We use this more complete model as a basis of discussion and review with other agencies. From experts in these agencies we learn their judgment as to the correctness of the general level of economic activity indicated by our model, as well as to its internal consistency. Some of these experts are specialists in particular fields such as construction, employment, industrial production, and prices. In obtaining their judgments as to the probable future developments in these fields, we get the benefit of much more intensive analysis of some of the components of our model than we ourselves can undertake. To the extent that suggested changes seem to us to be valid, we introduce them into our first model and modify our general forecast accordingly.

Outlook for Agricultural Income and Prices

From this general model of the anticipated economic situation, we proceed to the outlook for agricultural income and prices. What do the prospective levels of disposable income and of the value of agricultural exports mean for farm income? Here again we have developed a number of useful relationships.

The first relationship (fig. 1, pt. 3) shows cash receipts from farm marketings of all livestock, livestock products, and crops (except wheat, cotton, and tobacco) as a function of disposable income. The included items are largely consumed in this country, and changes in disposable income alone provide a fairly good explanation of variations in the level of cash receipts from the sale of these commodities.

The next relationship (fig. 1, pt. 4) shows cash receipts from the sale of cotton, wheat, and tobacco as a function of disposable income. It is apparent that this factor fails to explain a considerable part of the variation in cash receipts from the sale of these crops. These are the chief export crops; they account for about

two-thirds of our total agricultural exports in terms of dollar value. By adding a second variable, consisting of the total value of the exports of these three crops to the correlation, the relationship is materially improved. This is shown in figure 1, parts 5A and 5B.

Although exports are relatively unimportant for the rest of the agricultural commodities taken as a whole, adding the value of exports of these commodities results in some improvement in correlation results over those obtained by using disposable income alone. In any event, a good forecast of disposable income and the value of agricultural exports will yield a good estimate of total cash receipts from farm marketings.

The same factors are useful in estimating the general level of prices received by farmers. This is hardly unexpected, as cash receipts are equal to prices multiplied by marketings (fig. 1, pt. 6) and most of the year-to-year changes attributable to disposable income and the value of agricultural exports are price changes. Marketings, which are mainly a reflection of agricultural output, tend to be relatively stable compared with prices.

We make our first approximation of the index of prices received by farmers on the basis of a logarithmic relationship between prices received by farmers on the one hand and disposable income, value of agricultural exports, and the volume of farm marketings on the other. This relationship is not shown graphically. On the average, a 10-percent change in disposable income results in approximately a 12-percent change in prices in the same direction; a 10-percent change in the value of agricultural exports in almost a 11½-percent change, also in the same direction; and a 10-percent change in the volume of agricultural marketings in about a 17-percent change in the opposite direction.

In developing our final estimate of the general level of prices received by farmers, we do not rely solely on this over-all relationship. Our analysts who specialize in the various commodity fields estimate the expected prices for their individual commodities within the general economic framework that we have assumed, bearing in mind the special conditions that affect their commodities, such as stocks

and price-support programs. These estimates for individual commodities are then combined to yield a second estimate of the index of prices received by farmers. Any difference between the index resulting from this summation process and that derived from our over-all regression are reconciled, and our estimate of cash receipts is adjusted accordingly.

In addition to cash receipts, we attempt to approximate the realized net income of farm operators, exclusive of governmental payments to farmers. This measurement of farm income is the sum of cash receipts, the value of home consumption of farm products, and the rental value of farm dwellings, minus production expenses. The general relationship between cash income from farm marketings and realized net income of farm operators is a good one, and in relatively stable periods when prices received and prices paid by farmers are moving along together, it is reliable (fig. 1, pt. 7).

But in periods when prices received are rising or falling rapidly, the resulting lag in production expenditures is difficult to forecast accurately on an over-all basis. A helpful approximation, however, can usually be reached by making a separate appraisal of the principal components of production expenses (which include such items as feed, fertilizer, motor-vehicle operation, hired labor, taxes, and capital depreciation) and summing up the results. Thus, even if our forecast of a change in the level of cash receipts should prove correct, we cannot be sure of the precise percentage change in net income, although it is certain that it will be greater than that in cash receipts.

Outlook for Individual Farm Commodities

The third phase of our forecast is the preparation of outlook statements for the individual farm commodities. This is not characterized by any uniform method of analysis. The price and marketing structures of the several commodities differ decidedly in their complexity, and vary widely in the completeness and accuracy of the basic statistical data. Furthermore, there are differences in the extent to which our individual commodity analysts have been successful in developing quantitative measurements useful in forecasting the demand and supply

situations in their respective commodity fields.

This discussion is confined to a single example of a commodity forecast—meat animals—a commodity classification that includes cattle, hogs, sheep, and lambs, and accounts for about 30 percent of the total cash receipts from farming. The procedure with respect to this commodity group may also be described in terms of three successive steps: supply forecasts, distribution forecasts, and price forecasts. The first two are developing more or less independently of the general economic forecasts described earlier; the third is arrived at by joining the general demand analysis with the specific supply and distribution forecasts for meat animals and meat.

Production and Consumption Estimates

In the first step, a forecast of production of meat animals and output of meat for the ensuing year is made without much regard to the outlook for demand. Work on this phase must be begun before the general estimates of demand have been developed; it is a legitimate procedure, in any event, as the general level of demand for meat has a rather small effect on the supply of meat within a 12-month period.

During World War II, needs of the agencies concerned with food led to formation of a Supply Estimates Committee for meat. Since the war, a similar committee within the Department of Agriculture has continued this work on an informal basis. Meeting every 2 or 3 months, it projects meat production by quarters through the current or succeeding year.

Basic data for these forecasts include reports on the size of the pig crops, on hog-breeding intentions, and on hog slaughter; as well as reports on the number of cattle and sheep on feed, moving into feed lots, and going to slaughter.

Several statistical relationships between livestock numbers, feed supplies, and prices on the one hand, and the subsequent output of meat on the other, have been developed. These cannot be described here, but by combining current economic intelligence with the results of those relationships, the estimating committee is able to arrive at reasonably accurate projections of the prospective supply situation.

After the supply estimates have been completed, we take the second step, termed a distribution forecast. This involves a determination of the extent to which the total supply will be distributed among carry-over stocks, military requirements, foreign shipments, and domestic consumption. As about 95 percent of the total meat supply of the United States is usually provided from current production, and approximately the same percentage disappears for domestic consumption, it is obvious that the estimate of consumption for any one year depends mainly upon the accuracy of the production forecast.

The Price Forecast

Our third step—the price forecast—consists in relating the forecast of meat consumption to the forecast of disposable income that has been provided in the over-all demand analysis. Here again we make use of several statistical relationships which cannot be described in this paper. But it may be noted that we have had some success during the postwar period with what may be described as a price-structure approach, as contrasted with the multiple correlation of time series. This involves a separate estimate for each item in the price structure, starting with the retail price of meat and ending with the prices received by farmers for meat animals.

Our estimates of prices for pork and hogs in 1950 may be used as an example. We start with the disposable income estimate of 185 billion dollars which has been provided by the general demand analysis and with a forecasted pork consumption of 75 pounds per person derived from the supply and distribution analysis.

The next step, a crucial one, is an estimate of the percentage of income spent for pork. This averaged 2.3 percent in 1935-39 and appears to have been about the same in 1949. Applying this to the estimate of income for 1950, we find that the per capita retail value of pork consumption in that year will be about 28 dollars and the average retail price of pork about 40.5 cents a pound. This would mean an average price of about 36.5 cents a pound for pork and lard combined.

From analyses of costs and margins, we expect the charge for marketings to be about

14.5 cents a pound, leaving about 22 cents as the farm value of the retail price of pork and lard to which was added an allowance of one-third of a cent to cover byproducts. Thus, we arrive at an estimate of 22.3 cents a pound as the gross farm value equivalent of a pound of pork and lard at retail.

Using equations which indicate that 1.41 pounds of live hogs are required for 1 pound of pork and lard at retail, we move to an equivalent farm price for hogs of about \$16 per 100 pounds.³ Naturally we do not publish this figure as a precise forecast, but we may say that we expect the price of hogs to be down by something more than 10 percent from 1949; or if this seems too exact, we may say that we expect prices to decline "moderately."

This is as far as this article will go on the subject of individual commodity forecasts, except to note that, although the price forecasts are not developed by any uniform method, we do construct uniform supply and distribution tables, applicable to the year ahead, for each major food commodity. This process provides a forecast of the consumption of individual foods, from which we proceed to a forecast of the over-all level of food consumption, as indicated by a price-weighted index number of per capita food consumption at the retail level.

Evaluation of Forecasts

So much for the description of our general procedure. In conclusion brief comments are offered (1) on our results, and (2) on some of the more general problems involved in economic forecasting.

Results summarized in table 2 compare actual year-to-year changes of certain economic indicators during 1947-51 with changes which were forecasted by the methods described above. It should be noted that we do not reproduce these estimates in our published outlook statements, as they imply a greater exactness than we can hope to attain. For 1948, as an example, we were doubtful about the changes in farm prices and incomes indicated by the model and we confined ourselves to the generalizations that prices received by farmers would remain close

³ The average price of hogs after seasonal adjustment in the first half of 1950, before the outbreak of the Korean conflict, averaged \$16.92.

to current levels and that net income might not be quite so high as in 1947. But as estimates contained in the projection models do influence the general characteristics of our forecasts, they may properly be examined in comparison with the actual events.

Several things about the estimates contained in our models stand out fairly clearly:

The forecasts in terms of "real" elements, such as employment and industrial production, are generally closer to the actual outcome than those of prices and money incomes.

We seriously misjudged the economic climate with respect to inflation during 1947. Prices rose much higher than we anticipated and the inflation continued in 1948, whereas we had thought that it might abate before the end of 1947. The most damaging error affecting our forecasts of agricultural prices and income during 1947 was an underestimate of the liquidation of foreign gold and dollar reserves which greatly increased foreign imports of our farm commodities, particularly food grains, due, in part, to anticipations of United States aid.

A fairly good appraisal was made of prospects in 1948 and it appears that we did rather well in 1949.

The 1950 appraisal was, of course, upset by the situation in Korea. But up to the time of the outbreak of hostilities the behavior of the economy was reasonably in line with our forecast, as shown by a comparison with the major economic indicators during the first half of 1950. The 1951 forecast again appears to have been a fairly good appraisal of subsequent events.

On the whole, our forecasts of changes in agricultural prices and incomes appear to be subject to a relatively larger margin of error than those which measure changes in the economy generally. This is partly due to the fact that the latter are relatively larger aggregates, within which there is some tendency for errors in component items to offset each other. More important, however, is the fact that agricultural prices and incomes are subject to short-run instabilities which we are not fully able to anticipate. This was particularly true in 1951, which was characterized by very sharp movements in prices received by farmers together with some very atypical movements in monthly marketings, particularly of livestock.

TABLE 2.—Comparison of forecasted and actual changes in selected economic relations¹

Item	Percentage change 1947 from 1946		Percentage change 1948 from 1947		Percentage change 1949 from 1948		Percentage change 1950 from 1949 ²		Percentage change 1951 from 1950	
	Indicated in forecast	Actual	Indicated in forecast	Actual	Indicated in forecast	Actual	Indicated in forecast	Actual	Indicated in forecast	Actual
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Total employment.....	0	+2	0	+2	+1	1	1	0	5	5
Industrial production.....	+8	+10	1	+3	1	8	2	+7	+15	+10
Disposable income.....	+6	+9	0	+11	0	1	3	+6	+11	+9
Wholesale prices.....	+7	+26	+1	+9	4	6	6	1	+11	+12
Retail prices:										
Total.....	+6	+14	+1	+8	0	1	3	1	+6	+8
Food.....	+5	+21	+2	+8	2	4	6	2	+8	+11
Nonfood.....	+8	+9	+1	+7	2	1	3	1	+5	+6
Cash receipts from farm marketings.....	6	+20	7	+2	3	7	11	4	+12 to +16	+14
Realized net income of farm operators.....	-12	+22	-17	+6	8	14	16	-17	+19 to +23	+18
Prices received by farmers.....	4	+19	1	+3	4	13	6	3	+11	+18

¹ Forecasted changes are those made at time of Outlook Conference.

² First half of 1950 from calendar 1949. In order to avoid the effect of the Korean outbreak, the full year of 1950 was not used.

It is not possible here to make a full evaluation of our results which would necessarily have to be lengthy and detailed. For recent years, the Bureau is carrying on a continuing record and analysis of the results of the forecasts both for general indicators and for individual commodities.

Concluding Observations

It is perhaps appropriate to conclude with some general comments on several rather persistent issues in the forecasting field.⁴ Economic forecasting is still exceedingly unsatisfactory, and some economists regard it as a vice from which the virtuous should resolutely abstain. But so long as individuals, commercial enterprises, and governments must make decisions on the basis of judgment as to the course of economic events in the future, economic forecasts must necessarily be made and acted upon.

