Chapter Four. Parity Prices, Parity Ratio, and Feed Price Ratios

IN THIS CHAPTER

Parity Prices published by NASS are computed under the provisions of Title III. Subtitle A, Section 301(a) of the Agricultural Adjustment Act of 1938 as amended by the Agricultural Acts of 1948, 1949, 1954, and 1956.

Three major provisions of the amended Act relating to the calculation of parity prices are:

(1) The 'parity price' for any agricultural commodity, as of any date, is determined by multiplying the adjusted base price of such commodity by the parity index.

(2) The 'adjusted base price' of any agricultural commodity, as of any date, is
   (i) the average of the prices received by farmers for such commodity, at such time as the Secretary may select during each year of the ten-year period ending on the 31st of December last before such date, or during each marketing season beginning in such period if the Secretary determines use of a calendar year basis to be impracticable, divided by
   (ii) the ratio of the general level of prices received by farmers for agricultural commodities during the period January 1910 to December 1914, inclusive.

(3) The 'parity index' or Prices Paid Index, as of any date, shall be the ratio of
   (i) the general level of prices for articles and services that farmers buy, wages paid hired farm labor, interest on farm indebtedness secured by farm real estate, and taxes on farm real estate, for the calendar month ending last before such date to
   (ii) the general level of such prices, wages, rates, and taxes during the period January 1910 to December 1914, inclusive.

The prices and indexes published by NASS and the data used in computing them, is determined by the Secretary, whose determination is final. Section 301(a) (1) (F) outlines authority for the Secretary of Agriculture to make special adjustments in the method of computing parity

prices for particular commodities if the method outlined in the Act results in parity prices seriously out of line with those of other commodities.

The Code of Federal Regulations, Title 7, Volume 1, Part 1-26 mandates the publication of the price indexes and the data used in computing them be published in the monthly *Agricultural Prices* report. Also published in the monthly report is the parity ratio. The parity ratio is a percentage relationship between the Index of Prices Received and the Index of Prices Paid.

History / Background

The idea of parity stemmed from a continuous search for a concrete measure of economic justice for the farmer. Fluctuating conditions in the economic life of farms and of the nation have steadily modified the concept of parity. Parity did not develop as the practical application of an economic theory, but as a result to assist the agricultural community in the early 1900s. The economic justification in its present form is from rationalization. Parity is a practical economic and political expedient, not a theory. (Grove, 1943)

The acute economic emergency was in part the consequence of a severe and increasing disparity between the prices of agricultural and other commodities. This disparity largely destroyed the purchasing power of farmers for industrial products, broke down the orderly exchange of commodities, and seriously impaired the agricultural assets supporting the national credit structure. The Agricultural Adjustment Act of 1933 declared that these conditions in the basic industry of agriculture had affected transactions in agricultural commodities with a national public interest, had burdened and obstructed the normal currents of commerce in such commodities, and rendered imperative the immediate enactment of title I of this Act.

The enactment of the Agricultural Adjustment Act of 1933 initiated the computation of parity prices by the USDA's statistical agency. The statistical agency has gone through a number of name changes throughout history. Today, the agency is the National Agricultural Statistics Service (NASS).

The idea that came to be called parity developed in the early 1920s to describe the agricultural depression that followed World War I (Black, 1942). The U.S. farm sector grew when the frontier was settled in the early years of the 20th century and high farm prices during World War I encouraged even more production. The end of the war coincided with the onset of mechanization which slowed the growth of demand. Overproduction created low prices which resulted in low per capita income of farmers.

The idea of parity had both statistical and political origins (Black, 1942). If there had never been any statisticians collecting data on prices of farm and other commodities, "farm parity" would never have come about. The parity movement was merely the outward expression of the maladjusted relationship between agriculture and the rest of society that developed at the end of World War I.

The parity concept was introduced at a conference on agricultural policy called by Secretary of Agriculture Henry C. Wallace in 1922. George N. Peek named it "fair exchange value" at the conference (Fite, 1954). Legislatively, the con-

cept emerged in the first McNary-Haugen (tariff) bill. The bill outlined a method for measuring the inequality of purchasing power of farm products and the means to dispel the inequality. In the pamphlet "Equality for Agriculture" which Peek privately printed in 1922, "a fair exchange value for any crop" was defined as "one which bears the same ratio to the current general price index as a ten-year pre-war, average crop price bore to the average price index, for the same period." (Peek, 1922).

Peek got the statistical framework for his idea from the USDA bulletin, "Prices of Farm Products in the United States" authored by George F. Warren (Warren, 1921). Warren, a Cornell University professor, had toured the country interpreting the price movements of 20 farm products and changes in the "all commodities" index of the Bureau of Labor Statistics (BLS). Warren explained that the "all commodities" price movements resulted from monetary factors and the individual commodity price changes were due to supply and demand conditions for that product.

The USDA invited Professor Warren to Washington, DC, to author a bulletin based on his research. That publication, issued in 1921, designated the ratio of prices received by farmers to the all commodities wholesale price index as the "purchasing power of farm products." The farm price series was a weighted average, weights being the relative production of different crops and livestock products as reported in the 1910 Census of Agriculture.

In 1922 the USDA began publishing a purchasing power index series on a regular basis in "Weather, Crops, and Markets" (NASS). Prices in 1913 were called the base, or 100. By 1921 the index value was 61, compared with a value of 111 in 1918. After several revisions of the weights in both the "all commodities" and the "prices received" indexes, the parity ratio appeared at or above 100 for the entire period 1924-1929. The farm products whose prices had risen most also increased most in output, notably dairy products and tobacco. This revision was not released until September 1934.

