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A method for computing agricultural parity based on regional cost and income data

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A METHOD FOR COMPUTING AGRICULTURAL PARITY
BASED ON REGIONAL COST AND INCOME DATA

by ¹⁶

Wayne Arthur Fuller

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
MASTER OF SCIENCE

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Signatures have been redacted for privacy

Iowa State College

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INTRODUCTION

The concept of parity has become increasingly important in agricultural policy during the past 25 years. On occasion a disparity between farm and non-farm incomes has been recognized by both farm and urban peoples. However, the accurate measurement of this differential has proved exceedingly difficult.

The parity concept, developed during the late 1920's and early 1930's, has been subject to considerable criticism, revision, and discussion since that time. Since 1933, when parity was incorporated into law by the Agricultural Adjustment Act, revisions in the definition and construction of parity indexes have been the result of Congressional action.

E. W. Grove, in 1943, said of parity:¹

...the concept as we now know it did not spring full blown from the brain of some economic Jupiter, but rather grew out of the continuous groping for a concrete measure of justice for the farmer, and was steadily modified by conditions prevailing in the economic life of farmers and the nation. In other words, parity did not develop as the practical application of an economic theory immaculately conceived, free from all taint of original sin in the form of class interest. On the contrary, parity, like Topsy, just grewed; and whatever economic justification can be found for it in its present form may be considered largely a rationalization.

¹Grove, E. W. The Concept of Income Parity for Agriculture, Studies in Income and Wealth, Vol. VI, New York, National Bureau of Economic Research, 1943. p. 109.

However, the parity price ratio has come to be widely used as an index of agricultural prosperity, and newspapers report the monthly changes in the ratio. Price supports are tied closely to percentages of parity. In fact, the percentage of parity at which the "basic crops" were to be supported has often been fixed by Congress. For instance, 1956 was the first year since the war that the Secretary of Agriculture exercised discretion in setting the loan rates for corn below the 90 per cent of parity level.

The concept of parity for agriculture has played a dominant role in the thinking of farmers and legislators and in the determination of governmental policy, and will no doubt continue to do so. Therefore, an appraisal of the existing parity formula, and the consideration of an alternative parity formula, were chosen as the objectives of this thesis.

INCOME POSITION OF AGRICULTURE

The income problems of agriculture might be divided into two kinds - problems of level, and problems of stability. The instability of agricultural income can be largely explained by the variations in the supply and demand for agricultural products and the low elasticities of supply and demand for these products. The demand for most farm products is inelastic¹, being less than unity for most important commodities. While it is difficult to derive the elasticities of supply for individual products, the stable production of agriculture in the aggregate indicates that the total supply is relatively inelastic. Because of the low price elasticities that characterize the supply and demand relationships for farm products shifts in supply and/or demand induce relatively large fluctuations in price. Since a considerable portion of the costs of agricultural production are fixed or relatively inflexible, these price fluctuations result in even greater fluctuations in net income to producers. (The individual producer in agriculture has no appreciable influ-

¹Elasticities of demand for most livestock products, using retail prices and domestic consumption as variables, range between -0.5 and -1.0. If demand elasticities at the farm price level are derived from these they center around -0.5 Most of the demand elasticities at the farm level for selected crops are less than unity, and a few are between zero and -0.5. Quoted from Fox, Karl, A., The Analysis of Demand for Farm Products. USDA Technical Bulletin No. 1081, 1953, p. 4.

ence on price.) The individual has only limited control over crop production, year to year variations in yields being largely determined by weather and natural phenomena.

The often cited hog cycle is an example of short run fluctuations in the supply of livestock products. Commodity cycles of this type stem from the fact that periods of considerable length are involved in the agricultural production process. Hog producers projecting current price relationships into the future tend to underproduce following unfavorable price relationships and overproduce following favorable price relationships. Fluctuations in demand associated with general economic activity coupled with the irregular production of the individual producer have resulted in characteristically unstable incomes in agriculture.

Agriculture as an industry has been declining relative to the remainder of the economy. The percentage of the national income originating in agriculture has declined from an average of 14.5 per cent during the period 1910-14 to an average of 6.8 per cent during the six years 1950-55.¹ Also, there has been a decline in the absolute number of persons on farms. The number of workers on farms has declined from 13,555,000 in 1910 to 8,190,000 in 1955.² Innovations have

¹ Agricultural Marketing Service, USDA, The Farm Income Situation, July 17, 1956. pp. 20-22.

² Agricultural Marketing Service, Agricultural Research Service, USDA, Agricultural Outlook Charts, 1956, Wash., D. C., Nov. 1955.

been making it possible to replace labor with capital. The fact that machinery per worker in agriculture was approximately four times as great in 1955 as in 1940 illustrates this point.¹ Farm families are characteristically larger than non-farm families. This high reproductive rate of farmers coupled with a decreasing requirement for farmers tends to have a depressing effect on labor incomes in agriculture. These factors, however, do not explain the persistence of low income areas in American agriculture. Areas of this type seem to be self-perpetuating. The birth rate is generally high in these areas and young people are often handicapped by a poor education which neither prepares them for alternative occupations nor makes them aware of alternative income opportunities.²

Figures published regularly by the USDA³ show average per capita net farm income at about 50 per cent of the per capita non-farm income from 1949 to 1954. These figures probably overstate the differential between average farm and non-farm incomes. Products consumed in the home are valued

¹Ibid., p. 61. The value of machinery per worker was divided by the index of prices paid for machinery to obtain an index of the quantity.

²Shultz, Theodore W., *The Economic Organization of Agriculture*, New York, McGraw-Hill, 1953. Chapter 10.

³*The Farm Income Situation*, op. cit., p. 13.

at prices received by farmers, yet these products if purchased in retail stores would cost approximately twice as much. Often the net income figures for farmers include only income from farming. Many farmers have part time employment in cities and towns and hence the net income of farmers is larger than the net income from farming. It is also possible that there is a difference in purchasing power between urban and rural areas¹, which favors farmers. If this is true the income of farmers will purchase more goods and services than would the equal dollar income in cities.

John D. Black showed that adjusting the income data for the above factors and for differences in size of farm and non-farm families would raise the figures given for average farm incomes in 1940². The apparent discrepancy between farm and non-farm incomes might be further reduced if comparisons were made on a regional base; over one-half of the farm population is located in the south where farm incomes tend to be below the national average.

Despite these features of income data, it is generally agreed³ that the average monetary income of farm people has

¹Koffsky, Nathan. Farm and Urban Purchasing Power, Studies in Income and Wealth, Vol. II, New York, National Bureau of Economic Research, 1949. pp. 153-178.

²Black, John D. Parity, Parity, Parity, Cambridge, Harvard Committee on Research in the Social Sciences, 1942. p. 113.

³Shepherd, Geoffrey S. Agricultural Price and Income Policy. Ames, The Iowa State College Press, 1952. Chapter 2.

been below that of non-farm people, except for the period immediately following World War II.

EVOLUTION OF THE PARITY CONCEPT

The parity concept was first incorporated in legislation in the Agricultural Adjustment Act of 1933. The stated objective of this act was to

re-establish prices to farmers at a level that will give agricultural commodities a purchasing power with respect to articles that farmers buy equivalent to the purchasing power of agricultural commodities in the base period.¹

The designated base period was August, 1909 - July, 1914, except for tobacco for which the base period was August, 1919 - July, 1929.

The prices paid and prices received indexes had been constructed before the act was passed. G. F. Warren had published an index of prices received by producers in a USDA bulletin in 1921 using the August, 1909 - July, 1914 base period.²

New indexes of prices paid were published in 1924 and revised in 1934 using more products, improved price series, and the period 1924-29 as the weight base period.

The index of prices paid by farmers was published by the Bureau of Agricultural Economics in 1928. With the

¹U. S. Congress, 73rd, 1st sess. Agricultural Adjustment Act, May 12, 1933, Public Law 10, Wash., D. C., U. S. Govt. Print. Off., 1947.

²Warren, G. F. Prices of Farm Products in the United States, USDA Dept. Bul. 999, 1921.

passage of the Agricultural Adjustment Act of 1933 this index became the parity index. This index has been revised and amended several times since 1933. Interest and taxes were added in 1935, and both indexes were revised in 1950 by the USDA in compliance with the acts of 1948 and 1949. Both indexes now use the base period January, 1910 - December, 1914 and the period 1937-41 as the period determining commodity weights. The parity index now includes about 350 commodities and interest, taxes, and wage rates.¹ Parity prices were computed by multiplying the price in the base period by the current index of prices paid by farmers.

The Agricultural Act of 1948² introduced modernized parity. This changed the base for computing relative prices used in computing parity prices to the previous ten year period. Modernized parity was to be computed as follows:

$$\text{Parity price} = \frac{\text{Average price received for the commodity in the past ten years}}{\text{Average index of prices received by farmers (1910-14 = 100) in the past ten years}}$$

X Current year index of prices paid by farmers (1910-14 = 100)

¹Stauber, B. R. The Parity Index and the Farm Expenditure Survey, Journal of Farm Economics, Vol. XXXVIII, No. 2. May, 1956.

²U. S. Congress, 2nd sess. Agricultural Act of 1948, Public Law 897, Wash., D. C., U. S. Govt. Print. Off., 1948.

Provision was also made in this law to vary the levels of support prices inversely with the size of crop. The schedule of supports was fixed by Congress. The Agricultural Act of 1949¹ altered the schedule of supports so that the support levels varied from 90 per cent to 75 per cent of parity as the supply percentage varied from 100 per cent to 150 per cent of "normal supply".

These provisions have been used in support operations only recently. Congress, prior to 1954, on several occasions specified the supports at 90 per cent of the old parity level for corn and other "basics".

Parity income formulas have seldom played direct roles in agricultural policy. However, the "maintenance" or "re-establishment" of farm incomes to a "fair" level has been the stated or implicit objective of much legislation. The first definition of parity income appeared in the Soil Conservation and Adjustment Act of 1936. A stated purpose of this act was the

reestablishment, at as rapid a rate as the Secretary of Agriculture determines to be practicable and in the general public interest, of the ratio between the purchasing power of the net farm income per person on farms and the income per person not on farms that prevailed during the five year period August, 1909 - July, 1914, inclusive as determined from statistics available in the United States

¹U. S. Congress, 81st , 1st sess. Agricultural Act of 1949, Public Law 439, Wash., D. C., U. S. Govt. Print. Off., 1949.

Department of Agriculture and the maintenance of such ratio.¹

This definition was subjected to criticism and discussion of interpretation.²

The Agricultural Adjustment Act of 1938 altered the definition of parity income to:

'Parity' as applied to income shall be that per capita net income of individuals on farms from farming operations that bears to the per capita net income of individuals not on farms, the same relation as prevailed during the period from August, 1909 - July, 1914.³

The USDA published indexes of agricultural income using this definition of income parity. In interpreting the law, the USDA included: (1) Cash receipts from marketing, (2) Value of products consumed on farms (valued at prices received by farmers), (3) Rental values of farm dwellings, (4) Wages of farm labor living on farms; and excluded: (1) Production expenses, (2) Off-farm income to people living on farms (3)

¹U. S. Congress, 74th, 2nd sess. Soil Conservation and Allotment Act an Amendment to the Soil Conservation Act, Public Law 461, Sec. 7(a), (5). Original not available for examination. Cited in Stine, O. C. Income Parity for Agriculture, Studies in Income and Wealth, Vol. I, New York, National Bureau of Economic Research, 1937. p. 327.

²Stine, O. C. Income Parity for Agriculture. Studies in Income and Wealth, Vol. I, New York, National Bureau of Economic Research, 1937. pp. 327-348.

³Agricultural Adjustment Administration, USDA, Compilation of Soil Conservation and Domestic Allotment Act as Amended, Agricultural Adjustment Act of 1938 as Amended, and others, Wash., D. C., U. S. Govt. Print. Off. 1945. p. 17.

Interest and rent paid to persons not on farms. This figure was computed as a per capita value and compared with per capita non-farm income. When per capita farm income from farming was .276 of per capita non-farm (the ratio during the base period) the parity income index was 100.

