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of equations are inflexible and difficult to adjust to allow for special circumstances; cases described in this article show this not to be true. Structural models are highly flexible and they can be modified to allow for many special circumstances. Moreover, results from the analysis can be combined with judgment estimates on the part of commodity

specialists when this appears desirable. The advantages that a structural analysis of this kind has over one based entirely on judgment are that all interrelated estimates automatically are consistent, one with another, and account automatically is taken of those statistical relationships that are believed to be valid.

The Farmer's Share: Three Measurements

By Kenneth E. Ogren

The United States Department of Agriculture has long published statistics on the farmer's share of the consumer's food dollar based on a "market-basket" series. Questions frequently arise as to the interpretation of these statistics. This article describes the meaning of this series and considers two other series that can be used both to measure the part of consumers' food expenditures going to farmers and to provide other useful measurements in analyzing trends in marketing services and charges.

STATISTICS on the farmer's share of the consumer's food dollar published regularly by the Agricultural Marketing Service in *The Marketing and Transportation Situation* and other periodicals have received much public attention in recent years. This interest has been stimulated by the almost continuous decline in the farmer's share since early in 1951.

Consumer expenditures for food products are made up of two parts: (1) Payments going to farmers, which represent primarily the returns for the production of raw materials used in food products, and (2) payments going to agencies that assemble and process these raw materials and perform other functions necessary to get food products to consumers in the form, time, and place desired. For purposes of this article, the second group are referred to as payments for "marketing services."

Variations in services performed in marketing a product or group of products must be considered in any comparisons of farmer's shares. The extent of these marketing services may change because of shifts in kinds and relative quantities of food bought by consumers. Shifts in distribution channels, such as the buying of more restaurant meals,

affect total marketing services. Shifts in production and population centers also affect transportation and other marketing services required. Therefore, any interpretation of changes in the farmer's share of the food dollar over time, or of variations between products and product groups, should be considered in relation to variations and trends in marketing services.

The farmer's share calculated from the "market-basket" statistics compares urban retail-store prices of farm food products with payments received by farmers for equivalent quantities of produce. The purpose of this article is (1) to discuss the calculation and interpretation of this series and (2) to consider two other series from which a farmer's share may be derived. One of the two other series is derived from a comparison of total consumer expenditures for farm food products with the total farm receipts from sale of these products by United States farmers (adjusted for value of inedible byproducts). The other compares the same total consumer expenditures with the "value added" by agriculture, that is, the gross returns received by agriculture for its labor and capital, excluding the cost of purchased production materials and services.

As illustrated in figure 1, the measurement of the farmer's share given by each of these series varies both as to the level and trend during the period 1929 to date. This variation is related to the type of measurement being made in each instance. Each series has particular uses and applications in addition to the function of estimating the farmer's share.

The "Market-Basket" Series

Farm-retail price spreads are calculated regularly for a "market basket" of farm food products, commodity groups, and individual foods in the market basket. Statistics in these series include the retail-store cost or price, the farm value of equivalent quantities of produce, the marketing margin or farm-to-retail price spread, and the farmer's share of the retail cost. The principal purpose of these computations is to derive estimates of trends in the marketing margin and the farmer's share of the consumer's food dollar.

The retail-store cost and farm value are computed for the most part from average retail, wholesale, and farm prices that are published in connection with the various price indexes of the Bureau of Labor Statistics and the Agricultural Marketing Service. The marketing margin is the difference between the retail cost and farm value. The farmer's share of the consumer's dollar for the total market basket, or for commodity groups and individual products, is calculated by dividing the farm value by the retail-store price or cost. The farmer's share as measured in the "market-basket" series, therefore, applies only to the consumer's food dollar spent in retail food stores. It does not measure the farmer's share of consumer expenditures for food bought through other distributive channels.