Parity prices for farm products were first defined by the Agricultural Adjustment Act of 1933. Agricultural leaders recognized that high or low prices for farm products are not in themselves of primary significance. Of far greater importance is what farm products will buy in terms of food, clothing, feed, machinery, fertilizer, and other items farmers need for living and for production.

The Agricultural Adjustment Act of 1933 made it the policy of Congress to reestablish prices to farmers at a level that would 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. Parity prices have come to be a widely used parity standard. They are the prices that give a unit of a farm commodity the same purchasing power or exchange value, in terms of goods and services bought by farmers, as a unit of the same commodity had in the 1910-1914 base period.

The 1910-1914 period was chosen as the base because it was considered a relatively normal period when price relationships were generally stable across all sectors of agriculture and nonfarm industries. In 1933 the Secretary of Agriculture's economic advisers said the 1910-1914 base period was selected because (a) it "represented a

period of considerable agricultural and industrial stability... with equilibrium between the purchasing power of city and country," (b) it was free from, major economic and political disturbances, and (c) prices of most major products sold were considered to be in fair relationship to prices paid by farmers. They stated further that the act "bases the parity prices upon the most recent period when economic conditions, as a whole, were in a state of dynamic equilibrium."

The index base period for comparison specified by law is the period from 1910 through 1914. As a result, the commodity parity price comparisons do not take into account the many technological developments that have affected efficiency and input utilization for production of crops and livestock.

Parity prices are computed in terms of prices received by farmers. Prices received generally relate to the average of all classes and grades of a given commodity sold by farmers. The same is true of parity prices. Parity is a national concept, and parity prices are not computed by State, commodity grades, or for specific markets. In connection with some programs, however, differentials are determined for grade, location, or season. Differentials may be applied to the national average parity price to determine the parity equivalent for a specific grade or location. Parity prices are not adjusted for seasonal variation.

Two principal refinements in the legislative definition of parity since 1933 are:

(1) To include in the Index of Prices Paid by Farmers, which is used in computing parity prices, interest on mortgage debt secured by farm real estate, taxes on farm real estate, and wages paid to hired farm labor.

(2) To compute adjusted base period prices for individual agricultural commodities, using price relationships for the most recent 10-year period. The 1910-1914 base period, however, remains the reference point for expressing parity prices for farm products.

Legislation

The Agricultural Adjustment Act of 1933 contained the first definition of parity. The act stated that it was the policy of Congress to…

> …reestablish 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 commodities in the base period. The base period in the case of agricultural commodities except tobacco shall be the prewar period, August 1909 to July 1914. In the case of tobacco, the base period shall be the post-war period, August 1919 to July 1929.
>
> …approach such equality of purchasing power by gradual correction of the present inequalities therein at as rapid a rate as is deemed feasible in view of the current consumptive demand in domestic and foreign markets.

Several amendments to this first definition stipulated an alternative base period for the purposes of marketing agreements or marketing orders where determining the purchasing power of a commodity would be difficult. The alternative base period was used in cases where a commodity's purchasing power could not be satisfactorily determined from USDA's available statistics. The base period…

> …for purposes of such marketing agreement or order, shall be the postwar period, August 1919 to July 1929, or all that portion thereof for which the Secretary finds and proclaims that the purchasing power of such commodity can be satisfactorily determined from the available statistics of the Department of Agriculture.

Provision was also made for calculating parity prices:

> … give to the commodity a purchasing power with respect to the articles that farmers buy equivalent to the purchasing power of such a commodity in the base period; and, in the case of all commodities for which the base period is the period August 1909 to July 1914, which will also reflect current interest payments per acre on farm indebtedness secured by real estate, tax payments per acre on farm real estate, and freight rates, as contrasted with such interest payments, tax payments, and freight rates during the base period.

During 1910-1914, the "golden age of agriculture" on which parity is based, the farm sector was viewed receiving a "fair share" of the economy's income and growth. That purchasing power is measured by the "parity index" which is a composite of prices paid by farmers (1910-1914 base period) for commodities, services, interest, taxes, and wage rates. Items used in farm production and items used for family living are included in both commodities and services. The farm production items in the prices paid index include inputs such as feed, seed, fertilizer, and feeder livestock that are used only by specialized enterprises and inputs such as fuel, motor vehicles, machinery, and agricultural chemicals that are commonly used on all types of farms. The family living items in the prices paid index have been represented by the consumer price index (CPI-U) since 1978. Family living items include household goods, apparel, utilities, and medical care. By pricing items where farmers buy and sell them rather than at central markets, USDA removed an explicit index of freight rates from the parity index to prevent double counting.

In response to economists' widespread criticisms of the parity price concept and to the political climate of postwar America, Congress changed the legal definitions of the parity index, parity prices, and parity income during the enactment of the Agricultural Adjustment Act of 1948. Those definitions remain in force today.

Under the 1948 law, the "parity index" is the ratio of:

> (i) The general level of prices for articles and services that farmers buy, wages paid hired labor, interest on farm indebtedness secured by farm real estate, and taxes on farm real estate, for the calendar month ending last before such date to (ii) the general level of such prices, wages, rates, and taxes during the period January 1910 to December 1914, inclusive.

The 1948 act changed the base price concept from average 1910-1914 prices for individual commodities to "adjusted base prices" which are the most recent 10-year average prices received for the commodity deflated by the corresponding 10-year average of the index of prices received for all commodities. The 1948 law defined the "new" parity prices as the product of the adjusted base period prices and the parity index. The act also provided for a "transitional" parity price to smooth adjustment from the old to the new definition. The change had the effect of retaining the purchasing power parity of all agricultural products at the 1910-1914 levels, but allowed relative parity of individual commodities to be based on recent performance and to fluctuate in response to changing market conditions.

