PRICING SOYBEANS IN KANSAS

by

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INTRODUCTION

Purpose

It is the purpose of this study to investigate and analyze the price relationships between soybeans and related products in order to assist in solving marketing and processing problems involving inventory and risk management. Price relationships mean the relationships which exist between cash prices of the commodity (soybeans) and cash prices of its by-products; namely, oil and meal; relationships between cash and futures prices; relationships between futures prices of the commodity and futures prices of its by-products; and relationships between other farm commodity prices and soybean prices.

Problem

Soybeans have become a major crop in the United States within the last 20 years, and in Kansas their importance, as measured by production, has increased twenty-fold in the last 13 years. However, processing capacity has increased more rapidly. As a result, most soybean processors, during this period of expanded production, have been forced to purchase a supply of soybeans during the harvesting season to assure operation of crushing facilities throughout the year. The general practice has been to purchase a supply of soybeans during September, October, and November and place them in storage for later processing. The accumulation of large inventories during these three months has concentrated the problem of inventory and risk management into the hands of a relatively few processors.

Soybean processors have shifted the risk of inventory ownership by forward sales and by hedging. The forward sales or forward contracts are private treaties, like cash sales, except that they are made for deferred delivery. Forward

sales naturally sell for less than current delivery. Forward sales are a perfect risk shifting system if forward sales can be accomplished.

To date, the hedging of soybean purchases in the futures market has met with varied success for Kansas soybean processors. Many reasons are advanced for the inadequacy of the futures market: (1) volume of futures transactions has not been sufficient to provide adequate price change insurance, (2) relatively few buyers and sellers may influence the market unduly, (3) the many and varied products made from the soybean have different market values and outlets, and (4) similar products made from oil producing crops have an influence on soybean prices.

Risk bearing includes the cost of storage, insurance, interest on funds invested in grain ownership, and adverse price changes. Processors have attempted to shift these risks on to the futures market or by forward sales. The forward sales of soybean oil and meal to feed manufacturers and oil refiners have been used successfully in shifting risk; however, the shifting of risk by forward contracts has been met by increasing discounts from the current month delivery by users of oil and meal. The shifting of risk through the use of futures markets has met with varied success.

Review of Literature

A review of literature pertaining to soybean prices is necessary in this study to understand more adequately the many ramifications of soybean pricing in the United States. A brief review of published material will bring together the conclusions of many authors on subjects which will shed light on the analysis of relationships existing between soybeans, its many related products, and other like commodities and reveal areas where information is needed but not

heretofore provided. The major contributions to this field of study are listed along with their contribution.

The United States Department of Agriculture weekly and monthly publications were used in the tabulation of the many price series. Of particular value in this study were "The Feed Situation," "The Fats and Oils Situation," "Crops and Markets," Agricultural Statistics, Reports of the Kansas State Board of Agriculture, and Reports of the Commodity Exchange Authority.

The following private trade publications were used: "Kansas City Grain Market Review," "The Chicago Journal of Commerce," "The Wall Street Journal," and the "Oil, Paint, and Drug Reporter."

Miscellaneous tabulations were made from the market quotation reports of the "Board of Trade of the City of Chicago," "New York Produce Exchange," The Memphis Merchants Exchange Clearing Association, and The 1953 Soybean Blue Book.

Dr. G. L. Jordan, Professor of Agricultural Economics, University of Illinois, in "What Determines Soybean Prices," Bulletin 546 of the Illinois Agricultural Experiment Station reasoned that prices received by farmers for soybeans are determined as follows:

> Prices received by farmers for soybeans depend on the prices that consumers will pay for meat and other animal products, margarine, and vegetable shortenings; on the size of the livestock population; the supplies of protein supplements, corn, and edible fats and oils; and the costs and profits of handlers, transportation agencies, and processors. The dominant causes of year-to-year variations in soybean prices are changes in the ability of the United States consumer to buy these related products and in the quantities of protein supplements and edible fats and oils available.
>
> In the absence of price ceilings or effective price supports, prices of soybean meal can be expected to change during the next few years about 1.2 times as much (in percentage) as disposable personal income, and in the same direction. Meal prices can be expected to move in the opposite direction to changes in supplies of the supplements used in this analysis (converted to a meal-equivalent basis) and about 0.40 to 0.45 as much (in percentage). An increase of one bushel per animal unit in the

corn supply would tend to drive down the price of meal about 2.5 percent. During the next few years the actual price of soybean meal will probably be about the same as the weighted composite price of all the supplements used in this analysis when converted to a meal-equivalent basis.