As Arthur F. Burns of the National Bureau of Economic Research has said: "Prediction is inseparable from life. All human activity—whether within or outside the economic sphere—inevitably reflects forecasts of the future, mingled with current pressures and past commitments. The choice before man is not whether to engage in forecasting or to abstain from it, but whether to base expectations on 'hunches' or on lessons carefully distilled from experience."⁵ This is not to say that all economists must become professional forecasters, but the demand will call forth some supply, and a considerable number of economists and statisticians will continue to concentrate on the forecasting problem, either with the aim of developing more scientific methods or in the formulation of economic forecasts and appraisals for current use.

⁴ A large literature on the forecasting problem has arisen during the postwar period. See particularly Michael Sapir, "Review of Economic Forecasts for the Transition Period" and comments by Lawrence Klein, Morris A. Copeland, and Rufus S. Tucker in National Bureau of Econ. Research, Inc., *STUDIES IN INCOME AND WEALTH*, 11:273-367. New York, 1949. Sapir's article contains references to several of the more important papers, and together with the discussions, touches on most of the basic issues involved.

⁵ BURNS, ARTHUR F., *STEPPING STONES TOWARDS THE FUTURE*. Twenty-Seventh Annual Report of the National Bureau of Economic Research. New York, 1947.

An issue that puts in a fairly regular appearance is whether forecasting is a science or an art. More specifically, the issue centers around the relative merits of what may be described as objective statistical forecasts versus what have been termed judgmental forecasts. In theory, there is hardly any argument. If a statistical system existed that would yield highly accurate predictions by the process of introducing past observations into that system, it would be foolish to waste one's judgmental resources on the forecasting problems. Unfortunately, no fully satisfactory system of this type has yet been constructed and, in fact, a very considerable element of judgment is involved in even the most sophisticated statistical approaches.

Regardless of the method or combination of methods employed, any responsible forecaster recognizes that his predictions or appraisals are subject to error, and this raises the question as to how a forecast should be presented. Any attempt to give a complete answer to this question would lead into a whole new set of topics, including the usefulness of stating forecasts as ranges, the extent to which probability statements with respect to forecasts are valid,

what to do when the range is so wide that the values toward either end amount to essentially different forecasts, and so on. All that will be said at this point is that there appears to be no reason why any forecaster must confine himself to any specified method of presentation.

In our opinion, the only essential requirement is that one's forecasts be presented in such a way that the user is not misled as to their inherent accuracy. This involves some differentiation between those parts of the forecast for which substantial support can be adduced and those which are evaluated on more tenuous grounds. Whatever one may think about the forecast of demand and prices made by the Bureau of Agricultural Economics it seems fair to say that we have consistently tried to avoid leaving any false impressions as to the accuracy of our outlook statements. If anything, we hedge too much rather than too little.

Although we shall probably continue to prepare outlook reports relating to the demand for farm products, it should be emphasized that we are by no means completely satisfied with our present procedures. We hope that current research in the field of economic prediction will shortly provide us with a better set of tools.

Adjustment for Non-Response Bias in a Rural Mailed Survey

By A. L. Finkner

Reasonable reliability of the mailed inquiry has been attained by Agricultural Estimates and other agencies whose restricted budgets require them to rely largely on this method of collecting data for their surveys. Reliability is achieved mainly by building up historical series of mail-survey results plotted against more accurate data obtained later. But as there are no historical series for some surveys that are desired, different techniques must be used to increase their accuracy. This paper is confined to the statistical analysis of one source of bias in estimates—the bias of non-response—in a survey conducted by the North Carolina Field Office of Agricultural Estimates. It is possible in some instances, according to the author, to estimate totals of agricultural items reliably by using information from successive waves of mailed inquiries. He is convinced from the accumulated evidence that a general law governing reliability is operating but that further research is needed to learn its precise character.

AMONG the possible sources of biases in estimates resulting from the use of mailed questionnaires three important ones are: (1) Bias of a selective list, (2) bias of interpretation, and (3) bias of non-response. Bias of a selective list arises from failure to use a probability sample in selecting the original mailing list. Bias of interpretation is the difference that may result from asking questions by mail and asking in personal interviews. This bias has not been investigated extensively as it involves putting questions to the same individuals, both in writing and orally. This source of bias may be serious, especially in the case of difficult questionnaires.

Ways of Treating Non-Response Bias

In the present report results and remarks are confined to the third source of bias—the bias of non-response. It is widely known that the characteristics of the respondent population may differ from those of the non-respondent population. Research workers have proposed four main ways of treating non-response bias: (1) use check data for the purpose of establishing historical series; (2) use control data for purposes of stratification, and regression estimation or both; (3) mail successive waves of questionnaires, which is the technique known by some as sampling in depth; and (4) make personal enumeration of a subsample of persons who refuse to respond by mail. Of these, only (4) will guarantee unbiased estimates, although good results

are obtained from the other methods. In this investigation, we are concerned with a comparison of results obtained from (2) and (3).

In October and November 1948, mailed inquiries were sent to all farmers in three North Carolina counties, Caswell, Edgecombe, and Macon.¹ A farmer was defined as a rural-tract owner listed by the 1947 North Carolina Farm Census. The list was originally taken from the tax-scroll books of these counties. As the North Carolina Farm Census is reported on the basis of tracts, all tracts under one name in one township were combined and only one schedule was mailed to cover the operations on such combined tracts. A second request was sent to those farmers who failed to respond to the initial inquiry, and a third went to those who did not respond to either. The number and percentage responding by request in each of the three counties are summarized in table 1. The patterns of response in the three counties were similar to those in previous mailed surveys in North Carolina. In each county, the second request brought in a larger response than either the first or the third request.

Expansions of the data into county estimates were made by different methods and are designated in this report as the regression method (using control data) and the extrapolation

¹ The mailings were made by the North Carolina field office of Agricultural Estimates under the supervision of Frank Parker and R. P. Handy.

TABLE 1.—Number and percentage of farm owners responding to three successive waves of a mailed inquiry in Caswell, Edgecombe, and Macon Counties.

Request	Caswell		Edgecombe		Macon	
	No.	Percent	No.	Percent	No.	Percent
1	360	18.3	239	13.3	497	18.5
2	494	25.0	400	22.3	789	29.3
3	302	15.3	232	13.0	344	12.8
N.R. ¹	817	41.4	922	51.4	1,060	39.4
Total	1,973	100.0	1,793	100.0	2,690	100.0

¹ Non-respondents—those who failed to reply to any of the three mailed inquiries.

method (using successive waves). The regression approach was suggested by Hendricks (2) in which the regression coefficient b is computed by a simple method of averages rather than by least squares. To utilize this method, the sampling units are separated into approximately equal groups on the basis of size with respect to y , the item being estimated. For each sampling unit, there must be available the value of an auxiliary variable x . Further, population values for x must be known. Averages are then computed for x and y for each group. The estimate of b then becomes

$$b = \frac{\bar{y}_e - \bar{y}_s}{\bar{x}_e - \bar{x}_s} \cdot 2$$

The e subscript refers to the group of large sampling units and the s to the group of small units. The estimate of a , the y intercept, is given as

$$a = \bar{y}_e - b\bar{x}_e = \bar{y}_s - b\bar{x}_s$$

The estimate of the population mean for a given item is then

$$\bar{y} = a + b\mu_x$$

and the estimate of the population (county) total is

$t = N(\bar{y})$ where
 μ_x is the known county mean for the auxiliary variable, and
 N is the total number of farms in the given county.

As data were available by sample farm for all items in 1947 and 1948, this regression approach

² Bartlett (1) has shown that this procedure in estimating b has an efficiency equal to or greater than $\frac{3}{4}$. The efficiency can be increased equal to or greater than $\frac{8}{9}$ by dividing the sampling units in the sample into three groups (approximately equal in number) on the basis of size with respect to the item being estimated. The averages of the first and third groups determine the slope of the line which is to be run through the mean coordinates of the three groups combined to obtain the y intercept.

is applicable here. A complete Farm Census³ was taken so that 1947 population values were known for each of the three counties. The measure of the item taken in 1947 was used as the x variable and the measure of the same item in 1948 was taken as the y value. In this analysis, the data from all three requests were combined. The county estimates based on the regression method are given in tables 3, 4, and 5.

In an estimation of county totals, using the information from successive waves of requests, an attempt was made to utilize the "resistance" method described by Hendricks (3, 4). In brief, Hendricks' method is based on two assumptions:

(1) That those responding in each successive wave do so under more pressure; that is, they have progressively more resistance to releasing their information to a surveying agency. The logs of these resistances are assumed to be normally distributed, which allows the mean resistance to be estimated from the median response.

(2) That some definite basic relationship exists between the average resistances within each wave and the item means for each wave. On the basis of this relation, the population mean can be estimated from the mean resistance. This relationship was assumed to be quadratic in (3) and cubic in (4).

The resistance method was developed empirically using data from two previous mail surveys in North Carolina. Each of the surveys was concerned with only one item, fruit trees in one, and milk cows in the other. The proposed method

³ Although a complete enumeration was undertaken in each of the three counties in 1947, there was a small percentage of non-response. The figures adopted officially for the 1947 Farm Census were adjusted for this non-response and the adjusted figures were accepted in this analysis as being the population values.

worked well in both surveys. In the county surveys under investigation here, the assumptions do not hold. When the log of the resistance is plotted against the normal deviate corresponding to the cumulative percentage of response, there is considerable deviation from a straight line, indicating that the assumption of normality does not fit well in these circumstances. Similarly, neither a quadratic formula of the Gregory-Newton type (3) nor a cubic formula (4) seems to explain the relation between the item means of successive waves and the resistances.

One possible explanation for the discrepancy in our case is that resistance is a complex function of all items and length of schedule, whereas in the case Hendricks investigated resistance was coupled almost exclusively to the size of the operation of one particular item. This hypothesis is under study at the Research Office of the

TABLE 2.—Cumulative totals of farmers responding in Caswell County and the cultivated land held by those responding.

Request	Respondents		Cultivated Land	
	No.	Log of No.	Acres	Log of Acres
1-----	360	2.556	10,935	4.039
2-----	854	2.931	25,649	4.409
3-----	1,156	3.063	34,861	4.542
County-----	1,973	3.295	(59,293)	(4.773)

Bureau of Agricultural Economics at the Institute of Statistics in Raleigh, North Carolina.

Some of the earlier exploratory work on successive waves indicated that a straight-line relationship often existed between the log of the cumulative number responding, and the log of the cumulative total for a given item. For example, in Caswell County, the pertinent data for

TABLE 3.—Comparison of acreage of various agricultural item totals in Caswell County as estimated by different procedures.

Item	Unit	1948 regression estimate	1948 extrapolation estimate	1947 ¹ N. C. Farm Census	1945 U. S. Census	1950 U. S. Census
Farms-----	No.	1,973	1,973	1,973	2,689	3,051
All people living on farms-----	No.	15,513	16,218	15,597	12,428	(²)
All land in farms-----	Acres	267,653	268,540	259,776	218,239	244,036
Cultivated land-----	Acres	58,140	59,293	58,046	50,330	51,088
Idle land-----	Acres	29,089	29,174	29,722	20,989 ³	29,251 ³
Pasture land-----	Acres	17,729	19,907	13,492	17,697 ⁴	21,202 ⁴
Corn for all purposes-----	Acres	19,870	20,417	18,852	18,274	17,600
Tobacco-----	Acres	11,691	12,106	14,349	11,462	12,122
Soybeans, grown alone for all purposes-----	Acres	743	679	372	18	151
Wheat-----	Acres	5,065	5,470	6,200	5,811	5,726
Oats-----	Acres	2,311	2,618	636	902 ⁵	1,579 ⁵
Small-grain hay-----	Acres	3,591	3,622	1,641	131	912
Lespedeza for hay-----	Acres	12,903	13,428	8,735	10,622	11,156
All other hay-----	Acres	2,632	2,831	1,287	(²)	(²)
Potatoes-----	Acres	857	838	393	433	152
Sweetpotatoes-----	Acres	761	759	377	426	152
Fertilizer used-----	Tons	11,488	11,534	10,941	(²)	(²)
Milk cows and heifers 2 years old and over-----	No.	4,844	5,035	3,949	4,089	3,889 ⁶

¹ Adjusted to 100 percent completeness.

² No comparable data available.

³ Includes crop failure.

⁴ Cropland used only for pasture plus "other" pasture. (Does not include woodland pastured.)

⁵ Oats threshed or combined plus oats cut for feeding unthreshed.

⁶ Cows including heifers that have calved.

TABLE 4.—Comparison of acreage of various agricultural item totals in Edgecombe County as estimated by different procedures.