The income for persons in agriculture was computed using only income from agriculture, while the income computations for persons in the non-farm segment included income from agriculture. Income from non-farm sources varied between 35 (1934) and 20 (1946) per cent of the total income of persons living on farms during the period 1934-55.¹ The exclusion of an item of income this large would seem to reduce the validity of the 1938 method of measuring the relative income position of farmers and non-farmers. The concept of a relationship between non-farm and farm income might have been considered valid if income from all sources were included. In this case, one might have reasoned that the relationship measured the preference for living in rural areas and/or other factors not easily measured.

Other problems in income measurement were associated with the use of the 1938 definition of income parity. In computing parity income using this definition, the USDA valued products at prices received by farmers. If these products

¹Agricultural Marketing Service, USDA, The Farm Income Situation, July, 1956. p. 20.

were valued at retail prices farm incomes would appear closer to non-farm incomes. The valuation at retail prices would tend to raise farm incomes a larger per cent in times of depression as compared to times of prosperity. This is due to the fact that the farmers' share of the consumer's dollar is lower in times of depression (marketing margins tending to remain relatively constant) and that home-produced products make up a greater proportion of farmers' income during periods of low farm prices. The use of a ratio tends to reduce the difference introduced by the two methods of evaluation, but the valuation prices received still tends to show farmers at a more disadvantageous position in times of depression than would valuation at retail prices.

The rental valuation of farm homes is difficult because of the differences in location and modern conveniences associated with the two types of dwellings. The city home is located on a lot of considerably higher value and building and maintenance costs and taxes will probably be higher. Further, these two types of homes may not be of comparable size or convenience.

In 1948 Congress again changed the definition of parity income. In the Agricultural Act of that year parity income was defined in the following manner:¹

¹U. S. Congress, 80th, 2nd Sess. Agricultural Act of 1948, Public Law 897, Wash., D. C., U. S. Govt. Print. Off., 1948.

'Parity' as applied to income, shall be that gross income from agriculture which will provide the farm operator and his family with a standard of living equivalent to those afforded persons dependent upon other gainful occupations.

To date no computations have been published using this definition. The parity price formula and parity ratio remain the predominant tool used in comparing the economic status of farm and non-farm people.

APPRAISAL OF THE PRESENT PARITY PRICE FORMULA

Before appraising the present parity formula it is necessary to differentiate between the statistical accuracy of the formula and the adequacy of the formula as a measure of relative economic status. The parity price index does reflect changes in the prices of items farmers purchase, just as the numerator of the parity ratio, the prices received index, does reflect changes in the prices received by farmers.

It would appear that the parity concept was incorporated into legislation on the assumption that the conditions in the base period were in some sense "desirable" and further that it was desirable to duplicate these conditions as nearly as possible. Was the purpose to merely perpetuate a price relationship? This is doubtful. Certainly the income problem in agriculture was the motivating force for the agricultural legislation. In fact, the 1936 act stated as a purpose the "reestablishment" of a parity income, and one of the stated objectives of the 1956 act was to protect farm income.

It seems that parity formula has been used as a measure of the relative economic status of farmers and non-farmers. It would be more accurate to say that the parity ratio has been used to measure the position of farmers and non-farmers relative to the base period. The ratio becomes an absolute

measure only to the extent that relationships existing during the base period are designated the proper ones.

The desirability of protecting or raising farm income is not the concern here. Rather, the question is, how accurately does the parity price formula measure the cost and income position of farmers?

Even if a parity ratio of 100 also meant that farmers were receiving parity net income, a ratio of 90 would not mean that farmers were receiving 90 per cent of parity net income.¹ Since production expenses are about two-thirds of the cash receipts of farming, a price change of one per cent will result in a change in farmers' net income of approximately three per cent. This means that if farmers are in a position with prices received, prices paid, and net income on a basis of 100, a drop in prices received to 99 will result in a parity ratio of 99, and a net income index of 97.

During the 1910-14 period, net income averaged approximately one-half of gross income while in recent years it has been closer to one-third. As the net income becomes a smaller per cent. of sales, the fluctuations in net income

¹It has been estimated that from 1940 through 1948 income parity (using the 1938 definition) would have been achieved with a parity price ratio of about 90. Fox, Karl A. The Relationship Between Parity Price and Parity Income as Defined in the Agricultural Adjustment Act of 1938. (Unpublished Manuscript). 1949.

associated with a change in price relationships become wider.

Now the question becomes, how accurately do the price indexes actually reflect the cost and income situation of farmers? Shepherd¹ has pointed out several deficiencies associated with the use of the present parity price formula as such a measure. The parity price formula reflects only changes in price per unit of inputs. It is not an index of costs incurred by farmers. Although the relative weights used for various items included in the index are based on the period 1937-41 rather than 1910-14, this does not account for changes in absolute quantities used. For instance, if it now takes half (or twice) as much fertilizer, machinery, etc. to produce a bushel of corn as in the base period, a farmer will receive twice (or half) the parity income per bushel of corn at the parity price that he did during the period 1910-14.

However, it is doubtful if farmers are concerned directly with the profit per unit. Their concern is with their net income. This is determined by the profit per unit multiplied by number of units produced. If a farmer's productivity has increased from 4,000 bushels of corn per year to 5,000 (using a similar quantity of inputs), he would receive 25 per cent more gross income at the parity price now

¹Shepherd, Geoffrey. What Should Go into the Parity Price Formula, *Journal of Farm Economics*, Vol. XXXV, No. 2. May, 1953. pp. 159-172. The following appraisal is drawn primarily from the above reference and Shepherd, Geoffrey, Beneke, Raymond, and Fuller, Wayne. *Alternative Parity Formulas for Agriculture*. (Unpublished Manuscript) Iowa Agricultural Experiment Station, Jan. 2, 1957.

than he would have at the parity price in the base period. If productivity increased a similar amount in the non-farm segment, so that non-farmers were also receiving a greater income, then the farm income might still be considered on a parity with non-farm incomes. However, if technology advances at a rate favoring one segment of the economy, parity prices cannot be expected to provide parity of income.

Technological advances may result in the substitution of capital inputs for variable cost items. Although the prices of such capital inputs as tractors and machinery are included in the computation of the prices paid index, their importance is determined by the weight base period. No direct allowances are made in parity computations for the fact that a larger investment per farm operator may now be necessary than during the base period.

The parity ratio is computed from indexes for the United States as a whole. This means that the ratio cannot be expected to reflect the situation within an area, since different resources and different resource combinations are used in the individual areas. Such items as corn cultivators, potato diggers, chicken wash and milk pails are included when computing the parity price of wheat. The importance of various items varies considerably between regions which specialize in different products. Also, the relative importance of items is changing at varying rates in different

regions.

It appears that the parity index and parity ratio when used as a basis for price setting and as an indicator of agriculture's income position is deficient in that it does not accurately reflect cost or income situations, since it measures only price changes. The different combinations of resources used in an area are not reflected in the formula since it is computed for the United States as a whole. The longer the lapse of time between the base period and the period under consideration the more important become these deficiencies.

AN ALTERNATIVE PARITY CONCEPT

If a formula is to more accurately reflect the cost and income situation of farmers, it is necessary to include the actual production and input quantities in the computations. Further, it is desirable to derive such data for areas or regions smaller than the United States as a whole. Computation on an area base makes possible better estimates of costs associated with individual enterprises and makes possible comparisons of the changing income position of various groups of farmers.

The purpose here, therefore, is to design a parity formula containing the actual quantities and prices of inputs (cost) and the actual quantities and prices of outputs (income).

The problem of obtaining the quantities and prices of expense items is primarily one of obtaining accurate statistics. Obtaining the quantities of capital and the labor input used in production is a similar problem. However, the valuation of these latter inputs is more difficult. Further, the method used to value these latter items in effect determines the parity net income of farmers.

If these inputs are valued at returns in the non-farm segment, parity income could be defined as the income which provides returns to the resources engaged in agricultural production equivalent to the returns of similar resources

employed in non-agricultural production. The following method of valuation is an attempt to approximate this definition.

Return to Land and Working Capital

It would be desirable to value the services of farm capital at the same rate as that received on capital invested in the non-farm segment. If a non-farm interest series is used, it should represent risk and term situations similar to those faced by farmers in their use of capital. Such non-farm loans as inventory loans probably do not represent situations of the type faced by farmers. Yields of stocks might be used but the actual earnings of this type of capital are often difficult to determine. The difficulties associated with the use of non-farm returns suggests the use of interest rates actually paid by farmers. Rates on short term loans represent the cost of the services of capital facing farmers and the return they could obtain if they made loans in their community.

The valuation of the services of land is more troublesome. It is realized that farm prices are a primary determinant of land values, so the correct valuation of the services of land for price and income policy purposes is doubly dangerous.

The current value of land may not represent the actual cost of this resource to the farmer since he may have purchased land at either a higher or lower price, but the current value does represent an opportunity cost value to those who own farmland. Although farm land has few alternative uses, its ownership is not restricted to farmers. Investing in land is one of many alternative uses to which investors can put their capital. Therefore, with mobility of funds, capital invested in land should yield a return comparable to that from other capital investments (where hazards and utility of ownership are also comparable). In this study, short term and mortgage interest rates were used to value the service of working capital and land. Alternative methods of valuation could be used without altering the computational procedure outlined in later sections. Preliminary use of non-farm interest rates indicated results little different from those presented. It would also be possible to value land by assigning part of the total product to land on the basis of share rents without altering the basic procedure presented.

Return to Labor

Assigning a return to the labor* resource employed in

*In this study no distinction is made between the management and labor inputs of the farm operator. Labor return, as used, is the return to the operator for his personal services.

agriculture presents the most difficult problem. If it were possible to select occupations in the non-farm segment which were in some sense comparable to farming it would be possible to assign a return to farm labor and management in line with wages in these occupations. Many problems immediately arise at this point. As pointed out previously, farmers consume considerable quantities of home produced food and also occupy a dwelling which may be of different value than that occupied by persons in the rest of the economy.

In addition there may be other reasons why the monetary income could not be considered equivalent. The city worker may have to drive considerable distances to work, his occupation may require different outlays for working clothing, and he may receive more "fringe" benefits (the city worker may be protected in case of accident or receive other indirect benefits). Even if these items can be correctly evaluated the problem of evaluating the intangibles associated with different occupations remains. These range from the freedom of action and work in the open associated with farming to the nearness of theatres, museums and bars, and the presence of crowds and excitement associated with urban employment. Probably the simplest method of evaluating these differences is to observe the differences in returns in alternative occupations.

Since people are unable to make instantaneous changes in

occupations, this value may very well be obscured by short-run fluctuations in yields or demand. In addition, there is probably considerable resistance by established older persons to a change in occupations due to the uncertainty and geographic move which such a change often involves. Despite these difficulties, the relationship of farm and non-farm labor incomes during a relatively stable period should give an indication of the value of items associated with the two types of employment.

In this study the intangibles and items not subject to direct measurement are valued by the use of the relationship existing between farm and non-farm labor incomes during a selected period. Further, this relationship is expressed as a ratio. The parity relationship hypothesized by the use of a ratio is shown in Fig. 1. The line OA represents the line of parity income. When labor incomes fall on this line farm and non-farm incomes are considered on a parity. When labor incomes fall to the left of the line farm incomes are below parity. If incomes lie to the right of OA farm incomes are above parity.

It should be pointed out that the parity labor return established in this manner is not an absolute measure of equivalence. The parity farm labor return is the labor return which bears the same relation to non-farm incomes as existed during the base period. Hence parity indexes established by use of this ratio attempt to measure economic status relative

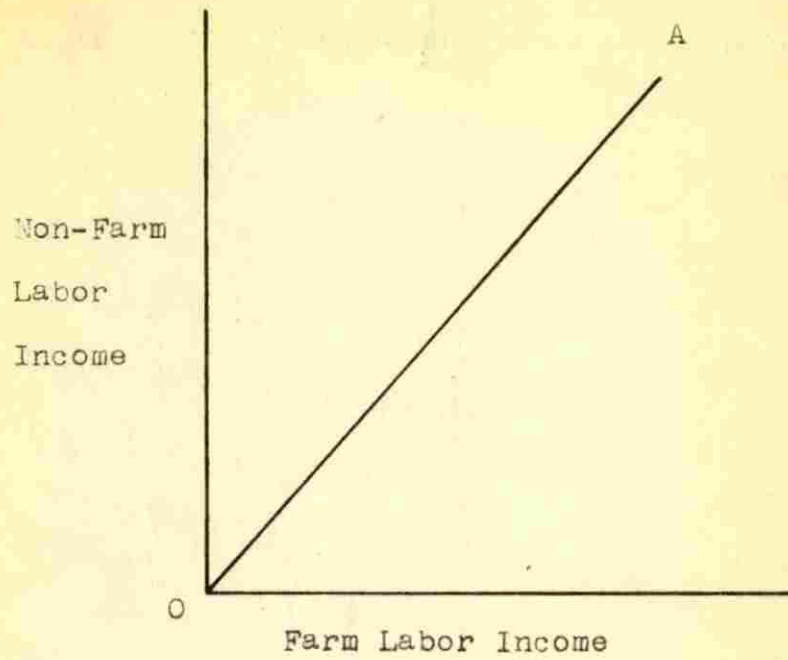


Fig. 1 Parity Relationship Hypothesised by Use of Ratio

to the base period. The absolute level of the indexes will depend on the base period selected.