The adjusted base period (1910-1914) price for each commodity is derived from the average price received in the 10 most recent complete calendar years and the corresponding 120-month average of the index of prices received by farmers (1910-1914 base). An allowance is made for unredeemed loans and other supplemental payments farmers receive for commodities grown under price support programs. The adjusted base price, multiplied by the parity index, gives the parity price for the specific commodity. This process permits parity prices to be calculated for commodities like soybeans, which were not widely grown in 1910-1914. The moving average underlying this changing base period price effectively raises the parity price for commodities whose recent price performance is stronger than the aggregate and lowers the parity price for commodities with weaker than average prices.

The first statutory definition of "parity" as it relates to income rather than purchasing power appeared in the Soil Conservation and Domestic Allotment Act of 1936, which declared that the purpose of the act was the …

> … reestablishment, at as rapid a rate as the Secretary of Agriculture determines to be practicable and in the public interest, of the ratio between the purchasing power of the net income per person on farms and that of the income per person not on farms that prevailed during the 5-year period August 1909 - July 1914, inclusive, as determined from statistics available in the Department of Agriculture, and the maintenance of such ratio.

The 1936 definition was revised in the Agricultural Adjustment Act of 1938, which provided that…

> …"parity", as applied to income, shall be that per capita net income of individuals on farms for (SIC) 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 to July 1914.

Both definitions relate to income ratios that existed in the same time span as the base period established for determining parity prices (1910-1914). Income parity under the 1936 definition was realized in every year between 1941 and 1956, and, under the 1938 definition, was realized each year between 1942 and 1955 with 98 percent of parity achieved in 1941 and 1956. The absolute levels of farm and nonfarm incomes per capita are regularly published in the Income and Balance Sheet Statistics from USDA.

The Agricultural Act of 1948 redefined parity income, effective January 1, 1950, in the following way…

> …"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 occupation. "Parity", as applied to income from any agricultural commodity for any year, shall be that gross income for such year as the average gross income from such commodity for the preceding 10 calendar years bears to the average gross income from agriculture for such 10 calendar years.

The 1948 act thus ushered in the standard of living concept of income parity, a subtle improvement over a money-income concept. A person's living standard depends on the goods, services, and intangibles consumed (including environment, health, safety, aesthetics, and lifestyle) rather than on income gained from work. To the extent that monetary values can be attached to a standard of living, they derive from the expenditure on items of consumption rather than from occupational income. However, differing preferences among farm and nonfarm people for identical items of consumption and differing availabilities of unpriced consumption distort the estimate away from the true standard of living. Hathaway estimated in 1963 that the welfare levels and labor returns of farm families would be comparable to nonfarm families if the money income of farm families equaled about 86 percent of nonfarm family income (Hathaway, 1963).

USDA research on the comparability of farm and nonfarm income revealed key information on the farm sector's structure. Part of that research was Grove's study of the per capita income by economic class of farm. Based on the value of 1949 sales reported to the Census of Agriculture, Grove found that farms with sales greater than $25,000 generated per capita income 2.4 times the per capita income of the nonfarm population, and farms with sales between $10,000 and $25,000 generated 1.1 times the per capita income of the nonfarm population. However, when the incomes of the smaller farms (less than $10,000 in sales) were taken into account, the per capita income of all persons living on farms averaged about half that of the nonfarm population. The result clearly showed the relationship between farm size and income, and the fallacy inherent in comparisons based on the average of a heterogeneous farm population.

The definition of parity was most recently reviewed in 1988 by a committee established by the Secretary of Agriculture. The committee evaluated changing the 10-year average prices and prices received indexes to a 15-year average used in calculating adjusted base prices. No change, however, was implemented to the current 10-year averages as little, if any, change would occur to current parity price levels.

The determination of parity prices is defined in the Code of Federal Regulations, Title 7, Volume 1, Agriculture Sections 5.1 to 5.6. This regulation was last revised January 1, 2010. Appendix A contains a summary of major legislation and farm bill programs. See table 4.1 for parity ratios and adjusted parity ratios.

Parity Prices

The parity price of a particular commodity is the price giving a unit of the commodity a comparable purchasing power to that in the base period. The comparison is made relative to a base period when prices for both paid and received provide an economic balance. By statute, the base period is 1910-1914.

The concept for parity prices then is essentially a comparison of the prices received for commodities with the prices paid for production and living expenses. Parity, at first glance, seemed to provide a way of gauging agriculture's economic condition particularly in relation to the urban sector which provides many of the goods and services producers purchase. Its use as a barometer of the agricultural sector is well sanctioned by tradition. As prices fall below the parity level, concern invariably rises among producers and their representatives.

The parity price formula does not measure cost of production, standard of living, or income parity. It is not a comprehensive measure of the economic well-being of farmers. It is based on price relationships, which are only one component of the cost of production.

Parity prices are generally national average prices. Prices represent all grades and qualities of the same commodity as sold by farmers in local markets at all locations in the United States. Parity prices do not represent a price for a specific grade of the commodity at a specific location.

Separate parity prices are calculated for fresh market and processing fruit and vegetables. For some fruits such as apricots, peaches, and pears there are three utilizations, fresh market, dried, and other processing. These utilization groups are considered separate commodities and parity prices computed for each.

Parity Price Calculations

The calculation of parity prices is a two step process, calculation of commodity adjusted base prices and the multiplication of the adjusted base price and the parity index (Prices Paid Index). The formula for calculating the adjusted base prices is:

$$ABP_c = \frac{\overline{P}_{10}}{\overline{I}_{10} * \left[1 + \frac{\overline{GP}_{10}}{\overline{CR}_{10}}\right] \Big/ 100}$$

where, ABP_c is commodity Adjusted Base Price, $\overline{P}_{10}$ is ten year average commodity price, $\overline{I}_{10}$ is ten year average Prices Received Index. $\overline{GP}_{10}$ is Government payments, and $\overline{CR}_{10}$ is total farm cash receipts.