Soybean oil prices, in the absence of price controls or effective price supports, will change in the same direction and to about the same extent (percentage as disposable personal income changes. They will also tend to change about 1.4 to 1.5 percent in the opposite direction with every 1 percent change in supplies of the four edible fats and oils—soybean oil, cottonseed oil, lard, and butterfat. The actual price of soybean oil will be approximately 55 percent as high as the weighted composite price of the four edible fats and oils.

From the combined value of the oil and meal must be deducted the marketing and processing costs. These costs fluctuate rather widely. They have become somewhat stabilized, however, since 1934-35 around a figure equal to 25 cents a bushel plus 25 percent of the value of the meal and oil minus 2 cents for every year since 1934-35 (cumulative).

Up to World War II, as soybean production expanded rapidly and the market became a little better organized, the seasonal spread in soybean prices from the October low to early summer high declined somewhat. Since World War II the October price has continued to be very low compared with the yearly average price (after corrections are made for changes in demand and production); but the peak has come sooner—in April or May—and much of the rise has occurred by January. More farm storage until January or May will probably pay growers for several years unless we get into a period of price controls. In case price controls are applied, some consideration will have to be given to the matter of orderly marketing, either by allowing seasonal variations in prices or by paying farmers or others a fee for storing. /1

Drs. T. A. Hieronymous and G. L. Jordan, Professors of Agricultural Economics, University of Illinois, in a monthly publication, Illinois Farm Economics, Number 173, October 1949, entitled "Farm Storage of Soybeans Carries Small Price Risk" make the following comments on seasonal movement of prices:

One explanation advanced for the unusually large seasonal increase in the price of soybeans has been that soybean storage was inadequate during the fall months and that the price of storage has been high. Soybeans move onto the market at harvest in such large quantities that it is difficult to find storage for them.

/1 G. L. Jordan, "What Determines Soybean Prices," University of Illinois, Agricultural Experiment Station Bulletin 546, March, 1951, pp. 187 -8.

We do not agree with this standard explanation and expection of the soybean seasonal.

Soybean processors, as a group, are willing to pay up to within 30 cents per bushel of as much for soybeans as they can get for the oil and meal made from a bushel of soybeans. In deciding the price they will bid at country points, they take the combined value of 48 pounds of soybean meal, bulk, Decatur, Illinois, and nine pounds of soybean oil in tank cars, midwestern mills, and subtract 30 cents from it. For example, if soybean oil is 15 cents per pound and soybean meal $70 per ton (3½ cents per pound) the combined value is $3.18 per bushel. Up to $2.88 will be bid for soybeans.

The prices of soybeans and soybean products are extremely erratic, changing frequently and by considerable amounts. If a soybean processor were to buy soybeans at one time and sell the products at some later time he might realize the expected 30 cents, or he might realize less or more than 30 cents. They use the sale of oil and meal for deferred delivery, or forward sale, almost exclusively.

Forward sales are made to oil refiners in the case of oil and to feed ingredient wholesalers and feed manufacturers in the case of meal. While oil refiners, feed wholesalers, and feed manufacturers are more willing to assume risks of price change than are soybean processors, they will not carry, without reward, more risks than are necessary. Accordingly, the practice of offering discounts for accepting deferred delivery has arisen. They decline as the time to delivery decreases. Accordingly, those farmers who sell soybeans in the fall pay much larger risk premiums than those who sell soybeans in the spring.

On the basis of this risk shifting system with its discounted prices we suggest that risk premiums explain the unusually large seasonal movement of soybean prices. It arises out of ownership considerations rather than storage factors. /1

A. R. Sabin, Bureau of Agricultural Economics, United States Department of Agriculture in Marketing Channels and Margins for Soybeans and Soybean Products, October 1950, studied on a sample basis, the marketing of soybeans by farmers in Illinois for crop years 1947 and 1948:

About 96 percent of soybeans sold off Illinois farms were sold to country elevators. The gross margin received by country elevators for soybeans was 13.6 cents per bushel for the 1947 crop and 8.0 cents

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/1 T. A. Hieronymous and others, Farm Storage of Soybeans Carries Small Risk, Illinois Farm Economics, Number 173, October 1949, pp. 911-12-13.

for 1948. The margin at the elevator in 1947 included speculative or fortuitous price gains averaging 4.3 cents per bushel. The 1948 price gain was 0.7 cents per bushel. Dealers intermediary between the country elevators and the processors received gross margins of 2.0 cents per bushel.