The labor return of farmers used in the comparison is obtained as a residual, by subtracting the operating costs and the return to capital from the gross farm income. This farm labor return is then divided by the non-farm labor return to establish the ratio.

The non-farm wage series selected to use in determining the parity labor return must be a series of only labor and management returns. Therefore, income series which include returns from capital resources cannot be used. One would prefer a series of wage rates which represented work requiring skills similar to those required of farmers and/or a wage series which represented the opportunities available to those leaving farming. However, the error arising from the selection of a wage series that does not meet these criteria is not as great as might appear at first glance. Since the farm labor return is computed by the use of a ratio, all that is required of the series selected is that it move in the same manner as the "ideal" series. The series "Yearly Earnings of Employed Workers in Manufacturing"¹ is used in this study to establish the income ratio. This series is the average wage rate for employed workers and does not make

¹U. S. Dept. of Commerce, Bureau of the Census, Statistical Abstract of the United States, U. S. Govt. Printing Office, 1931-1955.

allowances for unemployment in the non-farm segment. Therefore, it tends to overstate the actual labor incomes in the non-farm segment and hence the alternatives available to farmers during years of widespread unemployment.

Once a base period has been selected, the parity farm labor income in any individual year can be computed by multiplying the current non-farm rate by the ratio. The sum of this return to labor, the return to capital, and the operating expenses can be termed the parity gross income.

Obtaining Parity Prices from the Parity Gross Income

To proceed further and compute the prices which will yield the parity gross income, it is necessary to allocate the income among the products produced. If only one product was produced in an area, the parity price would be the parity gross income divided by the quantity produced. However, if several products are produced in an area by the use of a group of resources, the division of these costs among enterprises is more difficult. Not only is it difficult to allocate labor and machinery costs, but also the complementary and substitution effects of certain enterprises further complicate the problem. For example, it may be necessary to include meadow crops in the rotation to maintain grain production, or the livestock enterprises may use otherwise unsaleable

crops such as cornstalks and straw.

These difficulties can be overcome by indirect allocation of costs by use of prices in the market. The estimates of costs can first be made on the basis of the total production of an area and then allocated among the products by the use of relative prices for the individual products. The relative prices can be established by the use of a moving average of market prices.

Certain assumptions are implicit when relative prices established in this manner are used to allocate costs. It is a realistic procedure if farmers are acting rationally and with sufficient information in a framework of pure competition. In this case farmers will be allocating resources among enterprises in order to equalize marginal value products for the particular resources. Likewise, if they are maximizing profits, marginal cost equals average cost and average cost equals price. To the extent that these conditions are met, prices become good estimates of the marginal and average cost of the individual products.

A technological advance which changes the cost situation or a change in the demand will alter the pattern of production and the price ratios. There will be a certain time lag before these changes are reflected completely in price relatives established by the use of a moving average. However, the use of a moving average will more nearly reflect these changes than would the use of relative prices es-

tablished in a fixed base period.

The assumptions pertaining to this method of establishing prices are necessary if it is desirable to have the prices represent the cost situation. However, one need not make these assumptions if the goal is to construct prices which will yield a parity income; he requires only that the prices bear a realistic relationship to one another.

The cost-income method for computing parity incomes and prices is outlined in mathematical notation below. The following notation is used:

- P_i price of input i (except labor)
- q_i quantity of input i (except labor)
- P_j price of product j
- Q_j quantity of product j
- \bar{P}_j computed parity price of product j $j=A, B, C, \dots$
- L quantity of farm labor
- W non-farm wage rate
- P_{jt} market price of product j in year t
- R ratio of farm to non-farm wage rate
- r_j the relative price of product j

The superscript 0 and 1 will be used to denote the base and present period, respectively.

To establish the ratio, R , of farm to non-farm wage rates during the base period, the following is used:

$$\frac{\sum_j p_{j0}^0 q_{j0}^0 - \sum_i p_{i0}^0 q_{i0}^0}{L^0 W^0} = R$$

Relative prices, r , are computed by use of a moving base where t is summed over the immediately preceding (say) ten years. In this example the product A is assigned a relative of 1.

$$\frac{\sum_t p_{jt}}{\sum_t p_{At}} = r_j$$

The parity income for the present period is:

$$\sum_i p_{i1}^1 q_{i1}^1 + R W^1 L^1$$

And the parity price of A is computed as follows:

$$\bar{P}_A = \frac{\sum_i p_{i1}^1 q_{i1}^1 + R W^1 L^1}{\sum_j r_j q_{j1}^1}$$

Parity prices for the remaining products produced in the area are:

$$\bar{P}_j = \bar{P}_A r_j$$

APPLICATION OF THE COST-INCOME CONCEPT TO
EMPIRICAL DATA

The general form of the computations previously explained does not uniquely determine the parity prices and incomes. The parity income is dependent upon the methods used to value land and capital and upon the base period chosen. Beyond these basic selections several alternative methods of handling the data are available. Some of these possibilities are explored in the following sections.

Data Used

In order to compute parity prices and incomes by the cost-income method, extensive data on expenses, capital inputs, and production are required. Data of this type have been compiled by the USDA for several types of farming areas in the United States. Summaries of the operations of farms in these areas are published annually in Farm Costs and Returns.¹ The data represent the commercial family operated farms of the specified type within the relatively homogeneous areas. These farms constitute from 60 to 90 per cent of the

¹Goodsell, Wylie D., and others. ARS, USDA, Costs and Returns Commercial Family Operated Farms by Type and Size, Statistical Bul. No. 197, and Ag. Info. Bul. No. 158. Wash., D. C. Nov. 1956 and June 1956.

farms within an area. Part-time farms, large farms, and specialty farms are excluded from the computations. The commercial family operated farms would fall in the census economic classes II, III, and IV.¹ The data are presented as a budget for the average farm of the individual areas. The basic data are obtained from the U. S. Census of Agriculture, rural carrier and mailed questionnaires sent to farmers by the Agricultural Estimates Division, AMS, and enumerative field surveys. The series for the areas studied are complete from 1930 to 1955.

For the purposes of the present study, data were compiled for four corn belt areas - the cash grain, the hog-beef raising, the hog-beef fattening, and the hog-dairy areas. The locations of these areas are shown in Fig. 2.

On the hog-dairy farms, located in northeast Iowa, northwest Illinois, and southwest Wisconsin, about three-fourths of the cash income comes from the sale of hogs and dairy products.

Farms of the hog-beef raising type located in south central Iowa, northern Missouri, and the neighboring area of Illinois receive over half of their cash receipts from hogs and cattle. The majority of the cattle sales are feeder cattle produced on the pasture which makes up over half of the area

¹Farms in these classes had a value of products sold which ranged from \$2,500 to \$24,999 in 1954. United States Census of Agriculture, 1954, Vol. I, part 9. p. XXII.

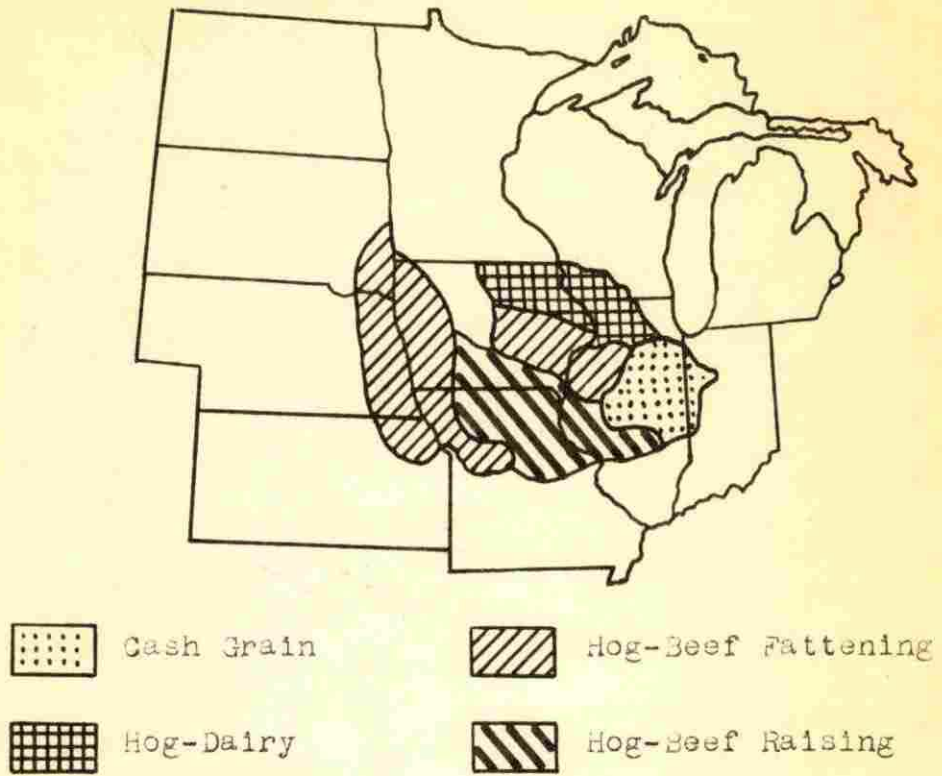


Fig. 2 Location of Types of Farms Studied

of these farms. Of the four areas studied net incomes are lowest in this area.

Hog-beef fattening farms located in western and east central Iowa and the bordering areas in Illinois, Missouri, Kansas, Nebraska, and South Dakota are farms specializing in feeder cattle and hog enterprises. Cattle and hog sales constitute approximately 90 per cent of the cash receipts for these farms.

The cash grain area of east central Illinois, as the name indicates, is characterized by farms specializing in grain production. About two-thirds of the cash receipts are from the sale of grain. Table 1 summarizes the organization and income of these farms during the five years 1937-41.

Base Period Selection

The selection of an adequate base period presents numerous problems. Ideally, the period should be a period of balance between farm and non-farm incomes, a period of stable income and prices, a period of stable and balanced production within and between areas of the farm economy. It is obviously impossible to choose a base which completely satisfies these criteria. It is not the purpose here to specify the correct base period to use for parity comparisons. The available cost and income data limit the base to the period 1930-55. The fact that this period contains a severe depression, a world

Table 1. Organization and receipts of commercial farms in type of farming areas studied^a (Average 1937-41)

	Cash grain	Hog-beef fattening	Hog-dairy	Hog-beef raising
Land in farm (acres)	209	178	155	181
Crop land harvested (acres)	163	113	89	76
Total farm capital	\$29,950	\$20,380	\$15,200	\$10,770
Total cash receipts	3,906	4,700	2,980	1,467
Total cash expenditures	2,118	3,222	1,986	1,134
Net farm income	2,627	2,520	1,612	928
Return to operator and family labor	1,253	1,540	880	407

^aGoodsell, Wylie D. and others. ARS, USDA, Costs and Returns Commercial Family Operated Farms by Type and Size, Statistical Bul. No. 197, and Ag. Info. Bul. No. 158, June, 1956. pp. 39-42.

war, a polie action, and two of the severest drought years in history further limits the choice of a base. The five years 1937-41 are used rather extensively as a base in the discussions which follow. This base has shortcomings and it is not to be implied that it is the only "correct" period. During those years, farm production was relatively stable between the four Cornbelt areas studied. Although prices received by farmers averaged about 84.5 per cent of the 1910-14 price parity for the United States, the parity income

index, based on the 1938 definition, averaged about 99 per cent of parity. The relationship of incomes among the Cornbelt areas existing during the 1937-41 period is similar to that existing during the ten years, 1945-54. Prices and incomes were considerably higher during the later period.