The commodity parity price is derived by multiplying the commodity Adjusted Base Price by the Parity Index and dividing by 100.

$$Parity\ Price = [ABP_c * \text{PI}] / 100,$$

where
ABP_c is the commodity Adjusted Base Price and

PI is the Parity Index.

The descriptive steps to calculate parity prices are:

(1) The average of prices received by farmers for individual commodities for the 10 preceding years is calculated (for 2011, the period was 2001-2010). An allowance for unredeemed loans and for other supplemental payments resulting from price support operations is included for those commodities where applicable.

(2) This 10-year average price is divided by the average of the Index of Prices Received by Farmers for the same 10 preceding calendar years, adjusted to include an allowance for direct government payments under farm price-support operations. This computation derives the adjusted base price for individual commodities.

(3) Parity prices are computed by multiplying the adjusted base prices by the current Parity Index (1910-1914 = 100) and dividing by 100.

An example of the computation of the parity price based on data for January 2011 follows.

- The 120 month, January 2001-December 2010, average of prices received by farmers for corn adjusted for supplemental price support program payments was $3.16 per bushel.

- The l20-month average of the Index of Prices Received by Farmers, adjusted to include an allowance for commodity-related Government payments, was 824 (1910-1914 = 100).

- The index percentage of 824 is divided by 100 to obtain a ratio of 8.24.

- Dividing $3.16 by 8.24 gives $0. 384 per bushel, the adjusted base price.

- The adjusted base price ($0.384) multiplied by the parity index (2574 percent) and divided by 100, the January 2011 Parity Index results in a parity price for corn of $9.88 per bushel. See the January Agricultural Prices for further discussion about parity prices and parity index.

Adjusted Base Price Calculation

$$\frac{3.16}{771*\ 1+\frac{16435.43}{240628.2}\ /100} = \frac{3.16}{771*1.0687\ /100} = 0.384$$

Parity Price Calculation

[0.384 * 2574] / 100= 9.88

Uses of Parity Prices

Parity prices had a major role in the Government price-support program from the 1930s into the 1970s. In the 1980s, use of parity prices in support programs diminished greatly. The Food Security Act of 1985 does not mention parity. When the act expires, however, the permanent legislation would revert to the use of parity prices for agricultural programs unless new legislation is enacted. Existing legislation mandates the calculation and publication of commodity parity prices.

Parity prices are required for administering marketing orders under the authority of the Agricultural Marketing Agreement Act of 1937. Currently, USDA's Agricultural Marketing Service administers 10 marketing orders for milk. The 1996 Farm Act required consolidation of the Federal milk marketing orders into 10-14 regional orders, down from 33. Currently, there are 23 specific fruit, vegetable, and nut commodities covered by five regional market order offices. Under present legislation, parity prices with appropriate ad-

justments may be used for the purpose of the Agricultural Marketing Agreement Act of 1937. Parity has an integral role in putting into action orders and in determining when market orders are in effect, suspended, or terminated.

Other acts currently requiring use of parity prices are:

(1) The Food and Agricultural Act of 1977. It establishes loan levels at 90 percent of parity for certain agricultural commodities when commercial export sales are suspended because of short-supply determinations.

(2) The Agriculture and Food Act of 1981. It sets price support at 100 percent of parity when national security or foreign policy interests mandate an agricultural export embargo.

Existing legislation mandates continued calculation and publication of parity prices, uses them to set price supports for selected commodities, employs them to administer agricultural marketing orders, and relies on them in a number of special circumstances.

Limitations of Parity

There is widespread agreement among agricultural economists and others that parity prices do not provide a good basis for agricultural price and income controls. Parity prices freeze price relationships among agricultural products and other products in a pattern that, in most cases, is out of date with current agricultural production practices. The inaccuracy of parity price as a measure of net farm income results from the variability of net farm income with changing commodity prices and quantities produced.

Parity prices and the parity index indicate price relationships. They do not indicate farmer well-being, net income, or production costs. They merely show how current prices relate to those in 1910-1914. They are reference prices which contain built in biases ensuring that parity prices increase more rapidly than farm commodity prices. Thus, parity prices are not useful for judging whether current market prices may be deviating from underlying trends simply because of weather or short run demand aberrations. Parity prices also do not make appropriate reference points for administering programs.

The parity formula disregards changes in the farm sector since the base period. Farms are larger and more productive than during the base period. Farm productivity has increased more rapidly than nonfarm productivity for as long as a USDA multifactor productivity index has been reported. (Tiegen, 1987, June)

The interest component of the parity formula is too broadly defined. A bias results from calculating the interest component of the parity index as payments per acre of farm real estate. That is, the index reflects both price and quantity dimensions. (Tiegen, 1987, September) While the index increases when interest rates increase, it also increases when other factors change. Other factors affecting the index change are the amount of land being mortgaged, the amount of the down payment of the mortgage, and the value of the land being mortgaged. (Tiegen, 1987, June) This is a weakness to the prices paid concept which is a building block to the parity index.