Processing plants incurred costs averaging 8.1 cents per bushel from the time soybeans were bought until they were received at the processing plant. Acquisition costs varied considerably, however, with large plants paying an average of nearly 10 cents per bushel more than small plants for getting beans to the processing plant after they were bought. Small plants may have averaged higher returns for soybean products than did larger processing plants. On the other hand, it seems probable that larger plants had lower costs per bushel for processing soybeans than did the smaller concern. /1

A. M. Rollefson, D. B. Agnew, and C. H. Kiorstead, Fats and Oils Branch, Production and Marketing Administration, Agricultural Information Bulletin No. 57, June 1951, entitled "Improved Soybean Marketing Through Farm Storage." In their summary they point out:

Soybean marketing problems include seasonally depressed soybean prices, shortages of freight cars, and congestion of handling facilities at country and terminal elevators at harvest time.

These problems are worsened by concentration of the major part of United States soybean production in limited areas, the short harvesting period with rapid accumulation of soybeans at harvest time, and the large volume of soybean sales by farmers at harvest time.

Increased soybean storage by farmers ordinarily would earn them extra profits and, especially for on-farm storage, would help reduce serious marketing problems.

In 3 of the 4 postwar years, soybean storage paid well. Of the farmers who stored 1,500 bushels in each crop year from 1946-47 through 1949-50, those who sold the beans at the average December-January price earned, for the four years, $1,800 more than they would have received at harvest time; those who sold at the average March-April-May-June price received $2,300 extra; and those who anticipated market changes well enough to sell within 25 cents a bushel of the seasonal peak price received

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/1 A. R. Sabin, "Marketing Channels and Margins for Soybeans and Soybean Products", United States Department of Agriculture, Study under Research and Marketing Act, October 1950, p. ii.

at least $3,000 extra. These figures are not gain in sales value for the 4 years, after paying storage costs.

Soybeans can be stored on farms with suitable facilities at low cost. Total storage costs for 3, 6, and 9 months are, respectively, about 4.5, 6, and 7 percent of harvest-time prices; peak soybean prices averaged 20 percent more than harvest prices over a 4 year post-war period. Cost differences are small between storing on farms or at elevators; each has its advantages. Total farm storage cost, for soybeans valued at $3 per bushel, ranges from 7.8 to 10.3 cents per bushel for 3 months, from 9.6 to 12.2 cents for 6 months, from 11.3 to 14.0 cents for 9 months, and from 13.0 to 15.8 cents for 12 months. Excluding the charge for use of storage space, farm storage cost ranges from 5.6 to 5.7 cents for 3 months, 7.4 to 7.6 cents for 6 months, 9.1 to 9.4 cents for 9 months, and 10.8 to 11.2 cents for 12 months. Charges for handling and for use of farm storage space, which are unaffected by the level of soybean prices, range from about 3.5 cents to 6.0 cents per bushel.

Farmers can control the timing of their soybean sales by controlling quality in the stored soybeans. Poor quality at harvest may keep some farmers from storing their soybeans. Quality deterioration also increases storage costs.

Maintaining soybean quality during storage means greater profits for farmers and increased efficiency in processing for crushers and manufacturers. Maintaining the quality begins with care in harvesting and handling, and includes storing clean soybeans (at 12 percent to 13 percent moisture content) in sound storage buildings of weathertight construction.

To be stored, soybeans with high moisture content should be dried to 12 percent or 13 percent moisture content, using natural or heated air. Drying should be done at the time of storing or as soon thereafter as possible. Stored soybeans should be inspected frequently.