Farm population decreased in the north central region during both the 1937-41 and 1945-54 periods.¹ Also, the average size of the farms considered increased during these two periods. This would indicate that some farmers considered income opportunities in the non-farm segment superior to those in farming. Therefore, it appears that neither period represents a period of "balance" between farm and non-farm incomes.

Computed Parity Incomes

The cost-income method was used to compute parity income per farm for the four cornbelt areas. Total expenses and the capital charge were subtracted from the gross income to obtain the return to operator and family labor during the base period. Gross income on these farms was composed of cash receipts from sales, an imputed value for house rent, food produced, and consumed on the farm valued at prices received

¹Farm population in the north central region decreased from 9,602,000 to 9,323,000 from 1937 to 1941 and from 7,942,000 to 7,082,000 from 1945 to 1954. Agricultural Marketing Service, USDA, Farm Population, AMS-102, April, 1956.

by farmers, direct government payments, and the physical change in inventory valued at year end prices. The expenses were the cash expenses, including hired labor, plus a correction for the change in inventory of machinery and other equipment.

All computations are made on a per farm basis. The return to operator and family labor was divided by the average yearly earnings per employed manufacturing worker to obtain the ratio of farm to non-farm labor incomes.*

For the 1937-41 base period, the income ratios established for the four areas were: cash grain 0.96, hog-beef fattening 1.19, hog-dairy 0.70, and hog-beef raising 0.31. The current non-farm earnings multiplied by these ratios give the parity** labor return for the respective areas. The sum of this parity labor return, the return to capital, and the operating expenses constitute the parity gross income per farm. The parity gross incomes computed in the above manner are shown in Table 2. The comparison of actual gross incomes and parity gross incomes is made in Table 3 by expressing the

*It would be possible to compute the ratio on an hourly basis. The hourly return to farm operators could be obtained by dividing the labor return by the number of hours worked. This hourly return could then be divided by the hourly manufacturing wage to obtain the ratio. Computations were made in this manner but results were not significantly different from those obtained by use of the yearly ratio.

**In the sections that follow the word parity is used repeatedly. It will refer to parity as computed by the cost-income method unless otherwise specified.

Table 2. Parity gross incomes per farm (1937-41 base)

Year	Cash grain	Hog-beef fattening	Hog dairy	Hog-beef raising
1930	\$ 5,138	\$ 6,233	\$ 3,891	\$ 2,382
1931	4,535	5,120	3,459	2,094
1932	3,799	4,227	2,826	1,782
1933	3,348	3,573	2,428	1,606
1934	3,480	3,880	2,715	1,759
1935	3,725	4,645	2,822	1,868
1936	3,964	4,294	3,001	1,693
1937	4,327	4,920	3,453	1,814
1938	4,351	4,951	3,219	1,868
1939	4,374	5,411	3,337	1,879
1940	4,684	5,913	3,466	1,989
1941	5,076	6,611	3,879	2,233
1942	6,025	7,943	4,828	2,823
1943	6,833	9,017	5,497	3,440
1944	7,556	9,525	6,030	3,567
1945	7,770	9,846	6,013	3,552
1946	8,270	10,977	6,386	3,830
1947	9,328	12,934	7,327	4,421
1948	10,381	16,414	8,208	5,148
1949	10,842	15,638	8,438	5,092
1950	11,381	17,451	8,937	5,443
1951	12,697	20,049	9,973	6,101
1952	13,775	19,959	10,499	6,683
1953	14,087	18,566	10,575	6,620
1954	14,256	19,742	10,487	6,524
1955	14,852	20,156	10,862	6,486

Table 3. Index of gross income and U. S. parity ratio
(1937-41 base)

Year	Cash grain	Hog-beef fattening	Hog dairy	Hog-beef raising	U.S. parity ratio 1937-41 = 100
1930	70	80	85	71	98
1931	59	69	70	67	79
1932	47	66	62	58	68
1933	41	56	64	53	76
1934	50	38	50	30	88
1935	108	104	107	97	104
1936	79	59	90	57	108
1937	119	118	105	105	110
1938	87	99	100	91	92
1939	92	90	94	97	91
1940	83	96	91	94	95
1941	118	100	109	111	110
1942	128	131	132	142	124
1943	131	124	131	133	133
1944	123	118	117	116	128
1945	128	108	127	113	129
1946	153	164	145	146	134
1947	131	134	123	106	136
1948	157	147	142	144	130
1949	113	123	117	127	118
1950	108	120	110	128	119
1951	126	120	121	127	126
1952	112	107	115	122	118
1953	98	97	112	106	109
1954	105	108	116	102	105
1955	90	81	93	100	100

actual gross income as a per cent of the parity gross income. These percentage figures give a comparison somewhat similar to that made by the present parity price ratio. When the actual parity gross income is used, prices received are weighed by actual production or marketings as opposed to the constant weights assigned prices in the parity ratio computations. These differences can perhaps best be seen in mathematical notation. The present parity ratio is of the form⁴⁸

$$\frac{\sum \frac{q_o P_1}{q_o P_o}}{\sum \frac{Q_o P_1}{Q_o P_o}}$$

where the p's refer to the prices received by farmers and the P's refer to prices paid by farmers in the current (subscript 1) and base periods (subscript o). The prices are weighed by constants q_o and Q_o , the quantities in the weight base period. The ratio of actual gross income to parity gross income might be expressed as $\sum \frac{q_1 P_1}{Q_1 P_1}$ where the lower case letters refer

⁴⁸The price indexes are actually computed with weighted price ratios rather than using quantities and actual prices. The formula used is $\sum w_j P_{j1}/P_{j0}$ where the w_j refers to the relative importance of product j during the base period and P_{j1} and P_{j0} are the prices of product j in the present and base periods, respectively.

to the actual prices and quantities of products sold in the current period and the upper case letters refer to the actual quantities and prices of inputs during the current period. (The labor return is included in the $Q_1 P_1$ at the price established by use of the ratio.) The area indexes are compared with the United States parity ratio in Table 3. The United States parity ratio is computed using the 1910-14 base period but has been converted to the 1937-41 base for this comparison.³

From 1930 to 1934 the United States index is above the cost-income indexes. Thereafter the United States index and cost-income indexes appear to be at somewhat comparable levels. In years of high or low production (1934, 1936, 1946, 1947, 1948) there are considerable differences between the United States ratio and cost-income indexes. This is due to the constant weights used in computing the parity ratio as opposed to the use of actual quantities in the cost-income computations.

Parity net income

The parity labor return plus the return to capital can

³The prices paid and prices paid indexes were converted to 1937-41 = 100 and the ratio constructed from these indexes. The index of gross income as constructed here will not necessarily average 100 for the base period. The ratio was established by use of the sums of farm and non-farm income. This means that the total parity income equals the total actual income, but the average of the ratios does not necessarily equal 100. This follows from the fact that the $\frac{x}{y} \neq \frac{y}{x}$. Also, the indexes have been rounded to the nearest per cent.

be termed the parity net income for a full owner operator of the average farm in an area. The parity net income for the four areas are shown in Table 4. The level of parity net incomes for the cash grain and beef fattening areas are similar, while parity net income for the dairy and beef raising areas are lower. Labor income makes up a slightly greater portion of the total in the beef fattening area than in the cash grain area. The differences which arise between the parity incomes in these two areas during the latter years are due to the greater amount of capital being used in the cash grain area. Parity incomes are lower in the hog-dairy and hog-beef raising areas because of the smaller ratios used in computing the parity labor return and because smaller amounts of capital are used per farm.

To obtain an index of net incomes the actual net income was divided by the parity net income. The actual net income was also computed as if all farms in the areas were operated by full owners. This index moves in the same direction as the index of gross income but the variations are wider. Since net income is approximately one-half of the gross income a change in the gross income index of one per cent is associated with a change of about two per cent in the net income index.

Of parity measures which have been used, the parity income index based on the 1938 definition probably is most nearly comparable to the net income indexes as constructed

Table 4. Parity net income per farm (1937-41 base)

Year	Cash grain	Hog-beef fattening	Hog dairy	Hog-beef raising
1930	\$ 3,265	\$ 3,268	\$ 2,080	\$ 1,361
1931	2,855	2,837	1,814	1,177
1932	2,337	2,243	1,446	974
1933	2,047	1,911	1,217	854
1934	2,199	2,036	1,314	788
1935	2,291	2,159	1,436	829
1936	2,399	2,312	1,544	880
1937	2,560	2,427	1,631	906
1938	2,510	2,343	1,545	880
1939	2,504	2,448	1,594	905
1940	2,670	2,542	1,646	935
1941	2,895	2,847	1,799	1,021
1942	3,458	3,421	2,165	1,238
1943	3,920	4,032	2,523	1,481
1944	4,303	4,266	2,717	1,593
1945	4,359	4,225	2,635	1,587
1946	4,469	4,247	2,714	1,608
1947	5,092	4,978	3,143	1,920
1948	5,660	5,618	3,528	2,078
1949	5,860	5,792	3,654	2,224
1950	6,105	6,097	3,877	2,358
1951	6,922	6,864	4,340	2,734
1952	7,582	7,396	4,658	3,001
1953	7,697	7,535	4,786	2,993
1954	7,626	7,231	4,714	2,846
1955	8,044	7,750	4,961	2,959

here. This United States income index and the area indexes are shown in Table 5. The methods used in computing the cost-income and United States indexes differ in several respects. The United States index is based on the 1910-14 base period, but converting the index to 1937-41 would change the figures less than one per cent. Also, the United States index is based on income from farming of farm operators and hired farm labor and is computed from per capita data. The indexes computed by the cost-income method are computed on a per farm basis (farm operator) and include all returns to capital, but not the wages paid to farm labor. The United States index results from a comparison of incomes in the non-farm segment with incomes from farming in the farm segment while the original comparison used in deriving the cost-income parity was made using labor wage data. The cost-income figures are computed from data on commercial farms, while the United States figures are based on all farms.

The cost-income indexes are considerably lower in the early 1930's, both because of depressed prices on livestock and feed grains and severe droughts and also because the non-farm labor income series used for comparison does not fully reflect the unemployment in the non-farm segment. Three of the areas showed a negative income in 1934 due to the severe drought. Both the area series and the United States series reached peaks in the period 1946-48 and again in 1951. The area indexes show considerably more variation than does

Table 5. Parity net income indexes (1937-41 base) and U. S. parity income index

Year	Cash grain	Hog-beef fattening	Hog-dairy	Hog-beef raising	U. S. parity income index ^a 1910-14 = 100
1930	53	62	72	49	81
1931	34	44	42	42	68
1932	14	37	26	23	61
1933	4	18	29	11	81
1934	20	-18	- 4	-57	83
1935	113	109	114	93	107
1936	65	24	81	11	99
1937	132	136	110	110	107
1938	73	97	100	81	96
1939	86	77	86	94	95
1940	70	91	81	88	92
1941	131	99	120	123	108
1942	149	173	171	196	133
1943	154	153	168	176	140
1944	140	139	138	136	143
1945	150	143	160	128	153
1946	199	266	207	209	177
1947	156	188	154	113	167
1948	204	237	198	208	181
1949	125	162	139	162	136
1950	116	157	124	165	142
1951	148	158	149	160	155
1952	122	119	133	149	139
1953	97	94	126	112	129
1954	110	122	135	104	129
1955	79	50	84	100	114

^a1930-39, Bureau of Agricultural Economics, USDA, Net Farm Income and Parity Report, 1943, p. 12. Agricultural Marketing Service, USDA, The Farm Income Situation, July 17, 1956. p. 24.

the United States series.

Effect of alternative valuation of perquisites

In the above computation perquisites were included in the gross income at prices received by farmers. It is often argued that food produced and consumed on the farm should be valued at retail prices in order to more realistically value the income of the farm family. In an attempt to ascertain the effects of valuing the food produced and consumed on the operator's own farm at retail instead of wholesale prices, the wholesale value of food consumed was divided by the ratio of prices received by farmers to prices paid by consumers. This ratio, published as the farmers share of the retail food dollar, is shown in the first column of Table 6. To be completely correct, this division should be carried through for each food item using the ratio for that item. However, the composition of food perquisites is quite similar in the four areas and the error introduced by using a single figure for food as a whole is small.