Item	Unit	1948 regression estimate	1948 extrapolation estimate	1947 ¹ N. C. Farm Census	1945 U. S. Census	1950 U. S. Census
Farms	No.	1,793	1,793	1,793	3,615	3,976
All people living on farms	No.	23,211	18,837	20,390	18,217	(²)
All land in farms	Acres	295,495	234,420	289,026	261,226	274,363
Cultivated land	Acres	130,097	103,510	128,387	116,563	120,485
Idle land	Acres	8,413	7,294	8,133	7,228 ³	9,553 ⁴
Pasture land	Acres	9,357	8,590	7,163	7,080 ⁴	11,845 ⁴
Corn for all purposes	Acres	43,098	36,307	40,192	39,125	44,840
Cotton	Acres	20,282	15,276	17,662	18,104	22,748
Tobacco	Acres	14,792	12,883	18,990	16,729	15,264
Peanuts, grown alone for all purposes	Acres	28,864	20,749	26,519	25,342	21,258
Soybeans, grown alone for all purposes	Acres	10,779	8,375	9,999	6,629	9,357
Wheat	Acres	1,021	565	830	1,679	574
Oats	Acres	3,031	2,748	1,644	3,702 ⁵	2,621 ⁵
Small-grain hay	Acres	1,981	1,652	1,795	48	1,942
Lespedeza for hay	Acres	2,622	2,250	2,068	1,631	1,861
All other hay	Acres	1,094	1,052	786	(²)	(²)
Potatoes	Acres	873	679	645	622	210
Sweetpotatoes	Acres	838	697	717	675	383
Fertilizer used	Tons	26,925	20,606	25,195	(²)	(²)
Milk cows and heifers 2 years old and over	No.	2,088	2,818	1,826	3,241	3,666 ⁶

¹ Adjusted to 100 percent completeness.

² No comparable data available.

³ Includes crop failure.

⁴ Cropland used only for pasture plus "other" pasture. (Does not include woodland pastured.)

⁵ Oats threshed or combined plus oats cut for feeding unthreshed.

⁶ Cows including heifers that have calved.

establishing this relation for the item, cultivated land, is given in table 2.

When the log of the acres of cultivated land, y , is plotted against the log of the number responding, x , a straight line results. By extrapolation, the acres of cultivated land for Caswell County can be estimated. That is, the value of y (4.773) corresponding to an x value of 3.295 is determined from the straight-line relationship and the anti log of 4.773 is 59,293, the estimate of cultivated acres in Caswell County.⁴ These extrapolation estimates are given, along

⁴ If all three points fell on a straight line the line was merely extended to obtain the estimate. If there were any perceptible departures from linearity, a least-squares estimate was computed.

with the regression estimates in tables 3, 4, and 5. Also shown for purposes of comparison are figures for the adjusted 1947 North Carolina Farm Census, the 1945 United States Census, and preliminary 1950 United States Census figures that are available. As sampling errors cannot be computed for either of these estimates, their accuracy must be judged by a comparison with other information—not too satisfactory a procedure. Check data are available on certain items, such as tobacco acreage. The study might have been materially improved by interviewing a subsample of the non-respondents so that unbiased estimates with calculable sampling errors could have been obtained.

With the possible exception of acres of all land in farms, which should be fairly stable from year to year, both types of estimates in Caswell County appear to be reasonable. Although the two estimates exceed the United States Census figures considerably, it should be kept in mind in making the comparisons that the same definitions may not operate in the United States and the North Carolina Farm Censuses. The estimates exceed the 1947 farm census figure by approximately 3.0-3.5 percent. The two estimates of tobacco acreage are close to the actual Production and Marketing Administration measured acreage in Caswell County in 1948. Considering a 15-percent cut in acreage from 1947 to 1948, they also agree closely with the 1947 North Carolina Farm Census figure.

The two estimates themselves are consistent; the extrapolation estimate exceeds the regres-

sion estimate slightly in 14 items, and is less in three.

About the same conclusions can be drawn from the estimates for Macon County. Here the only bad estimate appears to be the extrapolation estimate of acres of total land in farms. Again, this discrepancy may arise from differences in definition. The tax-scroll books list all rural tracts; many of these in the mountains are entirely wooded and ordinarily would not be classified as farms. But the owners may have replied to the inquiry and listed the acres of land owned as land in farms even though no farming was done. The over-estimate would not be reflected in other items, as zero would be recorded for them on the schedule. In Macon County, the regression estimate was larger than the extrapolation estimate in 11 items, and less in 5. Differences were slight, with the exception of all land in farms.

TABLE 5.—Comparison of acreage of various agricultural item totals in Macon County as estimated by different procedures.

Item	Unit	1948 regression estimate	1948 extrapolation estimate	1947 ¹ N. C. Farm Census	1945 U. S. Census	1950 U. S. Census
Farms	No.	2,690	2,690	2,690	2,350	2,276
All people living on farms.....	No.	10,656	10,691	10,316	10,360	(²)
All land in farms	Acres	138,124	151,010	138,031	136,238	131,712
Cultivated land.....	Acres	22,172	22,131	23,000	21,624	17,986
Idle land.....	Acres	7,816	7,431	9,823	6,447 ³	6,983 ³
Pasture land	Acres	23,389	23,174	27,263	25,841 ⁴	24,547 ⁴
Corn for all purposes.....	Acres	10,530				
Soybeans, grown alone for all purposes.....	Acres	627	10,544	9,086	11,437	8,721
Wheat	Acres	316	564	855	392	331
Oats	Acres	838	781	149	436	197
Small-grain hay	Acres	1,523	1,340	149	905 ⁵	209 ⁵
Lespedeza for hay	Acres	1,523	1,340	1,369	327	1,050
Lespedeza for hay	Acres	2,359	2,238	1,479	1,153	938
All other hay.....	Acres	3,685	4,457	3,031	(²)	(²)
Potatoes	Acres	972	933	937	862	510
Sweetpotatoes	Acres	322	324	84	220	38
Fertilizer used	Tons	3,476	3,404	2,768	(²)	(²)
Milk cows and heifers 2 years old and over.....	No.	4,228	4,217	3,458	4,469	3,877 ⁶

¹ Adjusted to 100 percent completeness.

² No comparable data available.

³ Includes crop failure.

⁴ Cropland used only for pasture plus "other" pasture. (Does not include woodland pastured.)

⁵ Oats threshed or combined plus oats cut for feeding unthreshed.

⁶ Cows including heifers that have calved.

Results in Edgecombe County gave an entirely different picture. For most items, the discrepancy between the extrapolation estimates and the regression estimates was considerable. Except in the case of milk cows, the regression estimate was greater than the extrapolation estimate. In general, the regression estimates appear to be a little too high and the extrapolation estimates much too low.

Discrepancies in Edgecombe County Estimates Noted

The logs of the cumulative number responding by request were again plotted against the logs of the cumulative total for the item, by request. A straight line was then drawn to connect the first and third points. The items were classified into three groups on the basis of the relationship between the middle point and the line drawn between the first and third points. Group 1 consists of two items, idle land and milk cows, whose middle point was noticeably above the line; group 2 included two items, "all other hay" and sweetpotatoes, whose middle points fell on the line; and group 3 contained the remaining 15 items whose middle points were considerably below the line. A least-squares regression estimate was used to obtain the best fitting straight line through the three points for those items falling in groups 1 and 3. Estimates based on these lines are the extrapolation estimates given in table 4.

The estimates of the group-3 items might be slightly improved by using the straight line between the two end points instead of the least-squares line for extrapolation. Similarly, the estimate of milk cows in group 1 would be improved slightly, but the group 2 items would not be affected. The estimate of idle land in group 1 would become poorer as it is already under-estimated. A curve drawn through the three points and extended to the population number of farms resulted in over-compensation for

groups 1 and 3, with group 2 again not affected. In other words, a curvilinear adjustment now resulted in an over-estimate of all group-3 items and under-estimate of group-1 items.

Several possible causes for the discrepancies may be assigned. For one, the mean for the second-response group was, in most instances, lower than the means for the other two request groups. This was true, with the exception of idle land and milk cows. Although milk cows were over-estimated, idle land was under-estimated. Hence it appears that one or more other factors also operated. Their exact nature is not easily discernible, but these factors may be tied up with the response rate.

Conclusions

In conclusion, these data furnish additional evidence that information from successive waves of requests can be used in some instances to estimate totals of agricultural items with reliability. It is also clear that no general relationship yet established will always hold. If control data, such as previous information on the same item for the same sampling units, are available, a regression approach as described herein will provide satisfactory estimates. Evidence continues to indicate that a general law operates, but further research is needed to ascertain its exact character.

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Distribution of the Food Supply of the United States

By Marguerite C. Burk

The production and distribution of food is perhaps the most important single vertical segment of our national economy. More than one-fourth of our personal disposable income goes for food. On the other side of the picture, our farmers receive more than two-thirds of their income from sales of food commodities and perhaps a third of all retail trade is accounted for by sales of food. Substantial proportions of other types of economic activity, such as manufacturing and transportation, are concerned with food. In order to gain insight into the future prospects for the demand for food produced by our farms, processed by our factories, and distributed by our marketing system, we need an over-all perspective of the pattern of food marketing or utilization in recent years. This article, prepared under the Agricultural Marketing Act of 1946 (RMA, Title II), is based on a study undertaken to provide such an over-all picture by drawing on all available data.

WE BEGIN OUR STUDY of the distribution of the food supply of the United States with a brief survey of data that are currently available on over-all food distribution. For several years the *National Food Situation* of the Bureau of Agricultural Economics has carried in table 2 the percentages of each year's total food utilization going to the armed forces, into export, into or out of stocks, and to our civilians.¹ For example, 97 percent of the food supply of the United States disappeared into civilian distribution channels in 1939, and 91 percent in 1948. These estimates are derived from the disappearance data for major foods.

But through what channels does the food supply move to civilians, and what changes, if any, have taken place in recent years? Relatively few quantitative data that bear on distribution to the final consumers are available, but it is possible to derive some approximations of the relative importance of the several channels of distribution from value or sales data.

Two principal sets of such data are published by the Department of Commerce. One set consists of the data on food expenditures, including alcoholic beverages, which are compiled by the Office of Business Economics as part of the process of estimating national income. These data include food and beverages purchased for off-premise consumption (valued at retail prices), purchased meals and beverages (in-

cluding service, valued at prices paid in the eating places), food furnished to commercial and Government employees including the military (valued at approximately wholesale prices), and food consumed on farms where grown (valued at farm prices, the BAE series). For current years, most of the estimates are based on extrapolations from the 1939 base period.² Although the Department of Commerce estimates the alcoholic beverage component of food and alcoholic beverage expenditures in the aggregate, it does not estimate beverage expenditures for each category just indicated.

The other data are from the Census of Business. They include information on food and beverage sales of many types of retail stores and sales of meals and of beverages by the several kinds of public eating places, as well as sales of food at other levels of distribution.

Channels of Food Distribution

In order to account for all significant flows of food supplies to domestic civilian consumers, we must combine information available in both sets described above and make some approximations for minor segments. The following list of consumers' sources of food supplies was drawn up as a guide.

- A. Purchases of food commodities for off-premise consumption from
 - (1) Retail stores of many types

¹ For methodology, see pp. 2-10 of CONSUMPTION OF FOOD IN THE UNITED STATES, 1909-48, U. S. Dept. Agr. Misc. Pub. 691. August 1949.

² Ibid. pp. 96-98 and the National Income Supplement to the Survey of Current Business, July 1951.

- (2) Service establishments
 - (3) Commissaries
 - (4) Wholesalers
 - (5) Manufacturers
 - (6) Hucksters
 - (7) Farmers
- B. Purchases of prepared meals and snacks in
- (1) Public eating places—street restaurants, hotels, drinking places, stores, dining and buffet cars, amusement places.
 - (2) Private eating places—sales of meals by institutions, clubs, industrial lunch-rooms, schools, school fraternities, and boarding houses.
 - (3) Meals supplied to patients or patrons of hospitals, camps, and similar establishments.
 - (4) Meals supplied to patrons with air and water transportation services.
- C. Meals and snacks furnished for consumption on premises, not sold,
- (1) Furnished employees in public and private eating places, institutions, commercial establishments.
 - (2) Withdrawn by proprietors for own use.
- D. Food consumed on farms where produced.

All available census data on sales of food, meals, and beverages separately were used. A small allowance was made for under-reporting to take account of such factors as business turn-over, poor records, and persistent failure to report. Census reports do not supply information on food sales to consumers by service establishments, commissaries, hucksters, and farmers; sales of meals by dining and buffet cars, amusement places, private eating places; on food furnished but not sold; or on food consumed on farms where produced. Estimates for some of these categories were taken from food expenditure data of the Department of Commerce and adjusted to exclude alcoholic beverages; but rough approximations had to be developed for others, such as boarding-house meals and direct sales by hucksters and farmers. Fortunately, they account for only a small

³ The estimates of food sold for off-premise consumption in 1939 and 1948 are derived from data from the Census of Business, Retail Trade, with adjustment for store turn-over (made upon the advice of specialists of the Bureau of the Census). They are lower than the estimates of personal consumption expenditures for food purchased for off-premise consumption in those years, published by the Office of Business Economics, United States Department of Commerce. The food estimates of the latter are developed by the commodity-flow method as explained in the National Income Supplement to the

part of the total flow of food. The data for 1939 and 1948, given in table 1, are in terms of value at various levels of distribution.³

Because of the variation in extent of services supplied with the food, the relative importance of a particular channel of food distribution in the whole flow, as well as year-to-year changes, cannot be measured directly by these value data. Accordingly we must convert them to a common basis. As sales of food by retail stores represent the largest proportion of the total distribution, value of food sold and furnished through other categories was converted to an equivalent value basis, also given in table 1. On the basis of data assembled in a recent study,⁴ the costs of food in eating places were judged to be 50 percent of their sales of meals and related items in 1948, and 47 percent in 1939.⁵ Eating places apparently pay slightly more than wholesale prices, therefore, a 5-percent differential was assumed. Such information as is available indicates that wholesale prices might average 80 percent of retail food prices when all types of retail stores selling food are considered. Adding 5 percent to the 80 percent, the ratio of eating-place food costs to retail sales value was estimated to be 84 percent, equivalent to a mark-up of 19 percent. Therefore, the equivalent retail sales value of food sold by eating places in 1948 equals 50 percent of the sales value of meals plus a 19-percent mark-up. A slightly higher mark-up was used for 1939, that is, 20 percent of meals and fountain items sold.