These statistics are based on comparisons of retail-store prices paid by urban consumers for farm food products and payments received by farmers for equivalent quantities of produce (table 1). More specifically, the retail-store cost is computed for a typical family market basket of foods which includes the estimated quantities of farm food products bought for consumption at home per urban wage-earner and clerical-worker family in 1952. For each of the retail quantities, corresponding farm-produce equivalents are esti-

mated. The "farm value" in table 1 is computed by multiplying the farm-produce equivalents by average prices received by farmers.¹

An essential feature of the market-basket series is that the retail cost and farm value of a fixed quantity of food products are computed. These series are index-number measurements, although current statistics are published in the form of value aggregates so that dollar changes in the retail cost of the market basket can be related to dollar changes in the farm value and marketing margin.² These series or indexes are concerned with measuring changes in prices and marketing margins, not with the effects of changes in marketing services and types and quantities of foods bought by consumers.

The principal advantage of the "market-basket" statistics over other possible measurements is that

TABLE 1.—*The farm food market basket: Retail cost, farm value, marketing margin, and farmer's share of retail cost, 1947-55*

Year	Retail cost ¹	Farm value ²	Marketing margin	Farmer's share
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Percent</i>
1947-----	932	471	461	51
1948-----	994	498	496	50
1949-----	939	435	504	46
1950-----	924	432	492	47
1951-----	1,026	495	531	48
1952-----	1,035	482	553	47
1953-----	1,010	450	560	45
1954-----	993	425	568	43
1955-----	975	396	579	41

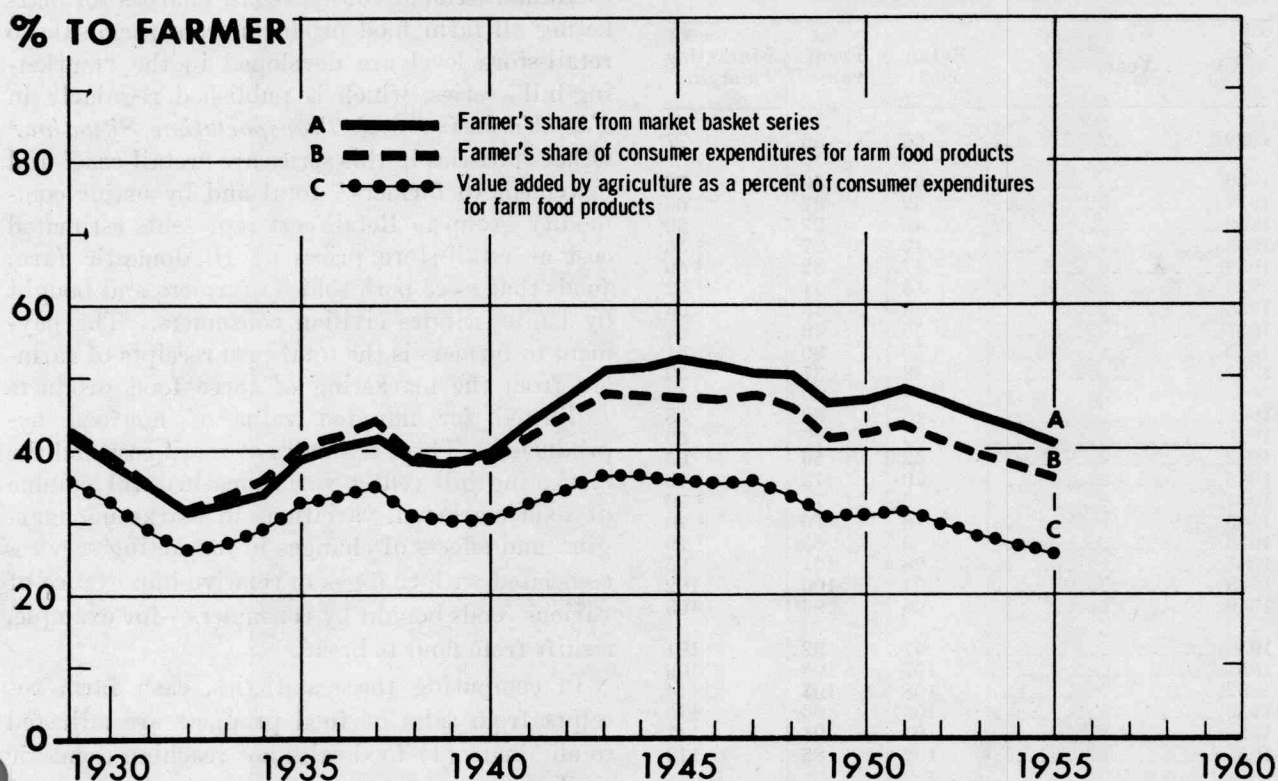
¹ Retail cost of average quantities of farm foods purchased per urban wage-earner and clerical-worker family in 1952, calculated from retail prices collected by the Bureau of Labor Statistics.