The income ratios are naturally larger when computed from an income series where food consumed in the farm home is valued at retail instead of wholesale. The income ratios established by use of the 1937-41 base were 1.14 for the cash grain area, 1.39 for the hog-beef fattening area, 0.92 for the hog-dairy area, and 0.52 for the hog-beef raising area.

Table 6. Parity gross income per farm. Food valued at retail prices

Year	Farmers share of retail food dollar ^a	Cash grain	Hog-beef fattening	Hog-dairy	Hog-beef raising
1930	39	\$ 5,354	\$ 6,485	\$ 4,157	\$ 2,626
1931	35	4,728	5,346	3,697	2,313
1932	32	3,957	4,412	3,020	1,961
1933	32	3,503	3,755	2,618	1,782
1934	34	3,651	4,079	2,925	1,952
1935	39	3,911	4,863	3,053	2,079
1936	40	4,166	4,530	3,250	1,921
1937	42	4,549	6,181	3,727	2,066
1938	39	4,557	5,193	3,473	2,101
1939	38	4,595	5,670	3,610	2,129
1940	40	4,918	6,186	3,754	2,253
1941	44	6,350	6,932	4,217	2,543
1942	48	6,364	8,340	5,246	3,207
1943	51	7,233	9,485	5,990	3,892
1944	52	7,983	10,025	6,556	4,050
1945	53	8,181	10,327	6,520	4,018
1946	52	8,676	11,452	6,886	4,289
1947	51	9,791	13,476	7,897	4,945
1948	50	10,882	17,001	8,826	5,715
1949	46	11,351	16,234	9,065	5,668
1950	47	11,931	18,095	9,615	6,065
1951	48	13,297	20,751	10,712	6,779
1952	47	14,405	20,697	11,274	7,396
1953	45	14,751	19,304	11,393	7,371
1954	43	14,922	20,521	11,307	7,277
1955	41	15,556	20,987	11,737	7,290

^a Agricultural Marketing Service, USDA, The Marketing and Transportation Situation, April 26, 1956. p. 6.

The parity gross incomes computed by use of these ratios are presented in Table 6.

These gross income figures were used to construct an index of gross income in the same manner as used previously. Perquisites were valued at retail prices in the actual gross income and this gross income divided by the parity gross income. These indexes when compared with those of Table 3 tend to be higher during the early part of the period and lower during the latter. During the early part of the period perquisites made up a greater portion of the gross income. Also, wholesale prices were a smaller per cent of retail prices during the 1930's. Therefore, increasing the value of food perquisites to retail levels increases the actual gross income by a greater per cent during the 1930's as compared to the latter years. The effect of this change was greatest in the hog-beef raising and hog-dairy areas since perquisites make up a greater portion of the income of these areas.

Parity incomes computed by use of 1945-54 base

To show the effect of an alternative base period on the parity gross income, the ten year period 1945-54 was used to compute the income ratios. This was a relatively prosperous period for agriculture, and the United States parity ratio averaged about 104 for the period. Prices re-

ceived by farmers were below the United States parity standard only during the last two years of the period. Hence the income ratios were considerably higher during this period than during the 1937-41 period. The income ratios were: cash grain 1.73, hog-beef fattening 2.32, hog-dairy 1.32, and hog-beef raising .68. These ratios represent increases of approximately 80, 90, 88, and 118 per cent, respectively, over those based on the 1937-41 period. These increases in the parity labor return result in increases in the parity gross income which average approximately 21, 23, 23, and 22 per cent for the respective areas for the 26 year period. The parity incomes computed by use of the ten year base are shown in Table 8. The indexes of gross income are presented in Table 9 with the United States parity ratio (converted to the 1945-54 base). The indexes are considerably lower when this base is used; they show cornbelt farmers receiving parity income in only about seven of the 26 years studied.

Comparison of 1937-41 and 1945-54 periods with 1910-14

The 1910-14 period is, at present, the legal base used for parity comparisons. The data on farm costs and incomes of the type used in this study are not available for years prior to 1930. However, national income and total agricultural income data are available for the 1910-14 period.

D. Gale Johnson has assigned the net income of farmers to the

Table 7. Index of gross income - perquisites valued at retail (1937-41 base)

Year	Cash grain	Hog-beef fattening	Hog dairy	Hog-beef raising	U.S. parity ratio 1937-41 base
1930	73	82	89	78	98
1931	62	72	75	75	79
1932	52	70	68	66	68
1933	47	61	72	63	76
1934	54	43	56	41	88
1935	110	104	110	102	104
1936	87	63	93	66	108
1937	119	118	105	108	110
1938	89	100	102	94	92
1939	92	90	94	95	91
1940	83	96	91	94	95
1941	116	99	107	107	110
1942	125	129	127	134	124
1943	128	121	126	128	133
1944	120	115	113	109	128
1945	125	106	121	107	129
1946	150	161	140	138	134
1947	128	131	120	102	136
1948	153	144	137	136	130
1949	111	121	113	121	118
1950	106	118	106	120	119
1951	123	118	117	120	126
1952	109	105	110	115	118
1953	96	95	107	100	109
1954	103	106	111	96	105
1955	88	79	89	95	100

Table 8. Parity income per farm (1945-54 base)

Year	Gross income				Net income			
	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising
1930	\$ 6,067	\$ 7,610	\$ 4,634	\$ 2,826	\$ 4,193	\$ 4,645	\$ 2,822	\$ 1,805
1931	5,367	6,355	4,125	2,492	3,688	4,072	2,480	1,575
1932	4,481	5,238	3,370	2,108	3,019	3,254	1,990	1,300
1933	4,015	4,564	2,962	1,926	2,715	2,902	1,751	1,174
1934	4,215	4,970	3,302	2,110	2,933	3,126	1,901	1,140
1935	4,529	5,827	3,466	2,252	3,096	3,351	2,079	1,213
1936	4,834	5,584	3,697	2,109	3,270	3,602	2,240	1,298
1937	5,288	6,344	4,221	2,273	3,522	3,851	2,399	1,365
1938	5,242	6,272	3,931	2,293	3,401	3,664	2,257	1,308
1939	5,327	6,824	4,099	2,334	3,457	3,661	2,356	1,360
1940	5,690	7,405	4,270	2,471	3,676	4,034	2,449	1,417
1941	6,257	8,362	4,823	2,796	4,077	4,598	2,743	1,586
1942	7,486	10,114	6,998	3,524	4,921	5,592	3,335	1,939
1943	9,395	12,254	7,500	4,446	6,143	6,994	4,187	2,473
1944	9,395	11,571	6,874	4,263	5,641	6,566	3,699	2,306
1945	9,541	12,474	7,430	4,400	6,131	6,553	4,052	2,434
1946	10,021	13,573	7,785	4,667	6,219	6,843	4,113	2,445
1947	11,522	15,892	8,921	5,376	7,086	7,936	4,737	2,824
1948	12,541	19,619	9,935	6,182	7,621	8,823	5,255	3,112
1949	13,034	18,690	10,191	6,141	8,064	9,045	5,407	3,273

Table 8. (Continued)

Year	Gross income				Net income			
	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising
1950	\$13,749	\$20,964	\$10,851	\$ 6,576	\$ 8,472	\$ 9,610	\$ 5,769	\$ 3,491
1951	15,281	23,881	12,038	7,337	9,505	10,696	6,405	3,970
1952	16,436	23,982	12,667	7,981	10,294	11,419	6,826	4,299
1953	16,949	22,771	12,864	7,989	10,560	11,780	7,075	4,362
1954	17,125	23,997	12,780	7,896	10,495	11,486	7,007	4,219
1955	17,915	24,692	13,308	7,949	11,106	12,287	7,406	4,462

Table 9. Index of parity gross income (1945-54 base)

Year	Cash grain	Hog-beef fattening	Hog dairy	Hog-beef raising	U.S. parity ratio 1945-54 = 100
1930	59	66	71	60	80
1931	50	56	58	57	65
1932	40	54	52	49	56
1933	34	44	53	44	62
1934	41	30	41	25	72
1935	89	83	87	81	85
1936	65	45	73	46	89
1937	97	91	86	84	90
1938	72	78	82	74	75
1939	75	71	76	78	74
1940	68	77	74	76	78
1941	95	79	88	88	90
1942	103	103	106	114	101
1943	105	96	105	107	109
1944	99	91	76	93	104
1945	104	85	102	91	105
1946	127	133	119	120	109
1947	108	109	101	87	111
1948	130	123	117	120	106
1949	94	102	97	106	96
1950	90	100	91	106	97
1951	105	101	101	105	103
1952	94	89	95	102	97
1953	82	79	92	87	89
1954	88	89	95	84	86
1955	74	66	76	82	81

three resource categories; land, labor, and capital.¹ In one series of calculations Johnson used short term and mortgage interest rates to assign the returns to working capital and land in a manner similar to that used in this study.

Johnson's data and data published in the Farm Income Situation were used to make a comparison between the 1910-14, 1937-41, and 1945-54 periods as shown in Table 10. The ratio of the farm labor return to the non-farm wage rate was about 90 per cent of the 1910-14 level during the 1937-41 period and about 123 per cent of the 1910-14 level during the 1945-54 period. Using these two figures and assuming that they give an indication of the relation between the national averages and the cornbelt areas, it is estimated that the income ratios would be increased less than 30 per cent above the 1937-41 levels by use of the 1910-14 base. An increase of this proportion would lead to increases in the parity net income of approximately 15 per cent and increases in the parity gross income of approximately 7 per cent.

Deficit in net income expressed as a per cent of net sales

Direct payments have been suggested by some as a part of

¹Johnson, D. Gale. Allocation of Agricultural Income, Journal of Farm Economics, Vol. XXX No. 4, Nov. 1948. pp. 724-749.

Table 10. United States operators labor income per farm compared with yearly earning of employed workers in manufacturing (1910-14, 1937-41, 1945-54)^a

Year	Return to operator labor	Yearly earnings of industrial workers	Ratio of farm to non-farm labor income
1910	\$ 338	\$ 552	
1911	200	531	
1912	356	544	
1913	228	571	
1914	283	573	
Average	281	554	.507
1937	683	1,251	
1938	439	1,160	
1939	492	1,241	
1940	510	1,310	
1941	857	1,538	
Average	596	1,300	.459
1945	1,708	2,308	
1946	2,124	2,279	
1947	2,164	2,598	
1948	2,478	2,815	
1949	1,592	2,856	
1950	1,768	3,085	
1951	2,108	3,365	
1952	1,890	3,534	
1953	1,575	3,728	
1954	1,516	3,737	
Average	1,892	3,030	.624

^aSource of basic data:

Agricultural Marketing Service, USDA, The Farm Income Situation, July 17, 1956.

Johnson, D. Gale. Allocation of Agricultural Income, Journal of Farm Economics, Vo. XXX, No. 4, Nov. 1948. pp. 724-749.

a farm program.¹ Likewise, net sales have been suggested as the basis for these payments.² Parity income figures of the type presented in the previous sections could be used as a guide for such a program, and as an illustration Table 11 has been prepared. The first column under each area lists the difference between the actual net income and the parity net income (1937-41 base) for those years when the actual was below the parity. The second column expresses this deficit as a per cent of net sales. Net sales was computed by subtracting livestock and feed purchases from the gross sales. The deficits as listed are in addition to direct government payments actually received by farmers. If these payments were included in the deficit they would result in considerable increases during the latter 1930's. For instance, the inclusion of these payments in the deficit for the hog-beef raising area in 1939 would increase the deficit from \$55 to \$315 and the per cent of net sales from 5 to 25 per cent.

The percentages and deficits as listed are those necessary to bring net income to the parity figure. If such a program were actually used, it is probable payments would be set

¹Schultz, Theodore W. *Agriculture in an Unstable Economy*, New York, McGraw-Hill, 1945. p. 221.

²Norton, L. J. and Working, E. J. *A Proposal for Supporting Farm Income*, Illinois Farm Economics, Nos. 127 and 128, Dec. 1945 and Jan. 1946. pp. 309-313.