Survey of Current Business, 1951. The Office of Business Economics expects to revise its currently published estimate for 1948 on the basis of the 1947 Census of Manufactures, 1948 Census of Business, and nonmanufactured food data from the Department of Agriculture. Preliminary results to date indicate a downward revision, which accounts for perhaps no more than one-fourth of the present difference between the two sets of off-premise food estimates for 1948. No satisfactory method of reconciling the remaining difference for 1948 (or 1939) has thus far been developed.

⁴ SARTORIUS, LESTER C., and BURK, MARGUERITE C. EATING PLACES AS MARKETERS OF FOOD PRODUCTS. U. S. Dept. Agr. Marketing Research Rept. 3, 118 pp. 1952. (In press.)

⁵ NATIONAL RESTAURANT ASSOCIATION — REPORT ON NATION-WIDE SURVEY OF RESTAURANT OPERATING DATA FOR 1940. Chicago, 1941.

TABLE 1.—Market value and estimated retail value of civilian food, by channel of distribution, United States, 1939 and 1948¹

Channel of distribution	1939				1948			
	Market value		Estimated retail value		Market value		Estimated retail value	
	Food sold or supplied	Food sold, supplied and furnished	Value	Percentage of total	Food sold or supplied	Food sold, supplied and furnished	Value	Percentage of total
	<i>Billion dollars</i>	<i>Billion dollars</i>	<i>Billion dollars</i>	<i>Percent</i>	<i>Billion dollars</i>	<i>Billion dollars</i>	<i>Billion dollars</i>	<i>Percent</i>
On-premise consumption								
Public eating places								
Meals and fountain items sold	2.7	2.7	² 1.5	8.4	8.1	8.1	³ 4.8	9.8
Food furnished civilian employees and withdrawn by proprietors		.3	.4	2.2		.5	.7	1.4
Total public eating places	2.7	3.0	1.9	10.6	8.1	8.6	5.5	11.2
Private eating places								
Meals sold by clubs, institutions, schools	.2	.2			.8	.8	.5	1.1
Food furnished employees by clubs, institutions, schools		(⁴)	.2	1.1		.2	.3	.6
Meals sold by boarding houses	.3	.3	.2	1.1	.6	.6	.4	.8
Total private eating places	.5	.5	.4	2.2	1.4	1.6	1.2	2.5
Institutions and transportation agencies								
Meals supplied to civilian patients or patrons	.2	.2			1.0	1.0		
Food furnished civilian employees		.1	.2	1.1		.3	1.1	2.2
Total institutions and transportation agencies	.2	.3	.2	1.1	1.0	1.3	1.1	2.2
Total on-premise consumption	3.4	3.8	2.5	13.9	10.5	11.5	7.8	15.9
Off-premise consumption—sales								
By retail stores	10.7	10.7	10.7	59.5	32.0	32.0	32.0	65.3
By commissaries, service trades, other establishments n.e.c.	.2	.2	.2	1.1	.8	.8	.8	1.6
Directly to consumers by farmers, hucksters, manufacturers, wholesalers	1.2	1.2	2.0	11.1	2.3	2.3	4.0	8.2
Gross sales	12.1	12.1	12.9	71.7	35.1	35.1	36.8	75.1
Less retailers' sales to eating places ⁵	.3	.3	.3	1.7	.9	.9	1.0	2.0
Net sales to consumers	11.8	11.8	12.6	70.0	34.2	34.2	35.8	73.1
Food consumed on farms where produced		1.1	⁶ 2.9	16.1		2.8	⁶ 5.4	11.0
Total	15.2	16.7	18.0	100.0	44.7	48.5	49.0	100.0

¹ See text for information on sources of data and methodology.

² Food cost estimated at 47 percent of sales based on National Restaurant Association survey; mark-ups of 20 percent used to retail.

³ Food cost estimated at 50 percent of sales; mark-up of 19 percent used for cost to retail sales value.

⁴ Included with public eating places. Probably less than \$100 million.

⁵ Rough approximations only.

⁶ Estimated farm values of farm food products sold in 1939 and 1948 were 38 and 52 percent of estimated retail value, respectively.

The farm value of direct sales of food by farmers to consumers and of food consumed on farms where produced was raised for each year

to the retail level, using the BAE estimate of the ratio of farm value of farm food products to retail value. As little or no information is

available on the levels of food costs and meal prices in private eating places and institutions, only rough approximations of equivalent retail values could be made. Because these channels of food distribution probably handle no more than 5 percent of the food supply, the possible error introduced by these rough approximations is minor.

Eating places, particularly the smaller ones, buy some of their food supplies from retail food stores. Such purchases had to be subtracted from sales of retail stores in order to avoid double counting. After consideration of the census data on the sales volume of small establishments and background information in the report of the study of eating places previously mentioned, the retail value of such sales was estimated at 1 billion dollars for 1948 and 0.3 billion dollars for 1939. These amounts were subtracted from the total of off-premise sales.

Retail Value of Food Consumed by Civilians

Summing the retail value equivalents of food moving to civilian consumers through all the channels of distribution, the aggregate of \$18 billion was obtained for 1939 and \$49 billion for 1948. These indicate an increase of 172 percent in the total retail value of all food moving into consumption in 1948 compared with 1939. Much of this increase resulted from higher food prices in 1948, so both aggregates were deflated by the Bureau of Labor Statistics retail food price index. An increase of 23 percent in "real value of food" remained. As a check, the change in the index of civilian food consumption per capita was multiplied by the increase in the civilian population from 1939 to 1948, yielding a 19-percent increase in total civilian consumption of food.

The difference between the two measures of the change in total food consumption in the United States from 1939 to 1948 may be accounted for by errors in calculations and approximations, by those shifts to higher priced or higher processed foods not measured by the consumption index, or by the effect on dollar sales of the rural-urban shift in population. The extent of such shifts from 1941 to 1949 was explored in another analysis;⁶ it might account for about \$10 to \$15 per capita increase in food

expenditures from 1939 to 1948, or a total of about \$2 billion. Subtracting \$2 billion from the \$49 billion aggregate, then adjusting for the increase in retail food prices, we obtain a 1948 retail value of food consumed, measured in 1939 dollars, which is 19 percent higher than that for 1939. The identity of the rates of change from 1939 to 1948 that was obtained from the two entirely different approaches, one based on food sales data derived, as described above, principally from the Census of Business, and the other on food-disappearance data,⁷ lends support to the calculations, although it may result to some extent from offsetting errors in estimation. It may be taken to indicate that the *change* in the aggregate retail value of food sold from 1939 to 1948 is approximately correct.

Moreover, the *levels* of the aggregate retail values for 1939 and 1948 derived from sales and other dollar volume data are remarkably well in line with the estimates of food expenditures derived from data on quantities of food disappearing into domestic distribution channels and retail food prices.⁸ When the extra costs of services received in public eating places are added to the aggregate retail value equivalents for 1939 and 1948, for purposes of comparison, and the new totals are divided by the civilian population for each year, we find the per capita values to be \$146 and \$358, respectively. The estimates of per capita food expenditures computed from the value aggregates of the civilian per capita food-consumption index and adjusted

⁶ BURK, MARGUERITE C. RECENT RELATIONSHIPS BETWEEN INCOME AND FOOD EXPENDITURES. *Agricultural Economics Research*, July 1951.

⁷ From the annual supply of each food in terms of physical quantity (production plus beginning stocks plus imports) are deducted feed and seed uses, industrial uses, exports and shipments, Government purchases, and ending stocks. The residual is considered to be civilian consumption and is divided by the population eating out of civilian supplies to derive the official estimates of per capita consumption of foods in the United States. These estimates are converted to approximate retail weights by means of factors which reflect the best available information on wastes and losses in the process of distribution from farms to retail stores. The sixty-odd individual foods are combined by means of average retail prices in 1935-39 into an index with changing quantities and fixed prices. For details see Misc. Pub. 691. op. cit.

⁸ Op. cit. p. 90.

for changes in retail prices of food are \$141 for 1939 and \$348 for 1948. Furthermore, as described in the previous study, this measure of food expenditures is slightly low because it does not include some expenditures for processing, and the estimate for 1948 is also a little low because it does not fully reflect increased expenditure resulting from the shift of the population from rural to urban areas.

Changes in Channels of Food Distribution, 1939 to 1948

Returning to consideration of the details on major channels of food distribution given in table 1, we note that about 73 percent of the food total in 1948 was sold to consumers for off-premise consumption, 16 percent was sold or furnished as meals and related items by public and private eating places, including about 2 percent which was supplied by institutions and transportation agencies, and 11 percent was consumed on farms where produced. For 1939 the comparable data are 70 percent of the United States civilian food supply sold for off-premise consumption, 14 percent sold or furnished as meals, and 16 percent consumed on farms where produced. Analysis of these data for 1939 and 1948 shows the effects of the shift of the population from rural to urban areas and some increase in "eating out" as incomes have risen and people's manner of living has gradually changed. Both of these factors raise food expenditures because more marketing services are bought, as does a hidden factor—the

increased processing of food away from home for off-premise consumption. As people move from farms to towns and cities, they spend more for food because ordinarily they no longer produce some of their own and because city food prices average higher than those of rural areas or small towns, owing to higher costs.⁹ Moreover, incomes of the former farm people are probably above those they made on farms, hence they can afford to spend more for food. But this shift does not necessarily increase the quantities of food consumed, as is likewise true of the increase in "eating out," unless the patterns of food consumption are really different. Accordingly, the total retail value equivalent of the food consumed also would not be affected except insofar as the quantities were changed as a consequence of higher incomes of consumers or different patterns of food consumption.

Unless consumer incomes rose concurrently, such changes in the channels of food distribution as those which occurred from 1939 to 1948 would have a depressing effect upon farm prices, because more of the food expenditures would go to pay for marketing services. But farm prices have not been depressed in the last decade. The substantial increase in real incomes has resulted in significant increases in farm prices for food commodities and in the quantities of food consumed per capita, as well as in greater demand for marketing services.

⁹ See p. 161 of the article by NATHAN KOFFSKY, FARM AND URBAN PURCHASING POWER in Volume XI of Studies on Income and Wealth.

Eating Places as Food Marketers — Methods, Problems and Areas for Further Research

By Lester C. Sartorius

Eating places market substantial quantities of food products and thus are important to food producers and distributors. They also constitute a unique marketing channel, because many services are sold along with food, thus increasing the costs of marketing. Moreover, quantities, types, and prices of food consumed in eating places are somewhat different from those prevailing in homes. Little if any previous research has been done on measuring the relative importance, costs, and other characteristics of eating places as distributors of food products. This article discusses the methods used and the problems encountered in a pilot study conducted in Minneapolis and Fairmont, Minn., and prepared under the Agricultural Marketing Act of 1946 (RMA, Title II); outlines the areas in which further research is needed; and suggests procedures for this research. Related problems for the United States as a whole are discussed in the article, "Distribution of Food Supply of the United States" by Marguerite C. Burk in this issue of Agricultural Economics Research. As the pilot study is based on a limited number of case studies and on estimated data, the findings are only tentative, or are indicative rather than conclusive. Detailed information as to objectives, methods, data, and limitations are contained in "Eating Places as Marketers of Food Products," U. S. Dept. Agr. Marketing Research Rept. 3. (In press.)

THIS PILOT STUDY, like many others, was immediately faced with the need for detailed statistical data on the industry. In the first phase of the study, therefore, data were developed for Minneapolis and Fairmont as to the number and sales of eating places by type of operation. As eating places vary widely in extent of service offered, in price, and in type of financial sponsorship, it was necessary to have data on the number and sales of eating places classified in these three respects.

All establishments that serve prepared meals and lunches were defined in the study as "eating places," and the following three main groups were set up to use as an approach to the problem of analyzing services, costs, and other aspects that were to be studied.

Street restaurants. Public commercial eating places whose primary business is serving cooked meals and lunches for profit, generally on the premises. These include table, counter, or combination service cafes, cafeterias, lunch counters, refreshment stands, canteens, and commercial in-plant feeding operations.

Auxiliary restaurants. Public commercial eating facilities combined with other business operations under a single roof, in which the serving of meals is not the primary business. These include hotel dining rooms, department and variety store restaurants,

drug store fountain luncheonettes, railroad dining cars, and club dining rooms open to the public.

Private eating facilities. Away-from-home eating operations that are not generally open to the public, but are set up to serve a particular group of people.