² Payment to farmers for equivalent quantities of farm produce minus imputed farm value of byproducts obtained in processing.

¹ For commodities from which nonfood byproducts are obtained in processing, the "farm value" is adjusted to allow for the value of these byproducts. A fuller explanation of the nature of this adjustment and other details concerning the calculation of these statistics are given in "Price Spreads for Farm Food Products, Revised Series, 1946 to Date" in the *Supplement* for July-September 1953 to *The Marketing and Transportation Situation*.

² Over a period of time, however, it is necessary to change weights to maintain representativeness of current food purchase patterns. Therefore, longer time series are published in the form of index numbers as in table 2.

THREE MEASUREMENTS OF FARMER'S SHARE OF CONSUMER FOOD EXPENDITURES



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Figure 1.

the marketing margin provides the best approximation for measuring changes in the cost of a fixed quantity of marketing services (table 2). The marketing margin measures the trend in charges made by marketing agencies for the "quantity" of marketing services associated with the fixed quantities of food products in the family market basket bought in retail food stores. In short-term comparisons, the quantity of marketing services measured by the "market-basket" series may remain nearly constant. The effects of changes in pricing specifications and weights are minimized by "linking" prices based on comparable units. But over a longer period of time marketing services do change even in comparisons of the same units at farm and retail store. Prices received by farmers may change because of shifts in marketing channels used by farmers. Retail

stores may vary the services they perform, such as credit service and delivery. Changes in marketing services such as washing or repackaging of fresh produce may affect quality of foods which cannot be reflected in specifications used by the Bureau of Labor Statistics in reporting retail-store prices.

Other advantages of the market-basket statistics are that they give us a convenient, easily computed measurement³ of trends in farm-retail price spreads or unit marketing charges and of the portions of the consumer's retail food dollar that go to farmers and other groups in the economy. Data are available to meet demands for current use,

³ Problems in developing methods for computing these series for many food products are neither simple nor uncomplicated, but once established, actual computation of the series is relatively straightforward.

TABLE 2.—*Farm food products: Indexes of retail cost, farm value, and marketing margin, annual 1929-55*¹

(1947-49=100)

Year	Retail cost	Farm value	Marketing margin
1929-----	66	56	77
1930-----	64	50	78
1931-----	52	37	66
1932-----	43	27	59
1933-----	42	27	² 56
1934-----	47	32	² 59
1935-----	53	41	² 62
1936-----	53	43	63
1937-----	55	46	64
1938-----	50	39	61
1939-----	48	37	59
1940-----	48	39	58
1941-----	53	47	59
1942-----	62	59	65
1943-----	70	72	² 69
1944-----	69	71	² 70
1945-----	70	75	² 70
1946-----	80	85	² 79
1947-----	98	101	95
1948-----	104	106	102
1949-----	98	93	103
1950-----	97	92	101
1951-----	107	106	109
1952-----	108	103	114
1953-----	106	96	115
1954-----	104	91	117
1955 ³ -----	102	85	119

¹ Data for 1946 and later years are for a market basket of farm foods representative of those bought by urban wage-earner and clerical-worker families in 1952. For the years before 1946, the series were derived from data for a market basket containing the average annual quantities of farm foods purchased per family of 3 average consumers in 1935-39. Index numbers were computed by "linking" the series at 1946. The dollar figures for the market-basket series, which are published currently in *The Marketing and Transportation Situation*, can be converted to index numbers by dividing by the following 1947-49 averages: Retail cost, \$955; farm value, \$468; marketing margin, \$487.