Table 11. Net income deficits expressed as a per cent of net sales

Year	Cash grain		Hog-beef fattening		Hog-dairy		Hog-beef raising	
	Deficit as % of net sales	Deficit	Deficit as % of net sales	Deficit	Deficit as % of net sales	Deficit	Deficit as % of net sales	
1930	44	\$ 1,546	30	\$ 1,239	20	\$ 583	55	\$ 695
1931	94	1,879	55	1,579	51	1,044	67	682
1932	138	2,001	76	1,421	77	1,068	100	751
1933	96	1,964	83	1,559	58	863	96	758
1934	80	1,751	121	2,400	96	1,365	193	1,238
1935								
1936	20	837	56	1,764	10	298	7	56
1937								783
1938	15	552	2	63	3	84	17	142
1939	11	363	21	555	8	166	5	55
1940	21	795	7	776	12	314		113
1941			1	25				
1942								
1943								
1944								
1945								
1946								
1947								
1948								
1949								

Table 11. (Continued)

Year	Cash grain		Hog-beef fattening		Hog-dairy		Hog-beef raising	
	Deficit	Deficit as % of net sales	Deficit	Deficit as % of net sales	Deficit	Deficit as % of net sales	Deficit	Deficit as % of net sales
1950								
1951								
1952								
1953	226	2	480	3				
1954								
1955	1,677	13	3,888	36	772	8		

at some lesser percentage of parity.

Also, it might not be desirable to make payments at differing percentages in different areas. The percentages vary considerably among the areas in the individual years. The percentages for the cash grain and hog-beef fattening areas, although differing in individual years, average quite close for the 26 year period. The average payment for the hog-beef raising area, although similar, is somewhat greater. However, the payment expressed as a per cent of net sales in the hog-dairy is below the average payment in all years and averages considerably below the other areas. The average percentage payments based on the 26 year period are: cash grain 21 per cent, hog-beef fattening 19 per cent, hog-dairy 13 per cent, and hog-beef raising 24 per cent. This seems to indicate that flat percentage payments to all areas would tend to overpay dairy farmers at the expense of beef raising farmers and to give rise to considerably inequities in individual years.

From Parity Income to Parity Prices

The previous sections have shown the derivation of parity incomes using the cost-income method. The ratios of actual net income to parity net income and the ratio of actual gross income to parity gross income were presented as methods of

comparing the economic status (relative to the base period) of farmers among areas and farmers with non-farmers.

The parity gross incomes as constructed in the previous sections can be used to obtain parity prices for the products produced within an area. These parity prices provide a further basis for comparison among areas and might be used as a basis for price support operations. Some of the possible alternative methods of computing these prices and the relationship of prices among areas will be explored in this section.

As explained previously, the parity prices can be obtained by dividing the parity gross income by the sum of the quantities produced (or sold) multiplied by their respective price relatives. In the computations which follow, the moving average price of corn was assigned a relative of one and all other prices were expressed in terms of the corn price. For instance, the relative price of oats was about 0.55 (varying slightly from year to year and among areas). The sum of quantities multiplied by the price relatives will hereafter be referred to as the Srq. Since corn is assigned a relative of one, the division of the parity gross income by the Srq gives the parity price of corn. Parity prices of other products can be obtained by multiplying the parity price of corn by the respective price relative. Only parity prices for corn are presented here. Additional parity prices are shown in Tables 15 and 16 of the Appendix.

The length of the moving average used to establish the price relatives depends, in part, upon the commodities under consideration. If crops which are characterized by stable production are the only products under consideration the period used could be shorter than that necessary when livestock, which are subject to cycles of considerable length, are considered. One wishes to use a period short enough to reflect structural changes, yet long enough to smooth short run yield and demand effects. In this study a ten-year moving average has been used. Area prices comparable to those used in the study are not available prior to 1930. Therefore, relatives established by use of the ten years 1930-40 were used in computing the parity prices for this same ten year period. Thereafter prices existing during the ten years immediately preceding the year under consideration were used to establish the price relatives.

The parity gross income as presented in previous sections was the gross income per operator from all farm sources.

(The farms considered are classed as commercial and no correction for off-farm employment is made.) Therefore, it is necessary to subtract perquisites and direct government payments from the parity gross income to obtain the income to be derived from sales. In addition, a correction must be introduced to handle the change in inventory of saleable crops and livestock. After these corrections are made, the division

by the Srq can be made to derive the parity price of corn.

One method of procedure is to subtract (algebraically) the inventory change, perquisites, and government payments from the parity gross income. The sales can then be used to compute the Srq. This procedure necessitates a dollar valuation of the change in inventory. One method of inventory valuation is to simply evaluate the beginning and ending inventory at prices then current, and obtain the difference. This procedure often results in apparently large changes in the value of inventory which are due only to short run price variations and not to changes in physical quantities. An alternative method which decreases the effect of short run price fluctuation involves valuing the physical change in inventory at the current year end price. the latter method of evaluating inventory is used in this study when the inventory change is expressed in dollar terms.

The parity prices of corn resulting from the above handling of inventory and the use of the 1937-41 base period are shown in Table 12. The parity gross income used in this computation was shown in Table 2. These parity prices were computed for the individual areas using price relatives established by use of market prices existing in that area. There are some differences in the level of open market prices in different areas. Therefore, the parity prices for areas are expected to reflect these differences. To analyse differences in parity prices due to other causes all parity

Table 12. Parity prices of corn established by the use of area data (1937-41 base)

Year	Cash grain	Hog-beef fattening	Hog-dairy	Hog-beef raising
1930	\$1.02	\$.73	\$.87	\$ 1.09
1931	.83	.67	.76	.80
1932	.61	.52	.62	.63
1933	.71	.47	.55	.62
1934	.94	.71	.75	.94
1935	.53	.58	.56	.64
1936	.83	.82	.77	1.00
1937	.55	.61	.67	.62
1938	.55	.57	.59	.63
1939	.53	.56	.57	.54
1940	.67	.57	.58	.55
1941	.57	.62	.66	.64
1942	.66	.59	.67	.53
1943	.80	.72	.75	.73
1944	.89	.77	.88	.84
1945	.84	.79	.83	.92
1946	.80	.71	.88	.73
1947	1.34	1.22	1.29	1.53
1948	.89	1.02	1.06	.96
1949	1.05	1.18	1.12	1.02
1950	1.23	1.15	1.19	1.03
1951	1.23	1.36	1.25	1.25
1952	1.39	1.37	1.27	1.15
1953	1.45	1.39	1.33	1.39
1954	1.37	1.22	1.18	1.42
1955	1.37	1.34	1.28	1.16

prices were changed to the level existing in the cash grain area.

A ratio of market prices in the cash grain area to market prices in the other areas was established by dividing the average market price in the cash grain area during the preceding ten years by the average market price in the other areas for the corresponding period. Parity prices were then multiplied by this ratio to place them on the cash grain level. Parity prices corrected to a common level are shown in the left section of Table 13.

Since all areas are important corn producing areas of similar size, it would be difficult to select one area as a standard to use in comparing the parity prices. Therefore, the arithmetic mean of the area parity prices was computed for every year. The area parity prices were then expressed as percentages of this mean. These percentages are shown in the right section of Table 13, and presented graphically in Fig. 3.

The averages of the percentage figures for the 26 year period were: cash grain 101.4, hog-beef fattening 99.5, hog-dairy 97.7, and hog-beef raising 101.4. The actual prices showed a similar relationship averaging 90.8, 89.6, and 90.2 cents for the respective areas. These averages seem to indicate that relative to the period 1930-55 incomes during 1937-41 were slightly higher in the cash grain and beef raising areas than in the dairy and beef fattening areas. The dif-

Table 13. Parity prices of corn (1937-41 base)

Year	Parity prices with area differential				Mean parity price	Parity prices expressed as a per cent of the mean parity price			
	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising		Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising
1930	\$1.02	\$.61	\$.84	\$1.10	\$.94	109	86	89	117
1931	.83	.70	.74	.81	.77	108	91	96	105
1932	.61	.55	.60	.63	.60	102	92	100	106
1933	.71	.50	.54	.62	.59	120	84	91	105
1934	.94	.75	.72	.94	.84	112	89	86	112
1935	.53	.61	.54	.65	.58	91	105	94	111
1936	.83	.85	.74	1.01	.86	96	99	87	117
1937	.55	.64	.65	.62	.61	89	104	106	102
1938	.55	.60	.58	.64	.59	93	101	98	108
1939	.53	.59	.55	.55	.55	95	106	100	99
1940	.67	.59	.55	.56	.60	112	100	94	93
1941	.57	.65	.64	.64	.62	91	104	102	103
1942	.66	.62	.66	.64	.62	107	100	107	87
1943	.80	.76	.75	.74	.76	105	100	96	97
1944	.89	.82	.86	.85	.86	104	95	102	99
1945	.84	.84	.83	.93	.86	97	96	97	108
1946	.80	.76	.67	.74	.79	102	96	110	93
1947	1.34	1.30	1.29	1.54	1.37	98	95	94	113
1948	.89	1.07	1.05	.95	.99	89	108	106	96
1949	1.05	1.21	1.11	1.02	1.10	96	110	101	93

Table 13. (Continued)

Year	Parity prices with area differential				Mean parity price	Parity prices expressed as a per cent of the mean parity price			
	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising		Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising
1950	\$1.23	\$1.19	\$1.18	\$1.03	\$1.16	106	103	102	89
1951	1.23	1.40	1.25	1.25	1.28	96	109	97	98
1952	1.36	1.41	1.27	1.16	1.31	106	108	97	88
1953	1.45	1.43	1.34	1.36	1.40	103	102	96	99
1954	1.36	1.26	1.19	1.41	1.50	104	97	91	106
1955	1.37	1.36	1.29	1.15	1.50	105	106	99	89

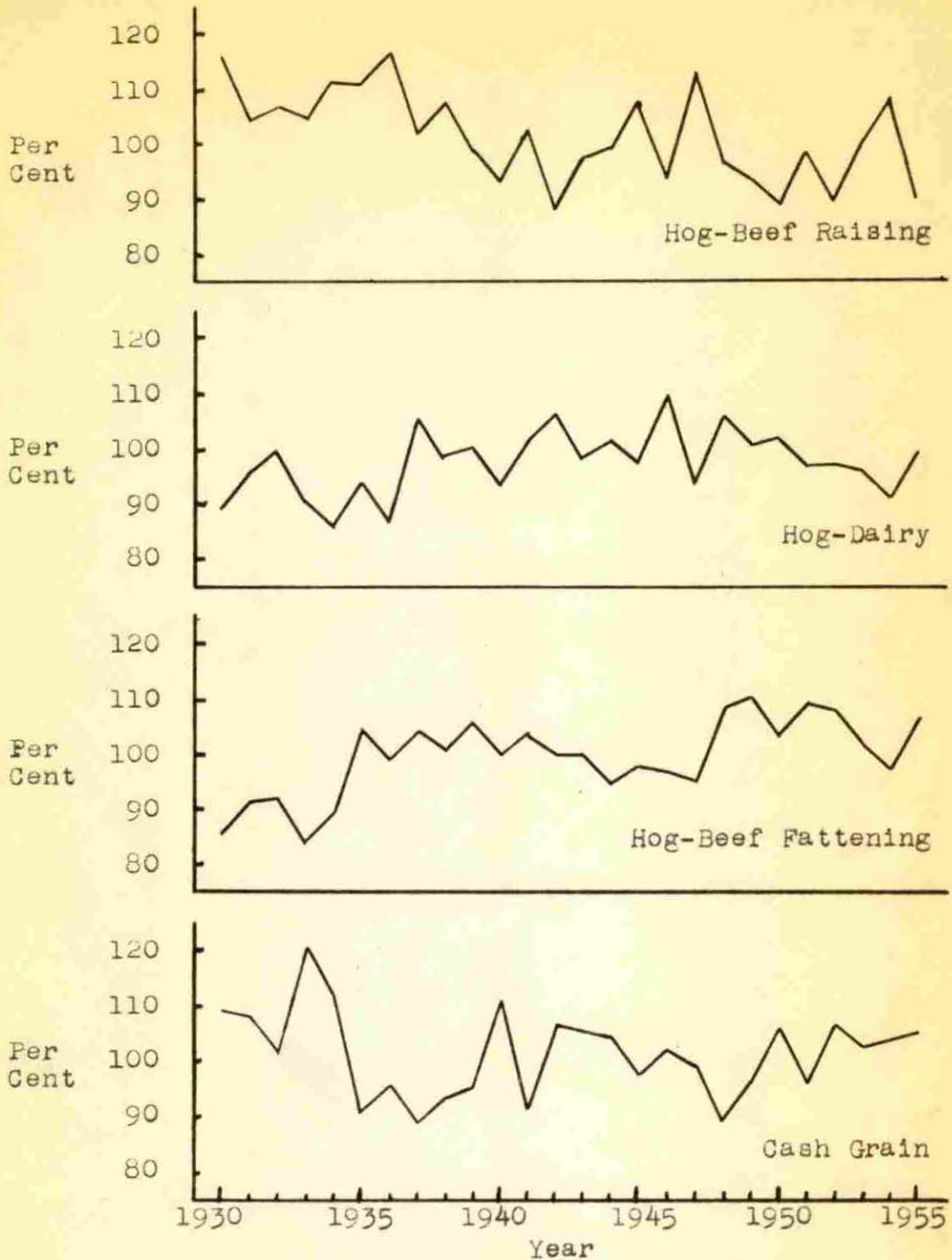


Fig. 3 Area Parity Prices of Corn Expressed as a Per Cent of the Mean Parity Price

ferences in price levels are most noticeable during the early years of the period. Parity prices for the beef raising area remained above the average until 1939 and prices in the hog-dairy area at or below the average until 1937. It would be possible to increase the income ratios for the dairy and beef raising areas so that prices in all areas would average 100 per cent of the mean parity price for the 26 year period.