Deterioration in stored soybeans can be costly to farmers, consumers, and the entire soybean industry. To farmers it may mean reduced profits because of lower grade and price discounts, or because deterioration may make it necessary to sell when soybean prices are low; it also means reduced quantities of soybeans to sell from storage. To crushers and refiners deterioration means reduced oil recovery, increased operating costs, and increased refining loss. To manufacturers of soybean products, deterioration means increased difficulties and costs in making oil and protein products; to consumers, it means higher prices and lower quality products. /1

/1 A. M. Rollefson and others, "Improved Soybean Marketing Through Farm Storage," United States Department of Agriculture, Agricultural Information Bulletin No. 57, June 1951, p. ii.

D. B. Agnew and C. H. Kierstead, Fats and Oils Branch, Production and Marketing Administration, United States Department of Agriculture, in a report issued September 1950, "Cash Costs of Farm Storage in Marketing Soybeans" summarized their findings as follows:

> There are three principal sources of loans made specifically on soybeans in storage. They are commercial banks, production credit associations, and the Commodity Credit Corporation. The organization and operating procedure of each of the three credit agencies vary considerably.
>
> Careful consideration of the following factors will assist the soybean farmer in choosing the most practical and efficient loan for his storage operation; need, inputed cost, terms of the loan, marketing schedule, liability of borrower, insurance requirements, cost of credit, convenience, personal relations, and dependability of loan source.
>
> In this study it has been found that the cost of a loan on soybeans stored on the farm (term--six months, on soybeans with a market value of $2.11 a bushel) varies from 4.2 to 9.1 cents per bushel. The principal factors causing variations in the cost of a loan are the source, size of the loan, and the interest rate.
>
> Most frequent insurance of farm property is against windstorm and fire, including lightning. A stored crop, such as soybeans can either be insured under a separate policy incorporating the most desirable features for this particular purpose, or under a general policy covering other personal property and improvements.
>
> Cost of insurance varies, of course, with its coverage and conditions. Whether a soybean grower decided to insure as heavily as permissible or carry all the risk himself, he will gain by taking common sense precautions to protect the stored crops against physical loss from these causes. Combined insurance coverage (against loss or damage from both fire and windstorm) for 75 percent of value on $2 soybeans stored in a designated building costs only 1/2 to 3/4 cent per bushel for a six-month storage period.
>
> Tax cost per bushel is dependent on the assessed value of the soybeans and the tax rate. Assessed value will necessarily vary with market price and assessment practice. Since soybean prices differ between states and fluctuate during the market year, and since the assessment date varies among states, the market price on the assessment shows considerable variation.
>
> In 11 of the 21 principal soybean producing states, property taxes are not levied against farm-stored soybeans. Among the other 10 states, average property tax rate (percent of assessed value) during the 1947-48 crop year was estimated to range from 0.25 percent to 3.8 percent. Assessed value on assessment date, from $3 to $3.95 per bushel. Average

property tax cost was estimated to range from 0.9 to 11.6 cents per bushel.

Each of the three major cash costs can be avoided to some extent. A farmer may be able to obtain a more fevorable insurance rate by improving the physical fire protection. He may reduce his risk to a point where he feels able to carry it without insurance. Taxes on a stored crop can be avoided in any tax jurisdiction by selling before assessment date. /1

Martin S. Simon, Bureau of Agricultural Economics, United Stetes Department of Agriculture, Report No. 35, May 1953, makes the following points in his study "Soybeans, Economic Analysis Relating to Processing":

This report describes or develops certain analyses which can be used to measure the economic effects of adopting processing methods that increase yields of soybean oil. These analyses, summerized in two sets of equations, were developed particularly for use in determining probable effects of new processing methods upon prices and returns to farmers and to the soybean processing industry.

Solvent extraction is the most efficient method in current use for recovering oil from soybeans. Based on averages for the 1947-49 and 1951 crop years, it yielded about 20 percent more oil per bushel of soybeans crushed than the screw-press process and about 26 percent more than the hydraulic-press process. In 1949-50 solvents were used to process, for the first time, more soybeans than the screw-press method--56 percent of the total crush as compared to 41 percent. In 1951-52, almost three times more soybeens were processed by solvent equipment than by screw-pressess--74 percent of the total crush as compared to 25 percent. The remainder were crushed by hydraulic presses. These changes have had important economic consequences and hence warrant some study.