² Adjusted for Government processing taxes and payments to processors during 1933-35 and 1943-46.

³ Preliminary estimates.

not only for the market basket and food commodity groups but also for many individual food products.

The principal limitation of the series, in addition to the inadequacy of available price data, is that it applies only to the farm-to-retail-store marketing channel. Not fully measured are the effects of changes in marketing channels used and in services provided by processing and distribution agencies on the distribution of the consumer's food dollar.

Aggregate Food Expenditures and Marketing Charges

Annual estimates of aggregate charges for marketing all farm food products from farm sale to retail-store level are developed in the "marketing-bill" series, which is published regularly in *The Marketing and Transportation Situation*.⁴ Other statistics in this series are "retail cost" and "payment to farmers," total and by major commodity groups. Retail cost represents estimated cost at retail-store prices of all domestic farm foods that were both sold by farmers and bought by United States civilian consumers. The payment to farmers is the total cash receipts of farmers from the marketing of these food products (adjusted for imputed value of nonfood by-products). These estimates of retail cost and the marketing bill reflect variations in total volume of food marketed, variations in marketing margins, and effects of changes in marketing services associated with changes in relative importance of various foods bought by consumers—for example, a shift from flour to bread.

In computing these statistics, cash farm receipts from sales of food products are adjusted to eliminate (1) food sales not reaching domestic civilian consumers and (2) imputed values of nonfood byproducts. In general, estimates of the retail-store cost of a commodity or product group are made by dividing adjusted cash farm receipts by the farmer's share for the individual commodity or product group. The accuracy of the estimated retail cost depends primarily on the reliability of cash farm receipts as adjusted and the estimates of the farmer's share of retail price. Although retail prices are available for most of the important food products, they are not available for many processed and packaged food products. Increased marketing services provided to consumers in some of these products may not be reflected fully in this series. Where reasonably good estimates of prices and volume can be made, allowance is made for effects of changes in marketing services, such as the increased proportion of potatoes sold in the form of potato chips or the

⁴ For most recent statistics, see the July and October 1955 issues of *The Marketing and Transportation Situation*.

additional cost resulting from the shifts to smaller can sizes for canned fruits and vegetables.

We know that much food is bought through outlets other than retail stores and that the proportion of total food bought in retail stores varies; hence, a different measurement is needed to reflect these changes in marketing services. The market value of all farm food products given in table 3 estimates total consumer expenditures for all farm food products—valued at its price at the place in the marketing system where it was bought by consumers.⁵ The market value in table 3 was derived by adjusting the retail-store cost in the “marketing-bill” series for the extra costs of food sold through restaurants and other eating places and for the lower costs of food bought directly from producers or wholesalers and jobbers selling below retail prices.⁶ The aggregate marketing charges given in table 3 thus reflect the effects of changes in volume, unit marketing costs, and most of the changes in marketing services provided. This series, therefore, provides a more appropriate basis for measuring what part of total consumer expenditures for food does go back to the farmer. And as such, it provides a better starting point for analysis of changes in the division of the food dollar, the changes in resources employed in the farm production, processing, and distribution of these products related to changes in unit marketing costs, volumes, and marketing services.⁷

⁵ This series is not comparable with expenditures for food as reported by the United States Department of Commerce, because it does not include expenditures for seafoods; imported products such as coffee, tea, bananas, and pineapples; food consumed on farms where produced; and value of food bought by the Armed Forces. Differences in methods of estimating result in other variations between the two series.

⁶ Market value and retail value of all civilian food, by various channels of distribution, for the years 1939 and 1948 were estimated by Marguerite C. Burk in an article, “Distribution of the Food Supply of the United States,” published in this journal, July 1952. Miss Burk assisted in the development and interpretation of the market-value series used in this article.

⁷ Data from this series for years 1940, 1945, and 1955 were used in MARKETING COSTS FOR FOOD. U. S. Dept. Agr. Misc. Pub. 708, Dec. 1955. See p. 11 of this pamphlet for a preliminary estimate of the effects of increased services, cost levels, and added volume in the increase in the marketing bill between 1940 and 1955.