Index differences in the adjusted base price definition move parity prices away from market prices. The adjusted base price is the ratio

of the current parity index to the 10-year average of the prices received index including adjustments for government program payments received. The parity index responds to different factors than does the index of prices received causing the two to change at different rates and to seek different levels. (Tiegen, 1987, June)

The resurgence of farm prices during World War II brought about price controls for farm products and other commodities. Parity prices were used as a ceiling to administer the price control program. Toward the end of the war, farmers would have received parity incomes or more, even without parity prices. The Steagall Amendment of 1941 set price support at 90 percent of parity for all commodities whose production was expanded by the war effort. As World War II was drawing to a close, intellectuals began to discuss the structure of society and American social policy in peacetime. In 1945 the American Farm Economics Association (AFEA) sponsored an essay contest on farm price policy. The winning essays were published in the November 1945 issue of the *Journal of Farm Economics*. There was virtually unanimous agreement among winning analysts that price parity hinders the functioning of a proper pricing system. (AFEA and Johnson, 1945)

The following views were presented from the winning essays:

- Price relationships of 1910-1914 grossly distort the current pattern of consumer choices.
- Cost relationships among commodities and regions in that time differ greatly from current relationships, freezing resources into an out-of-order design.
- Government actions to realize parity goals have insulated agriculture from the socially beneficial effects of a sensitive pricing system.
- Necessary shifts of population out of agriculture are prevented.
- Raising prices above free-market levels cannot raise inadequate farm incomes of noncommercial farmers.
- Parity fails to reflect the prevailing grade, geographic area, and seasonal price differentials.
- Parity would price products out of foreign and domestic markets resulting in either surpluses or production and marketing quotas.

The AFEA impaneled a committee on parity concepts. The committee set forth a slightly different set of weaknesses and limitations to the parity formula (AFEA and Wright, 1946):

- By adopting a historical base period, the parity formula freezes a functional and otherwise self-adjusting price mechanism.
- In allocating productive resources and people, the only alternative to relative prices is the direct order of the government.
- The parity formula ignores the progress made in farm technology which has reduced the costs of producing some crops more than others.

- The formula makes no allowance for the improvement in quality of goods and services bought by farmers.

- The high support prices based on parity gave the farmer incentive to produce on fewer acres as much as resourcefulness would allow.

- The parity formula has subsidized excess production simply to fill public storage facilities.

- Manufacturers of substitutes will be greatly encouraged by the fixed price of farm crops like cotton.

- Fixed parity prices do similar harm in the foreign market by pricing American exports out of the range of importing countries.

Congress responded to these analyses and criticisms and the political climate of the time by changing the legal definitions of parity price and parity income in the Agricultural Adjustment Act of 1948. The law provided for "transitional" parity prices in order to smooth the changeover from the old definition to the new definition during the 1950 to 1956 time period.

The 1957 report, as required by section 602 of the Agricultural Act of 1956, *Possible Methods of Improving the Parity Formula*, addressed the question of what kind of formula might be most useful and proposed a number of changes to parity prices. The report discussed in depth five changes in parity price formulas to address shortcomings of the current formula:

- Moving to different base periods.

- Devising separate parity indexes for individual commodities.

- Adjusting the prices to reflect gains in production efficiencies.

- Reflecting the costs of price stabilization programs in the parity prices.

- Shifting to a parity income formula, based on either historical income ratios or on direct farm/nonfarm comparisons.

The report's only specific recommendation was to continue using a 10-year average as the base period for parity prices.

For as long as there have been parity prices, criticisms and proposed improvements have been made. Since the parity price formula was last changed in 1956, many of the proposed changes to the formula from the 1957 report to Congress are still valid today.

Since 1957 two technical aspects of the concepts underlying the parity price definition have been recommended that would keep parity prices more responsive to current market prices. The first refinement would change the definitions of the adjusted base period price by deflating the moving average of the commodity prices by the index of prices paid by farmers, rather than the prices received index. Under this definition, the parity price would be consistent with a long run average, adjusted for current input costs. The second refinement would change the interest and tax components of the parity index to reflect price changes alone, rather than the expenditures they now reflect. If the tax component cannot be expanded to cover all taxes paid by farmers, then

dropping taxes as a component should be considered.

Parity Ratio

The parity ratio (the index of Prices Received by Farmers for the products they sell divided by the Parity Index (1910-1914=100) provides an indication of the per unit purchasing power of farm commodities generally in terms of the goods and services currently bought by producers, in relation to purchasing power of farm products in the 1910-1914 base period. A parity ratio less than 100 indicates that the average per unit purchasing power of all farm products is lower than during the 1910-1914 base period.

The parity ratio is a measure of price relationships and not a measure of farm income, producers' total purchasing power, or producers' welfare. The latter depends on a number of factors other than price relationships. Production efficiency and technology, quantities of farm products sold, and supplementary income, including that from off-farm jobs and federal programs, must be utilized to measure a producer's well-being.

Interpretations and Uses

The Index of Prices Received by Farmers is a measure of the changes in average prices that farmers receive for agricultural commodities. The Parity Index (Indexes of Prices Paid by Farmers for Commodities and Services, including interest, taxes, and farm wage rates) is a measure of changes in prices paid by farmers for goods and services used in family living and in production, together with interest, taxes, and farm wage rates. The parity ratio consists of the relationship between these two indexes expressed as a percentage.

The parity ratio measures the purchasing power of products sold by farmers in terms of things they buy, compared with their purchasing power in the base period, 1910-1914. As of any given date, the parity ratio is computed by dividing the Index of Prices Received by Farmers by the Parity Index and converting the ratio to a percentage. If the result is above 100 percent (i.e., if the Prices Received Index is higher than the Parity Index), products sold by farmers have a greater per unit purchasing power than in 1910-1914. In contrast, when the ratio is below 100 percent, the average per unit purchasing power of commodities sold by farmers is less than in the base period. Parity ratios from 1959 to 2010 are shown in table 4.1 in the Appendix.