The 1948 Census of Business contains adequate data on sales and numbers of establishments for street restaurants as a group. But random-sample data and local observation were required to develop original estimates of sales and numbers of street restaurants by type, such as high-priced cafes (often serving alcoholic beverages), moderate-priced cafes serving full meals (often having both table and counter service), cafeterias, lunch counters, and other types. Census analyses of sales by merchandise line provided substantial data on sales of meals, in contrast to liquor, tobacco, and other items, by large street restaurants. But extensive estimating was necessary to develop data for small street restaurants and for all street restaurants by type.

Census data on merchandise-line sales by hotels, drug stores, drinking places, department stores, and other types of retail establishments provide substantial information on sales of meals by large auxiliary restaurants, but

further estimating was needed for small establishments. No published data were available for private eating places. Original estimates were developed from direct data from major establishments in Minneapolis, such as private clubs, hospitals, the eating facilities of the University of Minnesota, fraternities, and sororities. Sales of boarding houses and lunchrooms for employees were estimated from random-sample data.

Many estimates were based on two 10-percent random samples of the Minneapolis industry drawn from a list compiled by the city sanitation inspection office. Every eating place in the two samples was visited by the writer to ascertain from brief observation the type of eating place, approximate sales volume, type of food, and so on.

A problem arose in the attempt to develop separate sales and cost data for table-service eating places in contrast to counter-service places. Such separation would be desirable because it is generally more expensive to serve customers at tables or booths than at counters. The high-priced cafes and hotels usually offer only table service and the cafeterias usually offer only cafeteria service, though exceptions to both may be found. The major group of medium-priced cafes typically offers both counter and table service, yet these cafes seldom maintain separate cost-accounting records for these types of service. This major group therefore could only be described as "medium-priced cafes with combination table and counter service, usually serving full meals (in contrast to short orders)."

Except as noted, the data developed were detailed enough for pilot-study purposes, but data based on larger samples or complete enumerations would be necessary before conclusive findings could be made.

Eating Places Second to Food Stores in Value of Food Marketed

As a second phase of the study, the proportionate importance of eating places in marketing the total food supply was measured. The value of the total food supply in Minneapolis and Fairmont, measured at the retail food store level or its equivalent, was computed and

the proportion consumed through eating places was noted. This value proportion is also the approximate proportion of the physical quantity of food so marketed, although some differences arise from differences in the patterns of price and quantity of consumption in eating places compared with consumption in homes.

The largest part of the value of the total food supply is represented by food sold through retail food stores for home consumption. Data on such sales were taken from the 1948 Census of Business. At the same time, available information on sales by three broad commodity groupings was assembled for Minneapolis and Fairmont for comparison with the survey data. Estimates were made of total sales (analyzed plus nonanalyzed) for all food stores by applying the percentage distributions from the analyzed data to the nonanalyzed sales for each of the separate categories of food stores.

The next largest part of the food supply of urban areas consists of food that is sold in the form of prepared meals and lunches by eating places, both public and private. Gross sales by types of eating places in the two cities were estimated from data obtained from the 1948 Census of Business and other data developed in the first phase of the study. The purchase value of the food represented by these sales was estimated by applying the most appropriate average food cost percentages from the case studies in Minneapolis and Fairmont, respectively. This purchase value (essentially at wholesale, and excluding all services, such as cooking and serving) was then adjusted upward to the equivalent value for the same quantities of food bought at retail food stores. Case-study data provided a base for estimating the division of this equivalent value into the same three food groups as for food stores.

The third part of the food supply of urban areas consists of food consumed at home but not sold through retail food stores. This category includes food sold direct to householders by farmers and wholesalers, particularly eggs and fresh fruits and vegetables, and food produced in home gardens and consumed at home. Census classification of wholesale sales by type of customer provided some data regarding sales to consumers by wholesalers, but no data were

available as to sales by farmers to consumers or as to food produced in home gardens. Estimates were made by the writer but they are nothing more than informed guesses.

Finally, the value of food purchased by eating places from retail food stores was estimated and then subtracted from the total gross value of the food supply in Minneapolis and Fairmont. This was done in order to avoid double counting in the data regarding retail sales. Interviews with restaurateurs on buying practices of eating places provided rough data as to the percentages of purchases made at retail by three food groups. These percentages were applied to dollar purchases of all eating places, and the resulting amounts were subtracted from the total food supply.

The general methods used in measuring the role of eating places in the total food-marketing process are considered to be reasonably satisfactory but many problems relating to the development of more detailed and more reliable data are still unsolved.

Using the above methods, it was found that about 18 percent of the food supply in Minneapolis was marketed through eating places in 1948 and about 161½ percent of the supply in Fairmont was so marketed.

Rate of Food Consumption in Eating Places

In the third phase of the pilot study, the average quantities of food consumed per person in 14 selected commercial eating places in Minneapolis were investigated. Original data were developed by tabulating detailed food purchases from invoices and adjusting for inventory changes. To obtain average food-consumption rates in five types of commercial eating places in Minneapolis, these quantities of food purchased were divided by the number of persons served. The rates were computed on a per person, per week, basis.

The chief problem here was to define a meal and a day's or week's consumption. For example, a between-meal cup of coffee should not be counted as an average meal, that is, as one-third of a person's daily consumption of food. Similarly, dinner at a high-priced cafe or hotel is probably more than one-third of a person's average daily food consumption. For these reasons, the average quantities of food consumed

per person served are not strictly comparable among different eating places. Therefore, two types of consumption rates were computed for this study—one from quantities of food divided by the number of customers served on an unadjusted basis, the other by dividing quantities of food by an adjusted meal or customer count. Adjustments excluded small snacks or coffee, and allowed, so far as possible for varying emphasis of different eating places on breakfasts, between-meal snacks, and lunches versus full dinners. The adjustments were made on the basis of detailed analyses of customers served by time of day and size of check.

The fourth phase of the study concerns the percentage distribution of eating-place food purchases by 23 types of food products. Original data were collected from 20 eating places in Minneapolis and 12 eating places in Fairmont. There were no major analytical problems in this phase, but there was a tremendous quantity of data to collect and analyze from each eating place to be studied.

Functions and Costs of Eating Places

The fifth phase of the study relates to the functions and costs of eating places as marketing agencies for food products. The functions of eating places were enumerated and briefly described. Problems here included measuring the costs of performing particular functions and ascertaining whether the functions are performed efficiently.

Food, labor, and other costs are commonly expressed as percentages of sales at menu prices. Food-cost percentages are usually available from annual financial statements but labor cost percentages are difficult to obtain. Food costs of 20 Minneapolis firms in the case study averaged 44 percent of total sales in 1949; the average for the firms in Fairmont was 52 percent.

Several problems are found here, one of which is the unavailability of separate cost data in regard to sales, food, and overhead for combination operations, such as table-and-counter service cafes. Another is to identify accurately the differences in reported costs with respect to functions performed. This is important because labor costs may be shifted into food costs by buying highly processed food, or

into overhead costs by mechanizing hand operations. Then there are the problems in interpreting labor costs that arise out of the exclusion of tips from business records, although tips constitute a significant item of labor cost to customers of eating places, and out of the exclusion of family labor from cost records.

General marketing characteristics of eating places were studied in the sixth phase. A brief survey was made of the types of marketing agencies that supply food to eating places in Minneapolis and Fairmont. Formal interviews, based on 37 questions on buying and management practices, were conducted with 71 randomly selected restaurateurs.

Analysis of the efficiency of eating places as food marketers is complicated by the selling of personal services, convenience, "atmosphere," and entertainment, along with varying quantities and qualities of food. A small gross markup on food purchased is not conclusive evidence of efficient marketing, for it may merely reflect the purchase of highly processed food such as cooked boned hams and baked pies, or the omission of desired services or conveniences. Overall efficiency was found to be almost impossible to define and measure, except in special circumstances. But three particular types of efficiency can be defined: The efficiency of eating places from the standpoint of consumers is measured by lowest menu prices for all food and desired services; for agricultural producers by charges made for marketing services and the effect on total food consumption; for owners of eating places by net profits earned.

All phases of the pilot study involve problems centering around the need for more data, or for data that are statistically more reliable by virtue of being based on larger random samples or complete enumerations. Examples are found in the need for better data on (1) sales and costs of private eating facilities, (2) costs of food, labor, and other items of all commercial eating places, (3) sales of meals and alcoholic beverages by small eating places, (4) sales by suppliers of eating places, by food group and extent of processing, (5) sales by retailers to eating places, (6) price differentials offered to eating places, (7) sales of food direct to consumers by wholesalers and farmers, and (8) average mark-ups by retail food store.

Many of the problems faced in this study are of the kind that are to be expected when a new type of study is made in an industry that consists of a large number of establishments, many of which are small and independently owned, and most of which are confined to operations on their own premises and are primarily service establishments at the retail level. It was difficult to get permission to make individual case studies, but after permission was given, the working relations were usually excellent.

Areas for Further Research

The preceding pages of this article have indicated many undeveloped areas of knowledge of the public-eating-place industry. These are areas in which basic information may be lacking or available information needs to be assembled and brought to focus on particular problems and areas in which economic analysis can contribute to greater comprehension of the marketing problems of the industry and possibly to ways of meeting them.

Census reports give considerable data that could be used when studying differences and similarities of eating places in other cities and towns and to compare them with the industries in Minneapolis and Fairmont, and with national averages. Such studies might cover the composition of the total eating-place industry in each area, the average sales volume of the firms, the average number of firms per capita, and average sales of meals per capita (based on resident populations). From past Census data supplemented by data in the national-income series, rough estimates can be made as to the changing historical role of food consumption away from home.

The whole field of the private eating-place industry is remarkable for the lack of information as to its magnitude and its over-all characteristics. No consumer-purchase studies have ever included such public and private institutions as hospitals and asylums. Census reports do not cover sales of private clubs and other such establishments. These may account for 3 or 4 percent of the total food marketings of the country. In the aggregate, they do not appear to be significant, but they may be major outlets for particular types of foods or in particular geographic areas.

The section of this study which deals with sources of food supplies is little more than an introduction to a fertile field for research. At least three types of studies could be used to assemble basic information: (1) Food distributors could be surveyed as to the qualities, varieties, quantities, prices, values, and extent of processing of food sold to the major types of public eating places. (2) Further analysis could be made of existing census data on wholesalers' sales or deliveries, by classification of customer, and possibly of other census wholesale data to estimate, from the wholesale level, the proportion of the total food supply moving through public eating places. (3) Analysis of further case studies of randomly selected eating places as to exact status of suppliers could provide additional data as to quality and price differentials to eating places who buy in wholesale units.

Information regarding food costs of public eating places is important to individual restaurateurs, farmers, food distributors, and consumers. There is a great need for up-to-date detailed data from all parts of the country. Inquiries made in the course of this study indicated that most public eating places paid more for the food they used than the wholesale prices that were charged the retail stores for similar food, but that they paid less than the prices charged to household purchasers who bought at retail. Further study of these prices and the reasons for them are fruitful fields for research. Moreover, additional analyses might be made of the economies in purchasing food that could be realized by eating places if they bought in large containers. This could be done by an extension of the process carried out in the pilot study, in which price quotations were obtained from one supplier for identical food sold in institutional and in household sizes.

A current source of data on food costs used in the pilot study could be investigated more thoroughly. This source is the regulations as to margins of the Office of Price Stabilization and the reports made by firms to that agency. Such investigations would provide additional information on the differential margins allowed wholesalers who supply the industry, and possibly it would provide information regarding other suppliers.

Food wastes after food is delivered at the restaurant door are related to food costs. A study carried on at the University of Minnesota¹ involved the separation of kitchen trimmings into four containers and the separation of plate waste into seven containers. The contents were noted and weighed, and the quantities of these two types of waste were expressed as percentages of the relevant total quantity of food used. Such studies of wastes might well be undertaken by individual firms, to find possible ways of minimizing their wastes, to ascertain relative advantages of particular forms in which they can buy food, and to discover customer disapproval of particular dishes, size of portions, and other information. A substantial amount of data on cooking and trimming losses has been published in certain quantity-recipe manuals that specify both purchased weights and yields, such as the Wenzel² and Treat-Richards³ books.

Other costs of the eating-place industry merit further attention. A more detailed break-down of cost information, such as accounting firms probably develop in their consultations with large establishments in the industry, would be helpful in evaluating costs of particular services of restaurants. Time and motion studies would be useful in analysis of labor costs. It might be well to learn the extent of subsidy in the form of space and other services that such firms as department stores make to their auxiliary restaurants.

Consideration might also be given to analysis of the efficiency of the eating-place industry as a whole. This pilot study has considered the efficiency of individual firms in the industry on the basis of available data. Further study of the efficiency of firms based on time and motion studies and complete cost analyses might be fruitful. When more is known concerning the relative efficiency of the various types and sizes of firms as to advantages in buying in large containers and in wholesale quantities, and as

¹ EATING PLACES AS MARKETERS OF FOOD PRODUCTS. Marketing Research Report No. 3, 1952. Appendix G.

² WENZEL, G. L. WENZEL'S MENU MAKER. 1947, p. 16.

³ TREAT, NOLA, AND RICHARDS, LENORE. QUANTITY COOKERY, Rev. ed., Boston. Little, Brown, 1951.

to utilization of labor and fixed facilities, further studies as to the efficiency of the entire eating-place industry could be carried on to arrive at an over-all evaluation and possible ways of improving the general efficiency of marketing.