TABLE 3.—*Total market value, payment to farmers, and aggregate marketing charges for farm food products purchased by domestic civilian consumers, 1929–55*¹

Year	Market value	Payment to farmers	Aggregate marketing charges
	<i>Billion dollars</i>	<i>Billion dollars</i>	<i>Billion dollars</i>
1929.....	16.8	7.2	9.6
1930.....	16.1	6.3	9.8
1931.....	13.3	4.7	8.6
1932.....	10.7	3.4	7.3
1933.....	10.7	3.6	² 7.0
1934.....	11.9	4.3	² 7.3
1935.....	12.4	5.0	² 7.1
1936.....	13.8	5.8	8.0
1937.....	13.6	6.0	7.9
1938.....	13.3	5.2	8.1
1939.....	13.5	5.2	8.3
1940.....	14.5	5.6	8.9
1941.....	16.9	7.1	9.8
1942.....	20.9	9.3	11.6
1943.....	23.9	11.4	³ 12.6
1944.....	24.4	11.6	³ 13.3
1945.....	26.8	12.6	³ 14.9
1946.....	33.5	15.7	³ 18.3
1947.....	39.2	18.7	20.5
1948.....	42.1	19.2	22.9
1949.....	41.2	17.1	24.1
1950.....	42.0	17.7	24.3
1951.....	46.9	20.3	26.6
1952.....	48.8	20.2	28.6
1953.....	49.4	19.3	30.1
1954.....	49.9	18.8	31.1
1955.....	50.8	18.3	32.5

¹ The market-value estimates are in terms of the cost of food at the various levels of distribution bought by consumers. They represent the cost of all domestic farm foods that were both sold by farmers and bought by civilian consumers in this country. Payment to farmers is adjusted to eliminate imputed value of nonfood by-products. The marketing bill is the difference between the market value and the payment to farmers, adjusted for processing taxes and Government subsidies for certain years.

² Excludes estimated processing taxes.

³ Includes Government subsidies.

The principal limitations to the use of this series are the rough approximations required to estimate the statistics in this series and the fact that no data are available for current measurements and that it is not possible to estimate data for commodity groups or individual products.

Value-Added Measurements

“Value added by manufacture” is a statistic that for many years has been used by the United States Bureau of the Census in its periodic Census of Manufactures. Value added is calculated, according to the Bureau, “by subtracting the cost of

TABLE 4.—*Value added by agriculture and by food processing as related to market value of farm food products, selected years, 1929-53*

Year	Market value of food	Agriculture		Food processing	
		Actual	Percentage of market value	Actual	Percentage of market value
	<i>Billion dollars</i>	<i>Billion dollars</i>	<i>Percent</i>	<i>Billion dollars</i>	<i>Percent</i>
1929-----	16. 8	6. 0	36	2. 7	16
1933-----	10. 7	2. 9	27	1. 8	16
1935-----	12. 4	4. 0	32	1. 9	15
1939-----	13. 5	4. 1	30	2. 5	18
1947-----	39. 2	13. 9	35	6. 2	16
1949-----	41. 2	12. 9	30	6. 5	16
1951-----	46. 9	14. 7	31	7. 5	16
1953-----	49. 4	13. 8	28	8. 4	17

materials, supplies, containers, and contract work from the value of products shipped." This statistic "provides the most satisfactory census measure of the relative importance of given industries * * *." In the application of this concept to agriculture, value added measures the gross returns received by agriculture for its labor and capital, excluding the cost of production materials and other services furnished by the nonagricultural part of our economy.