The first analysis considers the factors that affect prices of fats and oils, other than butter and lard, used in food products. In an analysis developed, three variables--per capita supply of fats and oils, other than butter and lard, used in food products, per capita supply of lard, and personal disposable income--explained 92 percent of the variation in prices of fats and oils, other than butter and lard, used in food products for 1922-42 and 1947-51. The average relationships between prices of these edible fats and oils and each independent factor, after allowing for the effects of other factors included in the analysis, were as follows: (1) A 1 percent change in the supply of edible fats and oils, other than butter and lard, was associated with a change of 1.6

/1 D. B. Agnew and others, "Improved Soybean Marketing Through Farm Storage," United States Department of Agriculture, A Study Under Research and Marketing Act, September 1950, p. 1.

percent in the opposite direction in price; (2) A 1 percent change in the supply of lard was associated with an opposite change of 1.1 percent in price; and (3) A 1 percent change in per capita disposable income was associated with a 1.4 percent change in price in the same direction.

On the average, a 1 percent change in prices of all fats and oils, other than butter and lard, used in food products was associated with a change of about 1 percent in the same direction in the price of soybean oil. After allowing for the influence of the general level of wholesale prices, 79 percent of the variation in prices of soybean oil for 1931-42 and 1947-51 was associated with changes in the total index.

The second analysis considers the effect of changes in the value of products obtained per bushel of soybeans processed on the season-average farm price of soybeans. Most of the annual variation in the season-average price received by farmers for soybeans is associated with changes in the total value of oil and meal obtained per bushel of soybeans processed. For the 1931-40 and 1948-50 crop years, the equation expressing the relationship between the relationship between the particular variables used in the analysis indicates that the season-average price received by farmers tends to equal 75 percent of the combined value of the products obtained per bushel or soybeans processed, less 12 cents. The analysis is designed to show the normal relationship that prevailed in the past between these two factors and not to indicate the actual processing margin. It is recognized that this relationship might change with the adoption of new processing methods. Apparent changes in the relationship for the post-World War II years are discussed. As a result, certain modifications may be needed in its application.

The rational behind the development of these equations is based on an analysis of the way in which the effects of an increase in the yield of soybean oil are likely to be transmitted. In brief, the following pattern would be expected.

An increase in the yield of soybean oil is likely to be accompanied by a decrease in the yield of soybean meal. Soybean oil competes directly with other edible fats and oils used as ingredients in the manufacture of edible fat and oil products, such as margarine and shortening. Soybean meal competes directly with other feed concentrates used in livestock rations, particularly several other protein supplements. A change in the yield of soybean oil would affect the total supply of competing edible fats and oils. Other factors associated with the food fats and oils economy may be affected also. A change in the yield of soybean meal would affect the total supply of protein supplements. In this way, the change would affect the feed-livestock economy.

Changes in the supply of edible fats and oils and of competing feed concentrates would cause changes in prices of these products, including those of soybean oil and meal. However, a given percentage changes in the supply of soybean oil and soybean mesl represents a smaller percentage change in the larger supply items. Consequently, the effect on prices of soybean oil and meal of changes in their supply would be less than if they were considered as commodities with no close substitutes. The changes

in the price and yield of oil and meal would be reflected in the total value of products obtained per bushel of soybeans processed. The price received by farmers for soybeans is closely related to total product value. Although changes in the price of soybeans might affect the percentage of the crop sold and also production in subsequent crop years, these relationships, for reasons indicated, could not be determined statistically.

Apparently, the lower yield of meal that would be associated with greater oil recovery would not have much effect on the price of meal. Hence, statistical analysis of this relationship was not required. In the 1947-49 and 1951 crop years, the solvent process yielded, on the average, about 4 percent less meal per bushel of soybeans crushed than the screw-press process and about 5 percent less than the hydraulic-press process. The meal obtained by solvent extraction ordinarily contains a higher percentage of protein and a lower percentage of oil than do meals produced by the mechanical processes. /1

Marian Pahigian, Fats and Oils Branch, Production and Marketing Administration, United States Department of Agriculture, "Marketing Study of the Soil Content of Soybeans as Related to Production Areas and Climate," September 1950, sets forth information of value:

This report concerns differences in the oil content of soybeans grown and marketed in different geographical localities throughout the major soybean producing areas of the United States. Soybeans of a given variety grown in different geographic localities may vary appreciably in composition. Also, the oil content of commercial soybeans shows wide geographic variations. These facts have raised the question whether the differences are consistent, or more specifically, whether farmers in different localities or areas can be expected to produce and market soybeans that are higher in oil content than soybeans from other areas.