Income from sales of farm commodities in many cases is supplemented by Government payments under farm support programs. To recognize income supplements provided by Government farm programs, an adjusted parity ratio is calculated incorporating direct Government payments. The method of computation which was published in the January 1964 issue of *Agricultural Prices* is outlined below:

(1) From annual data on receipts by farmers from marketings and Government payments, the ratio of Government payments to receipts from marketings is computed.

(2) The Index of Prices Received by Farmers is then multiplied by a factor that is 1.000 plus the above ratio. Thus, for 1989, the ratio of payments to receipts from marketings was 0.067 (6.7 percent). For each month in 1989, the Index of Prices Received by Farmers was

multiplied by 1.067, and the resulting product divided by the Parity Index to give the adjusted parity ratio.

Adjusted Parity Ratio

The importance of nonprice income supplements provided to farmers by the Government makes it essential to provide a parity ratio that reflects these supplemental funds to farmers. The method of computing adjusted parity ratios is as follows:

1) Compute the ratio of Government payments to annual cash receipts from marketings producers receive.

   Factor for adjusting the ratio of prices received to prices paid indexes for January 2010 is 1.04.

   Parity Ratio Adjustment Factor = GP / CR +1,

   where GP is the Government Payments and CR is total farm cash receipts.

   Government Payments and total Cash Receipts for 2010 are $12,176,400,000 and $312,300,000,000, respectively.

   12,176,400,000 / 312,300,000,000 + 1 ≈ 1.04

2) The Index of Prices Received by Farmers for any month in the year is multiplied by the parity ratio adjustment factor to account for Government Payments received by producers. The ratio of the adjusted Prices Received Index and the parity index multiplied by 100 gives the adjusted parity ratio. For January 2010,

   Adjusted Parity Ratio (PR)

   [[Jan. 2010 Prices Rec'd * PR Adj. Fac.]/ Parity Index]*100

   January 2010 Adjusted Parity Ratio

   (886 * 1.04) / 2407 = 921 / 2407 = .382 *100 = 38

No data on cash receipts from marketings or Government payment data are available in January of the current year. In order to provide a preliminary estimate of the adjusted parity ratio, an estimate of the ratio of Government payments to annual receipts from marketings is needed. The USDA's Economic Research Service (ERS), at the beginning of each year, estimates what the ratio of Government payments to receipts from marketings is expected to be for the year. This estimate is used to compute the preliminary adjusted parity ratio published each month in *Agricultural Prices*. Each year in January, adjusted parity ratios are revised based on actual data to compute the ratio of Government payments to annual receipts of marketings.

Limitations

The parity ratio is a measure of price relationships and not a measure of farm income, farmers' total purchasing power, or farmers' welfare. The latter depends upon a number of factors other than price relationships, such as changes in production efficiency and technology, quantities of farm products sold, and supplementary income, including that from off-farm jobs and federal programs. See Table 4.1 in the Appendix for adjusted parity ratios.

The limitations for parity prices apply to parity ratios. Descriptions of production efficiencies and technologies, quantities of farm products sold, and supplementary income weaknesses can be found in the parity prices limitations section.

Feed Price Ratios

Feed price ratios indicate whether price relationships between feed and livestock are becoming more or less favorable. The ratio is the amount of feed equal in value to the farm price of a unit of livestock commodity.

The largest component in the cost of producing livestock and livestock products is feed. Feed price ratios, then, provide a measure of the general profitability of production. The NASS published feed price ratios provide a general level of industry profitability for all U.S. producers of milk, eggs, broilers, turkeys, hogs, and fed cattle.

The individual ratio is an indication of how many units of a feed purchased are equal in value to one unit of product sold, based on US average prices received for specified date. Feed price ratios, when charted over time, present a picture of the changing overall general condition (weakening/strengthening) for the industry represented. The higher the ratio the more favorable is the profitability in the industry.

Background

The feed ratios for milk, eggs, broilers, and turkeys were first released in 1960. The hog ratio followed in 1961 and the steer-heifer ratio in 1969. The feed units and prices used for each of the commodity ratios are shown in Table 4.2.

Modifications in the calculation of feed price ratios for broiler-feed, egg-feed, milk-feed, and turkey-feed resulted from prices paid program changes initiated in January 1995. Prices paid estimates for feed items were reduced from a quarterly survey to an annual April survey. In February 1995, the methodology for calculating the four feed price ratios (milk, eggs, broilers, and turkeys) was modified. The feed rations formula changed from using the quarterly complete feed costs to a modeled ration methodology based on a mix of ingredients common to dairy and poultry production as provided by universities specializing with animal nutrition programs. The new methodology utilizes major raw feed component prices from NASS agricultural commodity prices reports that are published monthly. The major feed components of corn and soybeans account for 83 and 91 percent of the total ingredients in the rations. The contribution for feed additives and antibiotics are held constant.

Historical data for the new methodology carried back to 1985 were published in the February 1995 *Agricultural Prices Report.* Feed price ratio data are also available from the NASS searchable data base called Quick Stats. The Quick Stats database can be found at the bottom of http://www.nass.usda .gov/.

Feed Price Ratio Calculations

The following are the formulas used to calculate the six feed price ratios.

Hog-Corn Ratio

The hog-corn ratio measures the bushels of corn equal in value to one hundred pounds of hogs, liveweight.

$$\text{Hog - Corn Ratio} = \frac{\text{all hogs price per cwt}}{\text{corn price per bushel}}$$

Steer and Heifer-Corn Ratio

The steer and heifer-corn ratio measures the bushels of corn equal in value to one hundred pounds of sheers and heifers, liveweight.