Conceptually, consumer expenditures for farm food products can be divided into the different value-added components that represent the gross returns of each industry or group for its labor and capital. Some of the principal industries or groups would be agriculture, food processors, transportation agencies, wholesalers, retail food stores, and restaurants. Value added should give the most meaningful measurement of the distribution of the consumer's food dollar because it provides an unduplicated measurement of the gross returns received by various groups.⁹

Value added components for agriculture and food processors in selected census years from 1929 to 1953 are estimated in table 4. Value added by

food processors was derived from statistics in the various Censuses of Manufactures, with deductions made for imported, nonfarm, and nonfood processed products, such as cocoa products, seafoods, and prepared animal feeds. Estimates of value added by agriculture in table 4 and those used to derive line C in figure 1 were obtained from estimates of gross national farm product (or value added by agriculture).¹⁰

As a proportion of the market value (or consumer expenditures) for farm food products, value added by food processing accounted for a relatively stable segment in the period from 1929 through 1953, varying from 15 to 18 percent, with no significant trend evident. Agriculture varied from 36 percent in 1929 to 27 percent in 1933, and from 35 percent in 1947 to 28 percent in 1953. The greater fluctuations in agriculture's share may reflect partly the relatively greater fluctuation in prices of farm products. Because value added is measured in terms of current dollars, the sharp decline in the percentage going to agriculture between the years 1929 and 1933 was caused primarily by the sharp decline in prices received by farmers relative to other prices in the economy. But some of the relative decline in agriculture's share between 1929 and 1953 reflects the increased importance of processed foods in that period.

Comparison of the Three Series

Let us now examine the trends in the farmer's share of the consumer's food dollar in figure 1 as measured by the three different series. The farmer's share of total consumer expenditures for farm food products (series B) has declined relative to the farmer's share for the market basket of food products (series A). One of the primary reasons for this difference in trend between the

⁸ U. S. BUREAU OF THE CENSUS. ANNUAL SURVEY OF MANUFACTURES: 1953. Washington, D. C. U. S. Government Printing Office, 1955, pp. 10 and 11.

⁹ The application of the value-added concept to production and marketing of agricultural products, food and non-food, was discussed in an article, "The Marketing Bill for Agricultural Products," this journal, October 1955. Statistics on value-added components were estimated for the year 1954.

¹⁰ A value-added statistic for the total agricultural industry was first published in 1951 by John W. Kendrick and Carl E. Jones in an article, "Gross National Farm Product in Constant Dollars, 1910-50," in the September 1951 issue of *Survey of Current Business*. These statistics have been revised and extended in later issues of the *Survey of Current Business*. Gross national farm product, excluding the gross rental value of farm homes, was adjusted for the proportion that farm marketings of food products (to which the statistics in table 3 relate) were of total farm output. This adjustment was derived from data on the utilization of farm products given in MEASURING THE SUPPLY AND UTILIZATION OF FARM COMMODITIES. Agricultural Handbook 91, U. S. Dept. Agri., Agr. Market Serv., Nov. 1955.

two series is the growing importance of consumer purchases of food products through marketing channels providing more services to the consumers which, therefore, adds to the cost per unit of food bought. This shift between marketing channels is reflected in the series B statistics but not in the market-basket statistics which measure the marketing margin and farmer's share for food products bought through one specific marketing outlet—the retail food store.

During the period 1929 through 1955, an increasing proportion of food has been bought through restaurants and other eating places. This trend was particularly marked during World War II, when many housewives entered the labor market and took jobs away from home. It was also during this period that the sharpest differences in the trends of the two series (A and B) took place. During low income periods, consumers are more likely to economize on amounts of marketing services bought with their foods and to make more purchases direct from farmer-producers, hucksters, wholesalers, or other groups that will minimize their cash outlays for food. Although statistical measurements of the importance of direct farm-to-consumer sales and other channels of distribution below the retail-store level are difficult to estimate for all food products, statistics are available on the proportion of fluid milk retailed by farmers. Between 1934 and 1954, for example, the proportion of all milk marketed by farmers that was sold direct to consumers declined from 10 percent to 3 percent.

Changes in the kinds of food bought and changes in marketing services associated with these shifts also affect the trends in the farmer's share of the consumer's food dollar as given by these two measurements. These shifts in the pattern of food purchases over a long period are reflected to some extent in the market-basket series because of periodic changes in weights. One factor not reflected in the market-basket series is the growing importance of the urban population which increases transportation and other services required. In general, urban consumers, with smaller families than formerly and with many wives employed away from home, tend to buy more processed foods and in smaller units than rural families.