Discussion of the rates of purchase of major foods by type of firm and average consumption per customer raises several questions. One is the extent of consumption of dairy products in such establishments as fountains, dairy lunches, and amusement places. Another is the need for further experimentation in the estimation and analysis of rates of consumption in public eating places. This should include the refining of concepts and methods, and ascertaining what relation might normally be expected among the rates of food consumption for the whole country, and for the households of farmers and for eating places on the basis of known differences in the basic groups involved. Knowledge of these topic areas would be particularly aided by additional case studies for other parts of the country. Measurement of the extent of restaurant eating by farm people is needed in order to analyze the relations among the proportions of away-from-home consumption in farm areas, villages, small and large cities, suburban areas, and combination areas such as States or the entire country. This would involve analysis of customers at eating places by residence—city residents, country residents, and travelers—and possibly by other classifications. The extent of restaurant eating can also be evaluated from consumer-purchase studies but special care is needed to assure complete reporting of away-from-home expenditures for food.

In the process of estimating the proportion of the food supplies marketed by eating places in the two cities, several assumptions and approximations were necessary. The study used an indirect value measure which is appropriate for general purposes, but investigation as to other methods of measuring the proportion of the food supply marketed through eating places might be made. A direct quantitative measure by detailed food groups would be useful, such as the proportion of "U.S. Prime" beef marketed through eating places. Studies of consumption of food in homes and in eating places conducted concurrently would provide directly

comparable data for evaluating differences between home and away-from-home consumption. Such studies of home food consumption would need to be more inclusive than "family households," however, in order to measure all types of home consumption. Consumption rates from such concurrent studies could then be weighted by population data and customer count to provide an independent measure of the proportion of food marketed through eating places.

Limitations of This Study

Finally, it should be emphasized that many of the data and much of the supplemental information utilized in the development of the pilot study are indicative rather than conclusive. The two cities studied cannot be regarded as representative of other cities. The number of firms covered in the classification and management surveys was probably satisfactory to characterize the industries in these two cities, but not elsewhere. Additional case studies of each major type of establishment are necessary to provide sufficient observations to analyze costs, patterns of food purchase, and rates of food consumption with a reasonable degree of statistical reliability and to evaluate by statistical means the differences among types of firms and among areas of different sizes, economic make-up, and geographic location.

Procedure for Further Field Studies

The preceding analysis of areas for further research has included many topics suitable for research by individuals and research organizations based primarily on existing data, such as those collected by the United States Department of Commerce, the United States Department of Agriculture, and the Office of Price Stabilization.

The following section relates to suggested procedures for carrying out major field research where original data on operations of eating places are to be collected.

Further field studies of food marketing by eating places along the same general lines as the case studies conducted in Fairmont and Minneapolis are desirable. The following sug-

gestions as to procedure have been revised and expanded in the light of experience.

1. Select cities or areas in which the maximum amount of census and other data is available, either in published form or by special tabulation, and in which other comparative studies have been made, such as the home food-consumption studies. Use metropolitan areas with only one major city because then the various tabulations of the metropolitan area are directly useful. Data for large cities have the advantages of greater detail and include fewer cases in which data are withheld to avoid disclosure; but data for small cities are more adaptable to detailed estimating where necessary. Studies are needed, however, in all sizes and types of cities in every major geographic area.

2. Discuss plans with the national, State, and local restaurant associations. Try to collect information that will be useful to both the project and the associations if possible, and request their support. The findings of this study should be helpful.

3. Collect data on the local industry from all possible sources, including census data, sanitation-inspection agencies, local associations, direct observation, and random-sample data, particularly in large cities. Brief classification schedules from randomly selected firms will be extremely useful in determining major strata within the industry.

4. Conduct interviews on buying and management practices at the same time the random-classification schedules are collected.

5. Select individual eating places in which to make detailed case studies of sales, costs, purchases, inventories, customers, and so on, for a test period of, say, a month. These individual eating places should be randomly selected within predetermined strata in order to permit statistical estimation of totals from the case studies. Probability selection proportionate to size could well be used here.

Advance consideration should be given to the possibility that a randomly selected firm will refuse access to its records. In this case, it may be possible to gain permission by citing association approval and in other ways explaining the legitimate purposes of the project and the confidential nature of records of individual firms.

One refusal was withdrawn after the proprietor saw the paragraph in the research contract to the effect that confidential arrangements entered into by the researcher would be respected. The large establishments were generally more cooperative than the small ones, so that substitution for a large firm is less likely to be necessary if good support has been obtained from the industry. If a small eating place refuses, it would be relatively easy to substitute a similar eating place, and less violence will be done to random selection than if a large and relatively unique eating place were involved in a substitution.

Explanation should be made at the outset that relatively little if any extra effort will be required of the firms who are asked to cooperate in case-study analyses. Complete data on purchases are always available from existing invoices; inventories are regularly taken by many firms, but they can be taken by study personnel if necessary; data on sales, food costs, and labor costs for past annual periods can almost always be drawn from existing records; the number of customers served and value of meal checks by time of day or meal period are usually available in large establishments, and if not, they can be easily collected in any establishment by arranging for the management either to keep all meal checks (separated by serving period) or to note the serving periods on cash-register tapes while being careful to ring up only one person's check at one time. The writer believes that probability selection of case-study eating places is desirable and is possible at this time with wholehearted support of the local restaurant industry.

6. Actual collection of case-study data involves the following phases:

a. A period must be selected for the detailed analysis. One-month periods are believed to be both practicable and adequate, but consideration should be given to collecting data for one month in each of four quarters of a year. General indications are that seasonal changes are relatively unimportant in purchase patterns of eating places but quantitative data would make it possible to evaluate these indications.

b. Arrangements must be made with each firm in advance of the test period to take beginning and ending inventories, if the firm does

not regularly do so; to have the firm note descriptive information about food purchased from suppliers such as retail supermarkets that give only cash-register tickets rather than detailed invoices; and to have the firm keep customer-count records if it does not already do so. Most large firms have all these data by months, and in such cases advance arrangements are needed only to assure cooperation and to verify by personal inspection that record procedures are adequate for analysis.

c. Detailed data can be copied from the firm's records after the test period has passed. Data on food purchases come from invoices or stock record cards. Data should include units of purchase, quantities purchased by date; the price paid for every purchase; the vendor; complete information as to type, form, extent of processing, and quality. The recording of quantities purchased by date indicates patterns of purchase that are an aid in checking for completeness. At least part of the sales and customer-count data should be in full detail, as from meal checks or cash-register tapes, so an analysis can be made of average check size by serving period, and so that adjustments to exclude cof-

fee items can be made. Sales, number of meals, and types of meals served to employees should also be obtained. Food and labor cost percentages for both the current and the base periods, should be obtained. Other cost percentages and the profit percentage may not be freely available, and can be dispensed with for many purposes. The largest firms in Minneapolis involved 2 weeks of concentrated effort for collection of data, exclusive of advance arrangements, detailed analyses, and callbacks for supplemental information. Data for a few of the smaller firms, however, were collected in a day and a half.

7. Analysis begins with organizing the data on beginning inventory, purchases, and ending inventory for every detailed item of food purchased and/or used. Net consumption is computed for each item, the items are grouped and converted where necessary, and computations are made as described earlier in this article and in the publication cited on page 92 of this issue. Many supplementary analyses can be made from these data, such as sources of supply by type of food, extent of processing, price level, quality level, and wholesale or retail form.

Book Reviews

Agricultural Discontent in the Middle West, 1900-1939. By THEODORE SALOUTOS and JOHN D. HICKS. University of Wisconsin Press, Madison. 581 pages. 1951. \$6.75

Midwestern Progressive Politics; A Historical Study of Its Origins and Development, 1870-1950. By RUSSELL B. NYE. Michigan State College Press, Lansing. 422 pages. 1951. \$5.00.

PROFESSOR HICKS' book *The Populist Revolt* (Minneapolis, 1931) has remained the standard and definitive work on the subject for two decades. It was inevitable that Professor Hicks should continue his study of the subject of his book—the organizations and the movements of farmers in the twentieth century. It was just as inevitable that his history seminars during the middle 1930's at the University of Wisconsin should be devoted to the continuation of the study of the subject of the Populist revolt. The result is *Agricultural Discontent in the Middle West*.

The volume is a product of the meticulous research of two distinguished historians who have devoted two decades to the study of farmer organizations. It is an indispensable addition to the bibliography of the Middle Border. Future studies will add little in the way of new information on the subject.

Agricultural Discontent in the Middle West is the first broad historical treatment of agrarian unrest in the United States in the twentieth century. It is the story of how American agriculture formulated its objectives and used them so effectively during the last two decades. It is a realistic study, taking into account the farm legislation enacted in Washington, but focusing attention on the Nation's debt to the Middle West.

In these times of high prices and agricultural prosperity it is difficult to recall the bitter days of the 1920's and 1930's, when frustration and despair swept the rural areas, and agrarian radicals frightened sober men with their fiery preachments.

The chapters of this book are excellent summaries of the historical background and movements that the twentieth century developed. Here the author tells the familiar story of the organized farmers from the era of Patrons of

Husbandry. Equally important, these chapters submit the period to economic analysis. Clearly, the Middle Western farmers were indoctrinated in antimonopolism, in the physiocratic faith that agriculture was the basic industry in the economy, and in the belief that they had not been receiving a fair share of the national income. They were devoted, moreover, to the use of government power to protect their interests. Farmers were pictured as small capitalists, determined to protect their investments and anxious to have a fair return from their labor. This is perhaps correct from the viewpoint of economic analyses, but the authors should have made equally clear that farmers thought of themselves as producers. Capitalists were grain dealers in Minneapolis or the money lenders of Wall Street.

J. A. Everett's American Society of Equity is the first organization studied by the authors. Obsessed with the plan of achieving price controls through gigantic holding movements, Everett sought to bolster prices through equity action, but failed. Though the organization quickly splintered into numerous smaller groups, the authors discover the close kinship between Everett's ideas and the later McNary-Haugen bills, the ever-normal granary, and parity concepts.

A contemporary of the Equity, the loosely organized Farmers' Union, attacked the problem of low prices and agricultural distress. But its solutions were quite different, for most of its members urged cooperation as an answer to the farmer's dilemma, while others believed that federal assistance was necessary. The Union taught farmers that they could live in the capitalist system by applying the "practical business methods" of cooperative buying and selling.

The treatment of the American Farm Bureau Federation is disappointing. This organization, as the authors admit, is unquestionably the most powerful and most representative of all the farmers' organizations today. In spite of this fact, the Bureau receives far less attention than the Non-Partisan League and no more than the Equity. The Farm Bureau's emphasis upon cooperative enterprises, its effective action in the legislative field, and its ties with the agricultural extension services meant in many States that farm policy and Farm Bureau policy were synonymous.

The authors view the parity program as "a form of economic appeasement to the farmer" which promised "no equivalent benefits to the millions of unorganized consumers, the countless white-collar workers, school teachers, pensioners, widows and others who lived on fixed incomes. . . . Nor did it promise to make possible a very effective use of our natural resources." Perhaps farmers achieved through political action what they had failed to get through hard work during the previous century.

The accuracy of this volume and the absence of mistakes insure that it will be the standard work on this subject for many years, just as *The Populist Revolt* has been for the last two decades.

Midwestern Progressive Politics complements *Agricultural Discontent*. From the Granger and Greenbackers of the 1870's and 1880's through the New and Fair Deals of the 1940's, the author has attempted to tell, for the first time, the whole story of Midwestern progressive thought and politics. Most facts of this

subject are treated competently, sympathetically, and interestingly. In the process, the author draws vivid biographical sketches of such personalities as Ignatius Donnelly, "Sockless Jerry" Simpson, "Raise More Hell and Less Corn" Lease, James B. Weaver, William Jennings Bryan, and "Fighting" Bob LaFollette, carefully evaluating the significance, achievements, and contributions of the Midwest in politics.

Fundamentally, this is the story of the transition of the United States from liberal to social democracy and from laissez-faire economics to Government regulation. The progressive era was a golden age for liberals, intellectuals, men of good will, and God-fearing, upright citizens dedicated to political, economic, and social democracy. Their duty was clear: to reaffirm and to preserve in the nineteenth and twentieth centuries the democratic faith which the eighteenth century so eloquently expressed.

The Middle West, its pioneer tradition derived from its recent past and becoming rapidly industrial, was faced with the agrarians' problems of the frontier, as well as with those which resulted from its recent industrialism. Midwestern progressivism was a protest against the entrenched political and economic power of the individualists and financiers.

The spirit of progressivism, however, is not dead. It has reappeared whenever the times called it up again. The book is the type of history which will appeal to both the serious scholar and the general reader.

Everett E. Edwards

Four Thousand Million Mouths. Edited by F. LE GROS CLARK and N. W. PIRIE. Oxford University Press, New York. 222 pages. 1952. \$3.00

The Geography of Hunger. By JOSUE DE CASTRO. Little, Brown and Company, Boston. 337 pages. 1952. \$4.50.