Steer and Heifer –Corn Ratio =

$$\frac{\text{steers and heifer price per cwt}}{\text{corn price per bushel}}$$

Broiler-Feed Ratio

Broiler grower feed price is based on the composite price of 58-percent corn and 42-percent soybeans, U.S. average prices per bushel, where one bushel of corn equals 56 pounds and one bushel of soybeans equals 60 pounds. The broiler-feed ratio measures the pounds of broiler grower feed equal in value to one pound of broilers, liveweight.

$$\text{Broiler - Feed Ratio} = \frac{\text{live broiler price}}{\text{broiler grower feed price}}$$

Derived Broiler Grower Feed Price

Dollars per pound of broiler feed =

$$\left(0.58 * \frac{\text{Corn Price}}{56}\right) + \left(0.42 * \frac{\text{Soybean Price}}{60}\right)$$

Egg-Feed Ratio

The egg-feed ratio measures the pounds of laying feed equal in value to one dozen market eggs.

$$\text{Egg - feed Ratio} = \frac{\text{market egg price}}{\text{laying feed price}}$$

Derived Laying Feed Price

Laying feed price is based on the composite price of 75-percent corn and 25-percent soybeans, U.S. average prices per bushel, where one bushel of corn equals 56 pounds and one bushel of soybeans equals 60 pounds.

Dollars per pound of laying feed =

$$\left(0.75 * \frac{\text{Corn Price}}{56}\right) + \left(0.25 * \frac{\text{Soybean Price}}{60}\right)$$

Turkey-Feed Ratio

Turkey grower feed is based on the composite U.S. average prices of 51-percent corn, 28-percent soybeans, and 21-percent all wheat, where one bushel of corn equals 56 pounds, one bushel of soybeans equals 60 pounds, and bushel of all wheat equals 60 pounds. The turkey-feed ratio measures the pounds of turkey grower feed equal in value to one pound of turkey, liveweight.

$$\text{Turkey - Feed Ratio} = \frac{\text{Turkey Price}}{\text{Turkey Grower Feed Price}}$$

Derived Turkey Grower Feed Price

Dollars per pound of turkey grower feed =

$$\left(0.51 * \frac{\text{Corn Price}}{56}\right) + \left(0.28 * \frac{\text{Soybean Price}}{60}\right) + \left(0.21 * \frac{\text{All Wheat Price}}{60}\right)$$

Milk-Feed Ratio

The 16 percent dairy feed is based on the composite U.S. average prices of 51-percent corn, 8-percent soybeans, and 41-percent alfalfa hay, where one bushel of corn equals 56 pounds, one bushel of soybeans equals 60 pounds, and one ton of alfalfa equals 2,000 pounds. The milk-feed ratio measures pounds of 16% dairy feed equal in value to one pound of all milk.

$$\text{Milk - Feed Ratio} = \frac{\text{All Milk Price}}{\text{16\% Dairy Feed Price}}$$

Derived 16 percent Dairy Feed Price

Dollars per pound of 16% dairy feed =

$$\left(0.51 * \frac{\text{Corn Price}}{56}\right) + \left(0.08 * \frac{\text{Soybean Price}}{60}\right) + \left(0.41 * \frac{\text{Alfalfa Price}}{2000}\right)$$

Limitations of Feed Price Ratios

The feed price ratios published by NASS represent a general ratio of how many units of feed can be purchased with the sale of one unit of the commodity. The ratios, then, can provide some indication of profitability margins for the industry in general. These ratios are not intended to provide a level of profitability for an individual producer as prices and other production inputs vary by geographic regions.

Many factors affect the level where profitability occurs for an individual producer. Feed ingredient costs, feed conversion efficiencies, animal genetic characteristics and breeding, etc. are factors affecting the break-even level of the feed price ratio and individual producer profitability margin.

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Appendix A: Summary of Major Agricultural Legislation and Farm Bill Programs, 1933-2008[1]

Agricultural Adjustment Act of 1933

- the first major price support and acreage reduction program
- set parity as the goal for farm prices
- acreage reduction achieved through voluntary agreements with producers
- markets regulated through voluntary agreements with processors and others
- processing taxes used to offset cost of program

Agricultural Adjustment Act Amendments of 1935

- gave President authority to impose import quotas when imports interfered with agricultural adjustment programs
- designated 30 percent of customs receipts to promote agricultural exports and domestic consumption and help finance adjustment programs

Soil Conservation and Domestic Allotment Act of 1936

- payments to farmers authorized to encourage conservation
- set parity as the goal for farm income

Agricultural Adjustment Act of 1938

- reenacted a modified Soil Conservation and Domestic Allotment Act
- provided for acreage allotments, payment limits, protection for tenants
- first comprehensive price support legislation with nonrecourse loans
- marketing quotas established for several crops

Steagall Amendment of 1941

- required support of many non-basic commodities at 85 percent of parity or higher
- soon amended to require 90 percent of parity and extended for 2 years after war

Agricultural Act of 1948

- shifted price supports from fixed to flexible, a move postponed several years
- modernized parity formula

Agricultural Act of 1949

- became part of fundamental legislation along with 1938 Act; last major act without an expiration date
- superseded 1948 Act, postponing flexible price supports
- cushioned impact of new parity formula

[1] USDA. Economic Research Service. (1984)

Agricultural Act of 1954

- established flexible price supports beginning 1955
- authorized a CCC reserve for foreign and domestic relief

Agricultural Trade Development and Assistance Act of 1954 (P.L. 480)

- became the basic act for selling and bartering surplus commodities overseas and for overseas relief

Agricultural Act of 1956

- began Soil Bank program for long- and short-term removal of land from production

Emergency Feed Grain Program of 1961

- launched a voluntary acreage reduction program with PIK provisions

Food and Agriculture Act of 1962

- continued feed grain acreage reduction program
- provided two-tiered feed grain supports with price support payments in addition to nonrecourse loans
- proposed a mandatory wheat program, voted down by referendum