Some of the effects on the farmer's share of consumers buying more processed and ready-

prepared foods, which involve more marketing services, have been offset by the increasing importance of animal products which, in general, have a higher farmer's share than some of the other products. During recent years this has kept *trends* in the farmer's share from these two series (A and B) in closer relationship than might have been expected. For example, volume of products marketed for civilian consumption (weighted by 1947-49 average retail prices) indicates that total volume of bakery and cereal products has increased only slightly during the last 25 years, while volume of poultry and egg products has more than doubled. The farmer's share for bakery and cereal products is the lowest of any major product group; for poultry and eggs it is the highest.

In each of the individual food groups there has been a marked trend toward more processing and other services, but the rapid rise in marketings of poultry and eggs and the somewhat slower rise in all meat products have tended to reduce the overall impact of added marketing services in reducing the farmer's share. With available information, no completely satisfactory measurements or conclusions can be made concerning the overall effect of added marketing services. In many instances more marketing services may be provided at less cost to consumers because increased processing may result in marked economies in the transportation and distribution of the product.

The farmer's share of the consumer's food dollar as measured by series C—the value added by agriculture as a proportion of total consumer expenditures for farm food products—has declined in the period 1929-55 relative to measurements of both series A and B in figure 1. All of the factors discussed which affect the differences in marketing services between series A and B would also hold true in comparisons between series A and series C. The principal difference between series B and C is that the farmer's share is measured not in terms of farmers' cash receipts from sale of food products but in terms of their cash receipts minus cash farm expenditures for such items as motor fuels, fertilizers, and other purchased production supplies. These purchased production supplies have become increasingly important during this 25-year period. Therefore, the farmer's share of the consumer's food dollar as measured by value added

has declined relative to the farmer's share as measured by any of the more usual comparisons of farm and retail prices or incomes and consumer food expenditures.

Each of the measurements in the three series of the farmer's share and the share of the marketing agencies (including any breakdowns that might be made according to agency or function) relates to gross returns, not net returns. Neither are they measurements of the equity of the share received by various groups. It is important to note that the farmer's share is as much a measurement of gross returns as are marketing agencies' shares. For example, the poultry producer's share of the consumer's egg dollar averages from three to four times as large as the wheat farmer's share of the consumer's bread dollar; but obviously this does not tell us anything about the relative profitability of egg production versus wheat farming. It is true that the farmer's share, on the average, does tend to vary with the ups and downs of the parity ratio.

Trends in the farmer's share also are related to trends in net farm income. But, as shown in figure 1, trends in the farmer's share may be quite different if the full effect of changes in marketing services are considered. The wheat farmer's share of the consumer's dollar spent for products made from wheat may decline because consumers buy more bread and bakery products and less flour. Likewise, consumers may buy more eggs in the form of cake mixes and other processed and prepared foods, and less in the fresh form, with a resulting decline in the farmer's share of the consumer's dollar spent for eggs and egg products. In these examples the farmer's share may decline over time with no change in net returns to farmer-producers. However, the increased importance

of processed foods may be beneficial in terms of providing more outlets for these farm products.

Value added provides the most satisfactory measurement conceptually of gross returns received by each industry or group concerned with the production, processing, and distribution of food. It is a "net" measurement in the sense that value added by any firm, industry, or group excludes the cost of materials and supplies furnished by other firms, industries, or groups. It is not, of course, a measurement of productivity or efficiency by itself. Inputs of labor and capital in each industry or group would have to be measured against its value added to provide suitable bases for comparing relative returns of various industries. One of the principal limitations of value added measurements is the difficulty of making computations on anything but a total industry approach. Value added for agricultural food production, and particularly for different commodity groups or individual products, is extremely difficult to compute with available data. In addition, the concept would not be easily understood by many users of the data.

The reader is cautioned that many of the statistics estimated for this article, particularly those for series B and C, are based on meager and inadequate data. The primary purpose of this article was not to come up with exact measurements but to explore and discuss various types of comparisons and analyses that might be made in the measurement of the farmer's share and related statistics. It is believed that the statistics computed for this article were adequate for these purposes. If the various measurements possible with series B and C are desirable, then more satisfactory data should be developed for these calculations.