THE EDITORS of *Four Thousand Million Mouths* are concerned with the question of feeding a world population of four billion, a number which they believe may be achieved within the lifetime of some of our children. The examination proceeds from the assumption that our existing knowledge will be better applied and extended in directions that are more or less foreseeable. Authorities in the field were invited to contribute essays on such matters as soil conservation; use of fertilizers; disease and pest control; improving the efficiency of crop, milk, and pork production; the harvesting of the waters, and the preservation and use of fish; the prevention of waste, and the processing of food.

The opening article on "The Malthusian Heritage" outlines the development of the long controversy concerning the relation between human populations and food resources; it develops the social setting in which Malthus' theories were originally formulated, as well as the changing social situations in which other theories have been developed. Individual essays give clear and brief outlines of advances that have been made in their respective fields.

The essay by Professor Yates on the possibility of increasing crop yields by improving soil fertility goes on to examine in rough outline the world requirements for plant nutrients to achieve specified increases in crop production. Taken together, the essays indicate that agricultural science has made and is making major contributions to the increase of food production. Unfortunately the editors did not include an essay on the developing techniques by which the "masses of illiterate and unenlightened peasants" can become "alert cooperative farmers." The result is that the book outlines some of the contributions which scientific agriculture can make, but does not take into account the development of the social and psychological techniques by which this knowledge can and will be translated into practices by operating farmers.

Professor de Castro's book, *The Geography*

of Hunger, has three major theses: (1) Hunger is a major fact in the world, (2) there are enough resources to provide adequate diets for everybody, everywhere, provided the proper economic and social measures are taken, (3) starvation is the cause of overpopulation. Two-thirds of the book is devoted to vivid survey of hunger in the world, including those countries that are usually considered to be well fed. Many studies are cited, but there are few indications that the reports relate to specific times and places and that changes may have occurred since the studies were made. Neither are there any concise references to the population groups to which the studies apply. The account is interspersed with many comments on social and economic questions. The author does not like colonialism, monoculture, or the notion of Anglo-American superiority, and he misses few opportunities to attack them. Some facts are dealt with casually; for instance, the reader is not likely to learn from this account that monoculture is characteristic of great wheat-growing areas where people are politically independent and well fed, as well as sugar-and cotton-growing areas where people are often poorly fed.

Dr. de Castro argues that there are sufficient resources to feed the world's population now and in the foreseeable future, if appropriate economic, social, and political measures are taken. Vogt and "Malthusians" generally are attacked vigorously. There are few suggestions as to what the ameliorative measures might be.

In the author's own evaluation, the major contribution of his book is its presumed demonstration that hunger is the cause of overpopulation. The relationship is stated as follows: (1) A lack of protein in the diet sets off a series of biochemical changes which result in stimulating fertility, and (2) chronic hunger intensifies the desire for sexual activity at the same time that it lowers the appetite for food. These ideas are presented as incontrovertible scientific findings, but there is no scientific evaluation either of the studies on which the

conclusions are based or of the limits within which the laboratory findings are applicable to human populations.

There is an appeal to presumed corroborative evidence from current rates of population growth, but the argument does not withstand analysis. The correlation between human fertility and nutritional status is not so close as it is alleged to be, and the fact of the correlation that does exist does not demonstrate the direction of the causality or the absence of common elements underlying both phenomena. No nutritional theory can explain the fluctuations in human fertility that have occurred in Western and Eastern countries in recent years. Dr. de Castro ignores those differences in the social and economic conditions and attitudes of major population groups that are the essential factors in the variations in human fertility in the world at the present time. Nor does he give sufficient attention to the fact that rates of

population growth result from differences between fertility and mortality.

The Geography of Hunger is a call to organize a world-wide campaign for the extermination of hunger. If it leads people to believe that the pressing problems of the relation of population to resources will be solved simply by increases in the protein intake, as seems to be implied, it will have rendered a disservice to the cause of world development.

It should be added that this is an English translation of a book which appeared earlier in Portuguese. The English translation was prepared before Dr. de Castro became Chairman of the Council of the Food and Agriculture Organization of the United Nations. *The Geography of Hunger* is not an official publication of FAO and it is in no way sponsored by that Organization.

Conrad Tauber

The Policy Sciences; Recent Developments in Scope and Method. Edited by DANIEL LERNER and HAROLD D. LASSWELL. Stanford University Press, Stanford, Calif. 344 pages. 1951. \$7.50

THIS SYMPOSIUM of 16 articles, each addressed to a separate aspect of the central theme, is held together by the two broad purposes served by the entire collection. One of the unifying purposes of the volume is to show how the discipline of the scholar can help policymakers in their continuous function of making important choices. The other broad purpose of the book is to demonstrate the need for the integration of all knowledge that may be of use to policymakers.

Policy sciences draw upon all the sciences that can be useful in policy development. In this context, knowledge is for practical application to policy needs at a given period. During the war we needed to know, for example, the harbor installations at Casablanca, or the attitudes of the population of Pacific Islanders toward the Japanese, or the maximum range of a fixed artillery piece. These were questions for geographers, anthropologists, or physicists.

The editors of this book, however, are primarily concerned with the contributions that the social and psychological sciences can make to the policy sciences. The writers who were invited to join the symposium are therefore drawn from the fields of the social and psychological sciences, representing anthropology, economics, political science, psychology, and sociology.

Which of the social sciences has the most to contribute to the policy sciences? Lasswell asks the question and, by inference, answers it by asking which of them made the greatest advances between World War I and World War II. The social sciences which possessed quantitative methods, according to Lasswell, were the ones that rose most rapidly.

Lasswell goes on to consider the case of the economists, who were extensively used during World War II to estimate the facilities, manpower, and resources necessary to produce the

munitions required by the armed forces and to supply men and matériel where needed. The economic scientists who made the greatest direct contribution, Lasswell concludes, employed mathematics and statistics.

"They had method," he adds. "And they were quantitative. They could manipulate data in the light of a system of general postulates, laws, and hypotheses. . . . The rise of economists and psychometricians seemed to indicate that the closer the social scientist came to the methods of physical science the more certain his methods could be of acceptance."

Methods used in physical science receive emphasis in a section of the symposium devoted to research procedures. Hans Reichenbach describes the use of probability methods and Kenneth J. Arrow presents the case of mathematical models in the social sciences. Qualitative measurements, methods of classification, typological description and index formation are expounded by Paul F. Lazarsfeld and Allen H. Barton. The significance of communication patterns receives attention in an article by Alex Bavelas. Herbert Hyman writes on interviewing as a scientific procedure.

Scope and focus in the policy sciences are examined by Lasswell in articles on policy orientation and world organization. Others who write on scope and focus are: Margaret Mead and Clyde Kluckhohn, treating the subject from the point of view of cultural anthropology; Ernest R. Hilgard and Daniel Lerner, from the standpoint of social psychology; and Edward A. Shils, as a sociologist.

Two former members of the staff of the Bureau of Agricultural Economics—George Ka-

tona and Rensis Likert—contribute papers to a section devoted to policy integration. Katona writes on expectations and decisions in economic behavior. Likert's article is on the sample interview as a tool of research and policy formation. Other contributions to the section are on the effectiveness of psychological warfare, by Hans Speier; the natural sciences in policy formation, by Douglas M. Whitaker; and the social scientist and research policy, by Robert K. Merton. A 26-page bibliography provides suggested readings for students who desire to extend their knowledge of policy sciences.

This is the first full-length volume of the Hoover Institute Studies. The project is designed to study the changes in society since 1890. The significance of the present work is suggested in the foreword, by C. Easton Rothwell. "The century that dawned in hope," Rothwell writes, "has reached a noon of confusion and doubt." But our failure to perfect human relations, he adds, results less from lack of trying than from failure to discover how.

Here, then, is the crux of it—"discovering how." This symposium undertakes the difficult problem of telling how. The job is to get at the facts needed in arriving at policy decisions that will give a resurgence of hope to people whose faith in democracy is dimmed. This pioneer work deserves the careful attention of all professional workers directly or indirectly concerned with this function, and of students of the social sciences who hope to engage in public administration service after graduation from college.

Charles E. Rogers

Econometrics. By GERHARD TINTNER. John Wiley & Sons, New York. 370 pages. 1952. \$5.75.

TOO MANY agricultural economists are frightened by the word *econometrics*. If they look at Tintner's book at all, some of their fears may be confirmed. They will find that it contains much mathematics, some of which use Greek letters.

But any agricultural economist could learn a great deal from a careful study of this book. For those who have neglected mathematics, it may be hard going, but not too hard for an intelligent economist who is willing to learn; and Tintner can teach a willing learner many

things that would be to his advantage to know. An unfortunate and erroneous impression appears to be current that econometrics is a particularly abstract branch of mathematics, and that only a chosen few can understand it.

Tintner gives a good definition, and one that is clearly in line with the stated purposes of the Econometric Society: "Econometrics is . . . the application of mathematical economic theory and statistical procedures to economic data in order to establish numerical results in the field of economics and to verify economic theorems."

Econometrics is *not* mathematics alone, nor is it statistics or economic theory alone. It is a combination of all three working together for the purpose of measuring economic relationships. Any competent analyst does try to combine all three, whether he is studying the relation of feeding practices to milk production per cow or analyzing the market demand for potatoes. Thus, whether he knows it or not, any competent agricultural economist is an econometrician. But most of us need to know more about the techniques of econometric research.

Tintner's book provides an excellent survey of modern techniques of analysis. Though he gives us a fairly large dose of mathematics, he does not stop with abstract mathematical treatment. Rather, he illustrates each technique by applying it to concrete statistical problems. He demonstrates how to compute and interpret multiple regressions, weighted regressions,

canonical correlations, cyclical and seasonal swings, difference equations, lagged correlations, and many other measures that can be very useful in economic analysis. He shows how one can use confidence limits, discriminant analysis, variate difference analysis, and other tools that have been developed in recent years.

These actual applications of techniques to concrete statistical problems are indispensable to most economists. Abstract mathematics is not enough. The test of econometrics is its ability to analyze actual statistical data and to reach useful conclusions concerning economic relationships.

The reviewer notes only one sin of omission. No attention is given to graphic methods of analysis. Geometry is as much a branch of mathematics as algebra and the calculus. The researcher who makes a dot chart and draws a free-hand regression curve, uses statistics and mathematics. Presumably he combines them with a careful analysis of economic principles. Most agricultural economists understand diagrams and can use graphic methods of analysis. Some economists are frightened by a matrix or a difference equation. They should get up their courage and learn to understand these and other powerful tools of mathematics, and in this they would be helped greatly by a few diagrams. But, even without diagrams, Tintner's book will prove very useful to agricultural economists.

Frederick V. Waugh

The Design and Analysis of Experiments. By OSCAR KEMPTHORNE. John Wiley and Sons, New York. 631 pages. 1952. \$8.50.

SINCE the original contributions of R. A. Fisher, the subject of experimental design has grown to impressive, not to say formidable, proportions. The average agricultural scientist must sometimes long for the good days, not too long past, when conducting an experiment was a simpler matter than it is today. Whatever his feelings may be, he has come to accept the

fact that he must learn to live with this thing that has beset him. He should not be blamed too severely for seeking to make the process as painless as possible. The easiest way out of his troubles is to find a manual that shows how to lay out an experiment according to the latest approved principles and how to compute the intricate analysis of variance associated with

it. Though he may be hazy about what it all means, it does look impressive in his reports.

In contrast, a growing number of experimenters are able to probe more deeply into the subject. Instead of being content to follow a cook-book, they want to know the why and wherefore. It is for these research workers that this book is intended. It pays more attention to the mathematical basis of the design and analysis of experiments than the less ambitious experimenters are likely to try to comprehend. It is the hope of this reviewer that experimenters who have the mathematical background required to benefit from reading this excellent work will increase in number.

The first eight chapters contain an excellent discussion of the scientific method, the mathematical theories of estimation and testing of hypotheses, the mathematical background of analysis of variance in all of its ramifications, and the principle of randomization as it applies to experimentation. The remainder of the text is devoted to discussions of the "standard" designs that have evolved up to the present time, from the simple randomized-block models to the complex lattices. The treatment throughout emphasizes the mathematical theory involved rather than attempting to avoid it; this is entirely consistent with the viewpoint from which the book was written.

The various designs are presented in orderly sequence and their properties are discussed rather fully. The relationships of the various

designs to different kinds of experimental material are left largely to the imagination. This can hardly be considered a defect, because any experimenter worthy of his wages should have the ability to decide for himself which designs are adaptable to his material and which are not. As might be expected, the designs listed are those that are ordinarily used in field-plot experiments more frequently than in experiments with animals or other material. This is a natural consequence of the fact that the whole subject of experimental design received its strongest stimulus from workers engaged in research on field-plot projects.

Agricultural economists who have had the necessary background could read the book with profit. It would refresh their memories on several pertinent aspects of the experimental method in scientific investigation and give them an insight into the mathematical theory of experimental design that is not now available elsewhere in one place.

Considering the nature of the experimental material with which the economist has to work, it appears to this reviewer that designs developed for large-animal experiments, such as the "switch-back" designs used in nutrition experiments with dairy cattle, and the designs used in so-called "rotation" experiments with field crops, are more adaptable to economic experiments than many of the designs that are discussed at greater length.