Agricultural Act of 1964

- established a wheat certificate program
- began a cotton PIK program

Food and Agriculture Act of 1965

- first in a series of comprehensive, multi-year farm laws; lasted 5 years
- extended voluntary acreage controls to wheat and cotton
- wheat certificate program from 1964 extended

Agricultural Act of 1970

- provided a more flexible approach to supply control through set asides
- limit of government payments to $55,000 per crop

Agriculture and Consumer Protection Act of 1973

- target prices and deficiency payments replaced price support payments
- payment limit lowered to $20,000
- emphasized expanded production to meet world demand

Food and Agriculture Act of 1977

- raised price and income supports
- continued flexible production controls and target prices
- established farmer-owned reserve for grains
- set up new two-tiered peanut program

Agriculture and Food Act of 1981

- contained a number of cost-cutting measures
- set specific target prices for 4-year length of bill
- rice allotments and marketing quotas eliminated
- dairy supports lowered

Omnibus Budget Reconciliation Act of 1982

- froze dairy price supports

No Net Cost Tobacco Program Act of 1982

- established producer-supported fund to repay Government for program costs
- required disposal of some nonfarm allotment holdings

Payment-in-Kind (PIK) Program of 1983

- provided voluntary, massive acreage reduction by adding payments in kind to regular acreage reduction payments for grain, upland cotton, and rice; instituted by executive action

Dairy and Tobacco Adjustment Act of 1983

- froze tobacco price supports
- launched a voluntary dairy diversion program

Agricultural Programs Adjustment Act of 1984

- froze target price increases provided in 1981 Act
- paid diversions authorized for feed grains, upland cotton, and rice
- wheat PIK program provided for 1984

Food Security Act of 1985

- introduced marketing loan provisions to commodity loan programs to reduce forfeitures
- continued the reduction in milk price supports
- mandated a milk production termination program
- maintained normal marketing relationships between wool and mohair
- maintained approximately same percentage of parity for mohair as for wool
- authorized optional support programs including marketing loans, loan deficiency payments, target option program, and inventory reduction payments

Food, Agriculture, Conservation, and Trade Act of 1990

- provided producers greater planting flexibility
- based payments on historical production rather than current output

The Federal Agricultural Improvement and Reform Act of 1996 (Freedom to Farm Act)

- replaced price support and supply control program of direct payments base on historical production
- revised and simplified direct payment programs for crops
- eliminated milk supports through direct government purchases
- authorized 7-year production flexibility contract payments
- authority for honey program eliminated

The Farm Security and Rural Investment Act of 2002

- introduced counter-cyclical payments program triggered when current prices fall below target level and paid on historical production
- income support wheat, feed grains, upland cotton, rice, oilseeds provided through direct payments, counter-cyclical payments, and marketing loans
- support for peanuts changed from price support program with market quotas to program with market loans, counter-cyclical payments, direct payments, and a quota buy out
- sugar program to operate as a "no net cost" program
- new dairy income support program introduced

Food, Conservation, and Energy Act of 2008

- enacted an option revenue-based counter-cyclical program, Acreage Crop Revenue Election (ACRE) program
- counter-cyclical payments available for dry peas, lentils, small chickpeas, and large chickpeas
- base acreage adjustments for eligible pulse crops, eligible other oilseed acreage
- base acres of rice on farm apportioned using 4-year average percentages of acreage planted
- reduced payment acres for direct and ACRE payments to 83.3 percent
- prohibits direct payments, counter-cyclical payments and ACRE if sum of base acres is 10 acres or less unless farm is owned by socially disadvantaged or limited-resource producer

Appendix of Tables

Table 4.1. Parity Ratio and Adjusted Parity Ratio by Year

Year	Parity Ratio %	Adjusted Parity Ratio %	Year	Parity Ratio %	Adjusted Parity Ratio %
1959	81	82	1985.....	52	55
1960	80	82	1986.....	51	56
1961	79	83	1987.....	51	58
1962	80	83	1988.....	54	60
1963	78	81	1989.....	55	59
1964	76	80	1990.....	50	53
1965	76	81	1991.....	47	50
1966	79	85	1992.....	47	49
1967	73	79	1993.....	47	50
1968	73	79	1994.....	45	47
1969	73	79	1995.....	44	46
1970	72	77	1996.....	47	48
1971	70	75	1997.....	43	45
1972	74	79	1998.....	42	45
1973	91	94	1999.....		
1974	86	87	2000.....	39	43
1975	76	76	2001.....	40	44
1976	71	72	2002.....	38	40
1977	66	68	2003.....	40	43
1978	70	72	2004.....	42	44
1979	71	72	2005.....	38	42
1980	65	65	2006.....	37	39
1981	60	62	2007.....	40	42
1982	55	57	2008.....	39	40
1983	56	57	2009.....	35	36
1984	58	59	2010.....	38	39

Computed using indexes on the 1910-14 = 100 base period. The parity ratios are also available for each year 1910-1958

Table 4.2. Equivalent feed and price components, feed price ratios

Feed Price Ratio	Type and Unit of Feed	Type and Unit of Livestock Priced
Milk feed.....	16 percent dairy feed, pound	Farm price, one pound of whole milk
Egg feed	Laying feed, pound	Farm price, one dozen eggs
Broiler feed	Broiler grower feed, pound	Farm value, one pound of live broiler
Turkey feed.....	Turkey feed, pound	Farm value, one pound of live turkey
Hog corn	Corn, bushel	Farm price, 100 pounds of live hogs
Steer-heifer corn.....	Corn, bushel	Farm price, 100 pounds of live fed cattle