Although the general level of parity prices is similar for the areas studied, there is some year to year variation among areas. Differences are due, in part, to the fluctuations in total farm production among the areas. Variations are particularly noticeable in the years 1933, 1934, 1936, 1947, and 1954 when adverse weather conditions lowered yields in some or all of the areas.

Variations in costs or expense items peculiar to one type of enterprise cause differences in the parity gross income and hence in the parity prices for individual areas. Feeder cattle are an example. While an important item of cost in the beef fattening area, they are of little or no significance on cash grain or hog-dairy farms.

The parity price of corn also depends on the price relationships established during the preceding ten years. Relatively high prices of cattle during the preceding ten years will have an indirect effect on the parity price of corn. The relative price of cattle will be increased and a greater portion of the parity gross income allocated to cattle. The

importance of such changes on the parity price of corn will depend on the importance of cattle marketings in an area. In this case there would be considerable effect in the beef raising area and little effect in the cash grain area. If we assume no corresponding changes in costs, the parity price of corn in the beef raising area would be lowered relative to the price of corn in the cash grain level.

This interdependence of parity prices explains why parity prices for an individual area may not be equal to the actual prices during the base period. The parity gross income will equal the actual gross income during the base period. Either the set of actual prices or the set of parity prices multiplied by the quantities marketed will give this gross income but the actual price need not equal the parity price of corn.* The actual price of corn may be slightly above the parity price of corn and the actual price of cattle slightly below the parity price of cattle in a manner such that the sums (gross income) are equal.

The majority of the parity prices fall within ten per cent of the mean parity price. For the 26 year period 1930-

*These relationships between parity and actual gross income can be expressed as $\sum Q_i P_i = \sum Q_i P_i$. The actual gross income is the sum of quantities multiplied by actual prices ($\sum Q_i P_i$). The parity gross income is the sum of quantities multiplied by parity prices ($\sum Q_i P_i$). The two gross incomes will be equal during the base period but it is not necessary that parity prices and actual prices for an individual product be equal.

55; 22 of the parity prices for the cash grain area, 23 of the parity prices for the hog-beef fattening, 23 of the parity prices for the hog-dairy, and 17 of the parity prices for the hog-beef raising area fell within 10 per cent of the mean parity price.

The majority of the large differences in prices occurred during the first ten years of the period. Thereafter only the prices in the cash grain (in 1940) and the beef raising areas (in 1942, 1947, 1950, 1952, and 1954) varied more than 10 per cent from the mean parity price.

The fluctuations in prices are less violent in the beef fattening and dairy areas. It appears that the effects of short crop yields are often spread over two or more years in these livestock areas. Although the change in inventory is included in the computations, the effect of a short crop yield also will be reflected in the following year when livestock and livestock products produced from the current year's crop production are marketed.

The greatest evidence of a trend in the deviations about the mean occurs in the beef raising area. Parity prices in this area were above the average for the first eight years of the period and below the average from 1948 to 1955 except for 1954. Fluctuation in yields are greater in this area and it is possible that the droughts of the early 1930's had greater effect in this area.

If it is desirable to compute parity prices directly from the production of the farms, the physical inventory change can be used, rather than the dollar valuation of this change. The actual sales are corrected by the physical change in inventory and the resulting quantity used to compute the Srq. For example, if the sale of corn in the Illinois cash grain area was 2,000 bushels per farm and the inventory of corn increased from 600 to 700 bushels the Srq would be computed using 2,100 bushels of corn.

In this case the change in inventory is valued at the computed parity price, or if viewed in another way, the computed parity price will yield parity income if applied to the current year's production.

Parity prices were computed from a base approximating the physical production by including the physical change in inventory of crops and hogs in the Srq. The resulting parity prices are shown in Table 14. These prices differ from those computed by use of the dollar inventory change in such years as 1933, 1947, 1948 when large inventory changes were valued at market prices which differed considerably from the parity prices. However, the general levels of relationship of parity prices among areas is little changed by this method of computation.

Parity prices computed by use of the 1945-54 base period are shown in Table 15. These prices tend to be about 25 per cent higher than those based on the 1937-41 period. Al-

Table 14. Parity prices of corn (1937-41 base inventory value at parity prices)

Year	Parity prices with area differential removed				Area	Mean parity price	Prices as a per cent of the mean			
	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising			Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising
1930	\$1.06	\$.81	\$.84	\$1.10	\$.95	111	85	88	116	
1931	.71	.70	.73	.79	.73	97	96	100	107	
1932	.56	.51	.55	.60	.55	101	91	100	108	
1933	.86	.51	.56	.69	.65	132	73	85	105	
1934	.95	.75	.74	.96	.85	112	88	88	113	
1935	.51	.59	.54	.60	.56	91	105	97	106	
1936	.78	.81	.70	1.02	.83	94	98	85	123	
1937	.52	.59	.61	.56	.57	91	103	108	98	
1938	.56	.59	.56	.63	.59	96	100	96	107	
1939	.52	.57	.53	.53	.54	97	106	99	98	
1940	.69	.60	.57	.56	.61	114	98	94	93	
1941	.60	.64	.64	.65	.63	94	102	101	103	
1942	.67	.65	.67	.69	.64	104	101	103	91	
1943	.76	.76	.76	.73	.75	101	101	101	97	
1944	.89	.82	.87	.82	.85	104	97	102	97	
1945	.85	.83	.84	.93	.86	99	96	97	108	
1946	.81	.81	.85	.82	.82	99	98	104	99	
1947	1.18	1.11	1.12	1.27	1.17	101	95	96	109	
1948	.96	1.09	1.08	1.03	1.04	93	105	104	99	
1949	1.05	1.22	1.11	1.02	1.10	95	111	101	93	

Table 14. (Continued)

Year	Parity prices with area differential removed			Area		Mean parity price	Prices as a per cent of the mean			
	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising			Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising
1950	\$1.20	\$1.18	\$1.18	\$1.18	\$1.03	\$1.15	105	103	102	90
1951	1.26	1.39	1.24	1.22	1.22	1.28	99	109	97	95
1952	1.38	1.42	1.28	1.18	1.18	1.32	105	108	98	90
1953	1.45	1.43	1.31	1.38	1.38	1.39	104	103	94	99
1954	1.36	1.26	1.20	1.41	1.41	1.31	104	96	92	108
1955	1.36	1.38	1.29	1.16	1.16	1.30	105	106	100	89

Table 15. Parity prices of corn (1945-54 base)

Year	Price with area differential removed				Mean parity price	Parity prices as a per cent of the mean			
	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising		Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Raising
1930	\$1.21	\$.99	\$1.01	\$1.34	\$1.14	106	87	89	118
1931	1.01	.87	.89	1.00	.94	107	93	95	106
1932	.73	.60	.72	.77	.73	100	95	100	105
1933	.62	.62	.66	.75	.71	116	88	92	105
1934	1.12	.91	.87	1.10	1.00	112	91	87	110
1935	.72	.86	.75	.88	.80	90	108	93	109
1936	.97	1.06	.91	1.22	1.04	95	102	87	118
1937	.74	.92	.85	.92	.85	87	107	98	108
1938	.67	.82	.74	.84	.77	87	106	96	110
1939	.66	.78	.72	.76	.73	91	106	99	104
1940	.82	.77	.71	.74	.76	107	102	94	98
1941	.76	.84	.82	.87	.82	92	102	100	106
1942	.85	.86	.86	.79	.84	101	102	103	94
1943	1.00	.98	.98	.96	.98	102	100	100	98
1944	1.12	1.08	1.09	1.07	1.09	103	99	100	98
1945	1.06	1.06	1.06	1.15	1.06	98	98	98	107
1946	1.00	1.00	1.08	.99	1.02	98	98	107	97
1947	1.58	1.56	1.53	1.76	1.61	98	96	95	111
1948	1.16	1.35	1.34	1.27	1.28	91	105	105	99
1949	1.27	1.48	1.37	1.28	1.35	94	109	102	95

Table 15. (Continued)

Year	Price with area differential removed				Mean parity price	Parity prices as a per cent of the mean			
	Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Paising		Cash Grain	Hog-Beef Fattening	Hog Dairy	Hog-Beef Paising
1950	\$1.48	\$1.45	\$1.46	\$1.30	\$1.42	104	102	103	92
1951	1.52	1.69	1.54	1.53	1.57	97	108	98	97
1952	1.67	1.70	1.58	1.44	1.60	105	107	99	90
1953	1.75	1.72	1.65	1.69	1.70	103	101	97	99
1954	1.67	1.57	1.51	1.72	1.62	103	97	93	106
1955	1.66	1.69	1.60	1.45	1.60	104	106	100	91

though absolute differences in parity prices among areas are somewhat greater, the percentage deviations are similar to those computed by use of the 1937-41 base. The prices expressed as per cent of the mean averaged 99.6 for the cash grain area, 100.4 for the beef fattening area, 97.2 for the dairy area, and 102.7 for the beef raising area. Parity prices in the beef raising area again tend to be high relative to the dairy area during the 1930's, and prices in the dairy area generally below those in other areas.

The United States parity price of corn computed by the modernized method is graphed against cost-income parity prices of corn in Fig. 4. The cost-income parity prices were computed by use of the wholesale value of perquisites and the dollar change in inventory. The national income data indicate that cost-income parity prices computed by use of the 1910-14 base would probably fall slightly below a line midway between the 1937-41 and 1945-54 price lines. The modernized parity price is computed by multiplying the average price of corn during the preceding ten years by the current index of prices paid and dividing this quantity by the average index of prices received during the preceding ten years. Cost-income parity prices shown are the mean of the area parity prices.

The modernized parity price and the cost-income parity price based on 1945-54 show considerable agreement after 1937.