Walter A. Hendricks

Food; Volume I, The Growth of Policy. By R. J. HAMMOND. His Majesty's Stationery Office, London, 1951. 436 pages. \$5.75.

THIS is a publication in the series of some 20 United Kingdom civil histories authorized by the British War Cabinet in 1942. Mr. Hammond's first volume, *Food; The Growth Of Policy*, is to be followed by a second on the administration of food programs.

The author's objective to present food policy as "a successful attempt to solve a problem in the economics of war" has been admirably achieved. Mr. Hammond describes and analyzes

the development of food policy "in the face of circumstances." He has not hesitated to discuss conflicting points of view within the British Cabinet or between British and United States food officials. He notes that in many instances conflicts were resolved by the pressure of events rather than by the triumph of one view over another.

The first three chapters of the book outline prewar plans against their historical back-

ground. Seven chapters are concerned with the period from the outbreak of war to the beginning of the great air raids in the fall of 1940. The next six chapters are devoted to the critical year 1940-41. The fourth section of the book covers the period after Pearl Harbor through military victory, the concluding chapter being concerned with the "aftermath." Appendices contain statistical tables, charts, Sir William Beveridge's memorandum of 1936 on wider aspects of food control, and a critical note on the joint British, Canadian, and American inquiries as to levels of consumption during 1943, 1944, and 1945. Chapters of most direct interest to social scientists in the United States deal with lend-lease, the Combined Food Board, imports and stock levels, the international wheat negotiations, and the Hot Springs Conference.

The chapter on price and stabilization policy presents a realistic view of the interdependence of policies on food, labor, and price stabilization in a controlled economy. The Ministry of Food was continually asked to raise and lower food prices as nonfood prices changed in the interest of rigid stabilization of the cost-of-living index. After detailing a number of these changes, the author comments, "The Ministry . . . felt that so rigid an adherence to a specific index number was not merely an unmitigated nuisance, but might defeat its own ends by causing people to think that the Ministry had lost its grip on food prices." The comments that the success of the index as a basis for stabilization policy was due to its imperfections as a measure of the rise in the cost of living, and the comment on Treasury policy with respect to the index, are examples of the author's directness.

"In retrospect it is clear," he states, "that much trouble would have been saved if the Treasury had from the first felt able to allow the index to vary, say, within five points each way of a given figure. . . . The picture of officials . . . pondering whether a halfpenny on the price of hake would not have a 'trigger effect' on the index is hardly edifying; nor could the Ministry of Food welcome a policy which caused the most efficiently controlled prices

to move up and down in apparent aimlessness. . . . But it was three years before the Treasury admitted that these criticisms were substantially right; and that stabilization and rigidity were not one and the same thing."

The author's insight into basic issues and his ability to see both sides of a problem in the international as well as the national scene are demonstrated in his discussions of lend-lease and the Combined Food Board. He recognizes that Britain and the United States were "unequal yoke-fellows, with at any rate in appearance unequal interest in the Board's success." He distinguishes between the power to allocate which was vested in the national authorities, and the board's advisory status. This confusion, which has appeared in many published references to the Combined Food Board, was common not only for outsiders but even for the Ministry of Food, which tended to give the board "the aura of a super-national, external institution."

Mr. Hammond refers to Britain's vital interest in North American decisions, and says that the other food authorities had much to gain from the "pooling of Britain's invisible assets—experience, knowledge, and comparatively integrated governmental organization." Speaking of British impatience with changes made by the United States in food allocations that the British felt represented firm commitments, the author asks, "Were not the British rather too wont to suppose that their own unique organization was some sort of norm for other food administrations?"

But, Mr. Hammond tells also of the tendency of the United States to discount the possibility of food shortages and its inability, in 1945, when such shortages were apparent, to apply the agreed-upon principle of parity in food-consumption levels.

This book, with its unusual insight, balanced treatment of events, critical analysis, and clear and entertaining style, is a major contribution to the subject and to the development of useful administrative histories.

Gladys L. Baker

Selected Recent Research Publications in Agricultural Economics issued by the Bureau of Agricultural Economics and Cooperatively by the State Colleges¹

BOTTS, RALPH R. FARMERS' MUTUAL WIND-STORM INSURANCE. U. S. Dept. Agr. Agr. Inform. Bul. 70, 51 pp.; January 1952.

Of the approximately 1,900 mutual insurance companies that have more than half of their windstorm insurance on farm property, 65 are specialized windstorm companies and about 348 are fire mutuals that also offer windstorm insurance. Most of the specialized companies are located in the North Central States; about a third of the fire-wind companies are located in Ohio and Pennsylvania.

BRODELL, ALBERT P., STRICKLER, PAUL E., and PITTMAN, DONALD D. HARVESTING SMALL GRAINS AND SOYBEANS AND METHODS OF SAVING STRAW. U. S. Bur. Agr. Econ. FM 91, 22 pp. March 1952. [Processed.]

Data in this report were obtained from voluntary crop reporters of the United States Department of Agriculture in February 1951. More than 25,000 farms were covered in the study.

COLLINS, WARREN E., and SOUTHERN REGIONAL DAIRY MARKETING COMMITTEE. TRENDS IN THE PRODUCTION AND DISPOSITION OF MILK AND THE IMPORTANCE OF DAIRYING IN THE SOUTH, 1924-50. A Southern Regional Dairy Marketing Rept. Southern Cooperative Ser. Bul. 19, 26 pp., illus. December 1951. (RMA; Agr. Expt. Stas. of Ala., Ark., Ga., La., Miss., S. C., Tenn. and Tex., and BAE cooperating.)

The report presents a general panoramic picture of the region's dairy industry during the last quarter of a century and is intended to serve as a source of reference data for future studies.

GREENE, R. E. L. CONSUMER ACCEPTANCE OF WAXED AND COLORED POTATOES. Fla. Agr. Expt. Sta. Bul. 22, 27 pp., illus. February 1952. (RMA; BAE; BPISAE; and Expt. Stas. of Ala., N. C., S. C., and Va. cooperating.)

In a test conducted in 12 retail stores in one of the large chains in Baltimore, in the spring of 1951, it was found that consumers bought more waxed than unwaxed potatoes. The ratio of sales of waxed to unwaxed potatoes was about 4 to 1. Sales in stores that switched from unwaxed to waxed potatoes increased 41 percent.

HAGOOD, MARGARET JARMAN. FARM-OPERATOR FAMILY LEVEL-OF-LIVING INDEXES FOR COUNTIES OF THE UNITED STATES 1930, 1940, 1945, and 1950. 82 pp., illus. Bur. Agr. Econ. May 1952. [Processed.]

In 1950, the average level of living of farm-operator families in the United States was 22 percent above the level in 1945. The average county in the United States had an index of 75 in 1930, 79 in 1940, and 122 in 1950.

HOOFNAGLE, WILLIAM S. FACTORS AFFECTING THE ANNUAL AUCTION PRICE OF FLORIDA ORANGES, 1930-51. 12 pp., illus. Bur. Agr. Econ. March 1952. (RMA; Agr. Expt. Stas. of Fla. and Tex.; FCA; PMA; and BAE cooperating.) [Processed.]

Approximately 81 percent of the year-to-year variation in price on these 10 markets was accounted for by the combined effect of three factors: (1) the quantity of Florida fresh oranges sold; (2) the total combined quantity of competing fresh oranges and orange products sold; and (3) personal disposable income.

KORZAN, G. E., DAVIS, ALBERT B., and MAC-PHERSON, DONOVAN D. COSTS OF DISTRIBUTING MILK IN THE PORTLAND MARKET. Oreg. Agr. Expt. Sta. Bul. 510, 24 pp., illus. February 1952. (RMA; BAE cooperating.)

Proposes possible ways of reducing costs in distribution of milk as follows: Purchasing of certain low-volume specialty items by small distributors for other processors; establish exclusive wholesale stops to avoid duplication; increase route density wherever possible; eliminate special and unnecessary services; and reduce numbers of retail deliveries to three a week.

LAW, JERRY M. MARKETING EGGS AT THE FIRST BUYER LEVEL IN NINE SOUTHERN STATES. Poultry Mktg. Tech. Com. Southern Cooperative Ser. Bul. 18, 16 pp. illus. December 1951. (Agr. Expt. Stas. of Ala., Ark., Ga., La., Miss., S. C., Tenn., Tex., and Va., and BAE Cooperating.)

First buyers are in a position to reflect consumer wants to the producer. The present marketing system at this level, however, leaves much to be desired. Eggs are only a minor item to most first buyers and they give little special attention to handling them.

LAW, JERRY M. MARKETING EGGS AT THE PRODUCER LEVEL IN NINE SOUTHERN STATES. Poultry Mktg. Tech. Com. Southern Cooperative Ser. Bul. 17, 42 pp. illus. December 1951. (Agr. Expt. Stas. of Ala., Ark., Ga., La., Miss., S. C., Tenn., Tex. and Va., and BAE cooperating.)

Although eggs represent an important source of income to southern agriculture, apparently they are a side-line enterprise with most rural families. The study upon which this report is based indicates that many producers do not place major emphasis on achieving the maximum potential benefits of which the enterprise is capable.

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

RASKOPF, B. D., and BLAKE A. C. MARKET POSSIBILITIES FOR COTTONSEED FEED PRODUCTS—13 COTTON OIL MILL AREAS, 1948-49. Southern Coop. Bul. 16, 32 pp., illus. December 1951. (RMA; Agr. Expt. Stas. of Ala., Ariz., Ark., Ga., La., Miss., Mo., N. Mex. Okla., S. C., Tenn., Tex.; BAE, BPISAE; and PMA cooperating.)

Market possibilities for cottonseed meal and hulls are related to such factors as (1) potential local supply; (2) availability; (3) pricing policies; (4) prospects for increasing number of animals fed those products; (5) type of livestock fed and specific feeding practices including amounts fed, length of feeding period, and use of pasture; (6) attitudes and opinions of farmers; and (7) potential market outlets in other areas of the State.

RASMUSSEN, WAYNE D., and BAKER, GLADYS L. A CHRONOLOGY OF THE DEPARTMENT OF AGRICULTURE'S FOOD POLICIES AND RELATED PROGRAMS, JANUARY 1947 TO DECEMBER 1951, 133 pp. Washington, D. C., March 1952 [Processed.]

A continuation of a Chronology of the War Food Administration, Including Predecessor and Successor Agencies, August 1939 to December 1946, issued 1950.

SOLBERG, ERLING D. RURAL ZONING IN THE UNITED STATES. U. S. Dept. Agr. Agr. Inform. Bul. 59, 85 pp., illus. January 1952.

Enabling laws empowering designated classes of counties, towns or townships, or other local units of government to adopt rural-zoning ordinances have been passed by 38 States. By 1949, rural-zoning ordinances had been adopted by 173 counties in 23 States.

TEMPLE, FREDERICK C. STRAWBERRY MARKETING AND RELATED PRODUCTION PRACTICES AMONG NEGRO GROWERS IN LOUISIANA—1950 SEASON. 42 pp., illus. Bur. Agr. Econ. February 1952. (A Research and Marketing Act contract report.) [Processed.]

Present harvesting and marketing practices could be made more efficient through better planning and more instruction and supervision of workers.

THORFINNSON, T. S., EPP, A. W., and PINE, W. H. SYSTEMS OF FARMING IN IRRIGATION

DISTRICTS IN THE REPUBLICAN RIVER VALLEY (LOCATED IN A DRY SUBHUMID AREA). Nebr. Agr. Expt. Sta. Bul. 404, 44 pp., illus. October 1951.

This report describes a number of representative systems of farming that should prove feasible under irrigation in the Republican River Valley.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. FARM HOUSING AND CONSTRUCTION. 34 pp. Washington, D. C. February 1952. [Processed.]

Presents data based on a survey made in the winter and spring of 1950 under the Housing Act of 1949.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. MOTHERS' OPINIONS OF FIBERS IN SELECTED ITEMS OF CHILDREN'S CLOTHING. U. S. Dept. Agr. Agr. Inform. Bul. 65, 196 pp. October 1951.

Cotton was the only fiber in 7 of the 10 items of children's clothing with which a majority of the mothers said they had had experience and cotton was given as the preferred fiber in 7 of 10 of the items.

Statistical Compilations

KIMBALL, E. SMITH, SMITH, PAUL W., and MOORE, ROBERT F. CHICKENS AND EGGS. MONTHLY EGG PRODUCTION YOUNG CHICKENS AND LAYERS ON FARMS, AND RATE OF LAY, BY STATES AND GEOGRAPHIC DIVISIONS, 1945-50, REVISED ESTIMATES. 47 pp. Bur. Agr. Econ. April 1952. [Processed.]

KIMBALL, E. SMITH, SMITH, PAUL W., and MOORE, ROBERT F. FARM PRODUCTION, DISPOSITION, AND INCOME FROM TURKEYS, 1945-49, BY STATES AND GEOGRAPHIC DIVISIONS, REVISED ESTIMATES. 7 pp. Bur. Agr. Econ. May 1952.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. FARM PRODUCTION, DISPOSITION, AND INCOME FROM MILK, 1940-49, REVISED ESTIMATES, BY STATES. 24 pp. Washington, D. C., April 1952. [Processed.]

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