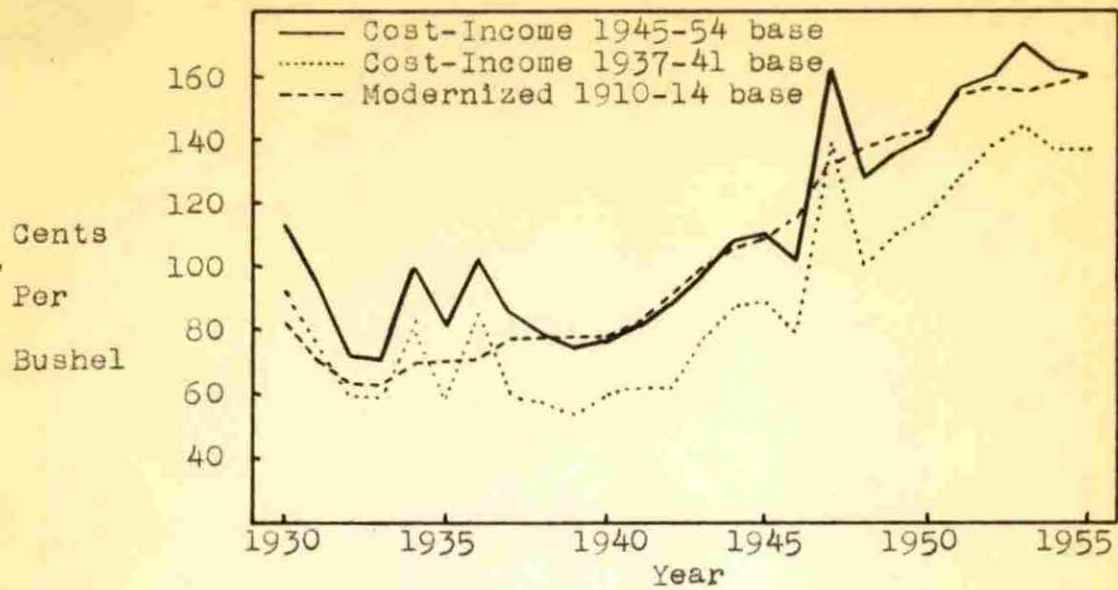


Fig. 4 Cost-Income and Modernized Parity Prices of Corn

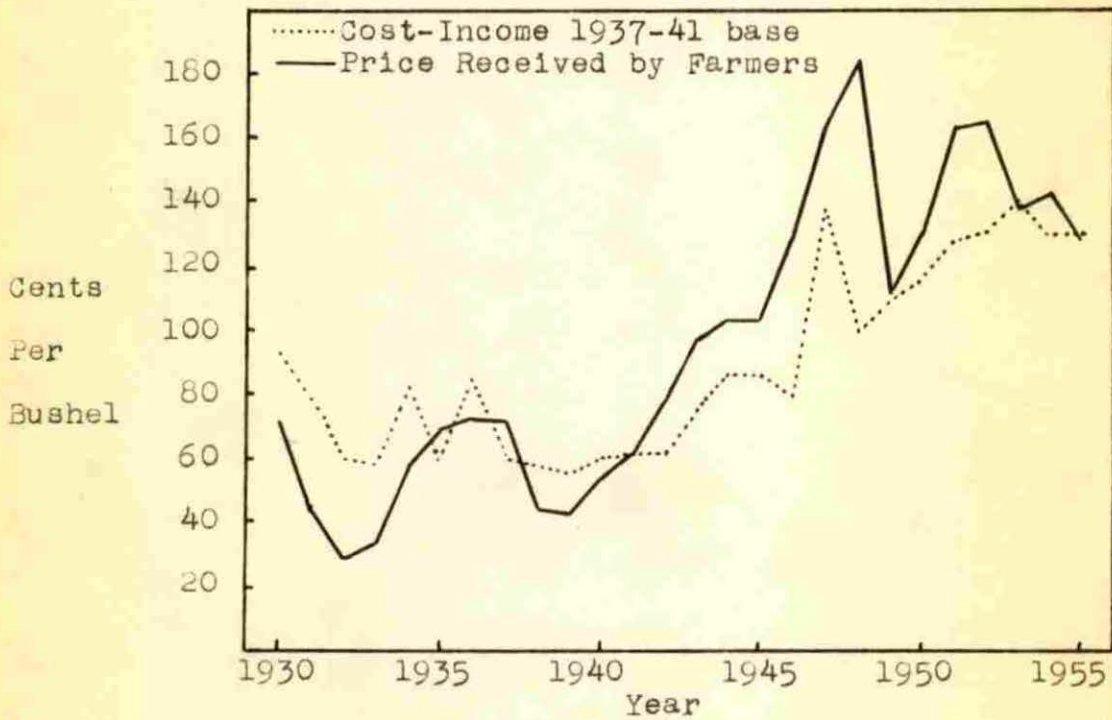


Fig. 5 Cost-Income Parity Prices of Corn Compared with Prices Received by Farmers

Prior to 1938 the cost-income parity price was above the modernized parity price.

The cost-income parity price based on 1937-41 was above the modernized price only in 1930, 1931, 1934, 1936, and 1947. The high prices of 1934, 1936, and 1947 are due to the short crops of those years.

In Fig. 5 the mean cost-income parity prices of corn (1937-41 base) is graphed against the yearly average price received by farmers. The price received is the average yearly price for the areas studied. The parity price was above the actual price during the early 1930's and below the actual price from 1941 to 1952.

SUMMARY

Area cost income data and the ratio of farm to non-farm income during a base period were used to develop a method for computing agricultural parity. Computations on an area base make possible more accurate measurement of the actual resource quantities and enable one to make comparison between areas and types of farms.

If it were possible to obtain the labor return in agriculture which was considered equivalent to non-farm labor returns by persons choosing between employment in the two segments, the parity labor income could be established on this basis. To approximate income relationships considered equivalent, the income relationships were established by use of a base period. Since people do not have perfect knowledge or perfect mobility it is improbable that relationships established in such a manner actually represent equivalent incomes in the two occupations.

The periods 1937-41 and 1945-54 were used in this study to derive the labor income ratios. There was considerable non-farm unemployment during the earlier period; hence a shortage of non-farm opportunities existed for farmers and farm reared people entering the labor force. During both periods, there was a decrease in farm population. There was probably a considerable surplus of persons on farms willing

to leave agriculture during the 1937-41 period because of the slowdown in migration which occurred during the early 1930's. The 1945-54 period was one of unusual prosperity for agriculture due to the high demand for farm products following World War II and during the Korean conflict.

Therefore, income ratios established during 1937-41 probably undervalue the farm income considered equivalent to non-farm incomes while the 1945-54 period probably overvalues farm incomes in some areas relative to non-farm.

The cost-income method was used to compute parity incomes and prices for the cash grain, hog-beef fattening, hog-dairy and hog-beef raising type-of-farming areas of the cornbelt. The ratios of farm labor income to the average annual wage of employed industrial workers computed by the use of the 1937-41 base period were: cash grain .96, hog-beef fattening 1.19, hog-dairy .70, and hog-beef raising .31. Ratios established by use of the 1945-54 period were 1.73, 2.32, 1.32, and .68 for the respective areas.

There was little evidence of changes in the income position of the farm areas studied. Incomes in the beef raising area appeared slightly lower during the early part of the period 1930-56 and higher during the latter part of the period relative to farm incomes in other areas. The wide economic fluctuations and the length of the period studied preclude any definite observations on changes in income

position of the areas.

If food perquisites are valued at retail instead of wholesale levels farmer income positions appear higher relative to non-farm incomes during the early years of the period and lower during the latter years. The effect of alternative valuation of perquisites is greater in the hog-dairy and hog-beef raising areas since perquisites are a more important income item in these areas.

Despite the differences in the income ratios, the area parity prices resulting from their use were closely related. Differences in prices among areas arose in individual years because of yield variations and fluctuations in the expenses associated with the enterprises characterizing an area. Both the 1937-41 and 1945-54 base periods resulted in parity prices which averaged approximately five per cent higher in the hog-beef raising area than in the hog-dairy area. This was the largest difference in the average level of parity prices and was particularly obvious in the early years of the 1930-55 period studied. These differences in level arise because of the relationship of incomes during the base period.

If the income ratios used to compute the parity income correctly represented equivalent incomes and the government initiated a program of income support (through either direct payments or price supports) to maintain incomes at this level, such a program would tend to "freeze" resources in agriculture. There is also a possibility that part of the

increased income to agriculture would be capitalized into increased land values. If such a program was maintained over a long period of time the number of people engaged in agriculture would probably increase. Young farm people choosing between agriculture and other alternatives would be assured of an equivalent income in agriculture and hence would have little incentive to seek employment in the non-agricultural segment.

Such a formula, however, could be used as a guide to income policy. If returns to agriculture below a certain minimum are deemed undesirable, payments or price supports could be used to provide a floor for incomes. Parity ratios computed on an area base could provide a guide for the expenditures of government funds on employment guidance or perhaps payments to aid movement of the labor resource.

SUGGESTIONS FOR FURTHER STUDY

The computed parity prices, as presented in this study, are probably not apt as a guide for a price support program such as is now in effect. Since detailed data on expenses and production were used it would be impossible to compute prices until some time after the end of the year. Also, the parity prices shown in this study were computed for small areas and were based on the actual production of that area. It should be possible, however, to alter the computations to meet the requirements of a price program. For instance, the data could be aggregated by regions and the price of corn established by use of data collected from the cornbelt as a whole. Prices could be established on the basis of "average production" by using a moving average of yields for (say) the past ten years. If it was desirable to announce prices early in the season the input quantities for the previous year(s) could be combined with current prices to obtain an estimate of the parity gross income for the current year. The exploration of these possibilities needs further study.

In this study, there was considerable agreement of parity prices among areas, but this does not insure agreement between prices computed for the cornbelt and prices computed for the wheat region. Therefore, the parity incomes and prices should

be computed for other areas and comparisons made. The comparison of the income positions of various areas should prove interesting.

The earnings of production workers in manufacturing was used throughout this study to establish the income ratios. The effects of the use of alternative series, with the possibility of correcting for unemployment in the non-farm segment should be explored.

The possibility of a relationship existing between the income ratios and the outmigration of farmers also presents an interesting area for study.

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APPENDIX

Table 16. Parity prices computed for the cash grain area (1937-41 base)

Year	Corn	Oats	Wheat	Soybean	Hogs per cwt.
1930	\$ 1.02	\$.52	\$ 1.42	\$ 1.48	\$ 13.28
1931	.83	.42	1.15	1.20	10.75
1932	.61	.31	.85	.88	7.91
1933	.71	.36	.98	1.02	9.18
1934	.94	.48	1.31	1.37	12.26
1935	.53	.27	.73	.76	6.83
1936	.83	.42	1.15	1.20	10.73
1937	.55	.28	.76	.79	7.09
1938	.55	.28	.77	.80	7.17
1939	.53	.27	.73	.76	6.83
1940	.67	.34	.93	.97	8.67
1941	.57	.30	.82	.79	7.26
1942	.66	.35	.97	.98	8.51
1943	.80	.43	1.15	1.24	10.60
1944	.89	.48	1.24	1.40	12.03
1945	.84	.47	1.17	1.36	11.63
1946	.80	.47	1.14	1.39	11.19
1947	1.34	.81	1.94	2.40	18.80
1948	.89	.53	1.25	1.64	12.49
1949	1.05	.61	1.45	1.89	14.43
1950	1.23	.71	1.72	2.23	17.14
1951	1.23	.71	1.74	2.24	17.30
1952	1.39	.78	1.93	2.48	19.06
1953	1.45	.80	2.00	2.55	19.12
1954	1.36	.73	1.84	2.39	18.11
1955	1.37	.71	1.84	2.42	18.52

Table 17. Parity prices of hogs (per cent) (1937-41 base)
(area differentials removed)

Year	Cash grain	Hog-beef fattening	Hog-dairy	Hog-beef raising
1930	\$ 13.28	\$ 10.54	\$ 10.87	\$ 14.23
1931	10.75	9.14	9.57	10.47
1932	7.91	7.11	7.74	8.17
1933	9.13	6.43	6.94	8.05
1934	12.26	9.69	9.37	12.20
1935	6.83	7.91	7.04	8.39
1936	10.73	11.07	9.65	13.09
1937	7.09	8.26	8.41	8.10
1938	7.17	7.78	7.51	8.27
1939	6.83	7.62	7.18	7.10
1940	8.67	7.70	7.31	7.23
1941	7.26	8.28	8.11	8.19
1942	8.51	7.98	8.51	6.94
1943	10.60	10.11	9.90	9.79
1944	12.03	11.02	11.89	11.50
1945	11.63	11.71	11.56	12.90
1946	11.19	10.53	12.15	10.28
1947	18.80	18.23	18.11	21.62
1948	12.49	15.07	14.12	13.45
1949	14.43	16.67	16.20	14.01
1950	17.14	16.57	16.49	14.39
1951	17.30	19.63	17.51	17.60
1952	19.06	19.41	17.48	15.90
1953	19.12	18.94	17.69	18.28
1954	18.11	16.76	15.84	18.81
1955	18.52	18.70	17.53	15.60