Two-year averages for seed yield per acre, percentage of oil content, and oil yield per acre were computed for 22 soybean producing states. In general, the Northern states averaged higher in both seed yield and oil yield per acre but lower in percentage of oil content than did the Southern states. The number of acres used for soybean production in the various states was found to be influenced more by seed yield per acre than by the percentage of oil content or the oil yield per acre.

Analysis of data of the Commodity Credit Corporation, by areas, reveals that for the given years soybeans produced in southern areas averaged higher in oil content than those grown farther north. A

/1 Martin S. Simon, "Soybeans, Economic Analysis Relating to Processing," United States Department of Agriculture, Agricultural Report No. 35, May 1953, pp. 4-5.

consistent increase in oil content of soybeans from north to south was noted for six areas lying more or less directly on a north and south line.

Analysis of state averages shows a positive relationship between oil content and temperature during the growing season which would seem to indicate that the more southerly areas could be expected to produce soybeans with higher oil content than those grown farther north.

Slight negative relationships, which may or may not be significant, were found for oil content and total rainfall during the growing season. With the effect of rainfall held constant, temperature alone explained 68 percent of the variations in oil content during 1944 and 25 percent in 1945. The smaller value for 1945 was probably due to some extent to the unfavorable planting season through parts of the North Central states. Very late planting of soybeans in many cases resulted in crops being injured by frost before harvest. The amount of rainfall provided very little additional information in explaining oil content over and above that obtained from records of temperatures. Temperature and rainfall together explained 68 percent of the variations in oil content in 1944 and 29 percent in 1945. Separate relationships between (1) oil content and temperatures, and (2) oil content and rainfall were also sought within each cause of the fact that within each area soil and cultural factors varied much more than temperature and rainfall.

Analysis of uniform soybean test data showed a tendency for both the protein content of beans and the iodine number of the oil to decrease from north to south. This is consistent with results of previous studies, that show protein content to have an inverse relationship with oil content, iodine number to vary with latitude. /1

ACREAGE AND PRODUCTION OF SOYBEANS IN THE UNITED STATES AND KANSAS

Soybeans have been cultivated extensively and highly valued as food in oriental countries since ancient times. As long as the year 3000 BC, soybeans held an important place in the agricultural economy of the Chinese people. Prior to that time in the Far East it was highly regarded as a cure for human ills. History is not definite on the introduction of the soybean to the United States, however, the first importation of soybeans seeds into the

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/1 Nariar Pahigian, "Marketing Study of the Oil Content of Soybeans as Related to Production Areas and Climate," United States Department of Agriculture, A Study Under Research and Marketing Act, September 1950, pp. 1-2.

U. S. probably were from eastern Asia.

The soybean was first mentioned in our literature in 1804 as being "adapted to Pennsylvania," but its culture in the U. S. was limited to that of a rare garden plant until near the end of the nineteenth century. First use of the soybean centered around the use of the plant and not the seed. The plant was thought of as a legume to increase soil fertility and to be used as a green manure crop and was not harvested as a grain crop. Production of soybeans for hay increased during the first quarter of the twentieth century from 50,000 acres in 1907 to 2,000,000 acres in 1952.

Soybeans have been grown as a grain crop for about the last 25 years. The many multiple uses of soybeans have lent themselves to continued increased production "with five exceptions since 1925—due to climatic conditions). Within a period of time of more than 25 years soybean production had increased from 5 million bushels in 1925 to well over 291 million bushels in 1952. Since 1940 the U. S. has produced over a hundred million bushels each year (Fig. 1).

Acres planted for production of soybeans have shown a phenomenal growth since 1925. In 1925, 448 thousand acres of soybeans were harvested while 1,234 million acres were harvested for hay or plowed under. In 1952 the preliminary figures show 14,075 million acres were harvested for beans and 2,061 million acres harvested for hay and plowed under. Since 1940 the harvested acres have increased from nearly 5 million acres to 14 million acres in 1952.

Soybeans were grown mainly for forage until 1941 when slightly more than half of the total planted acreage was harvested for beans (Table 1). Some soybeans were crushed for oil and meal beginning in the early 1920's but it was not until 1953 that the quantity processed was larger than that

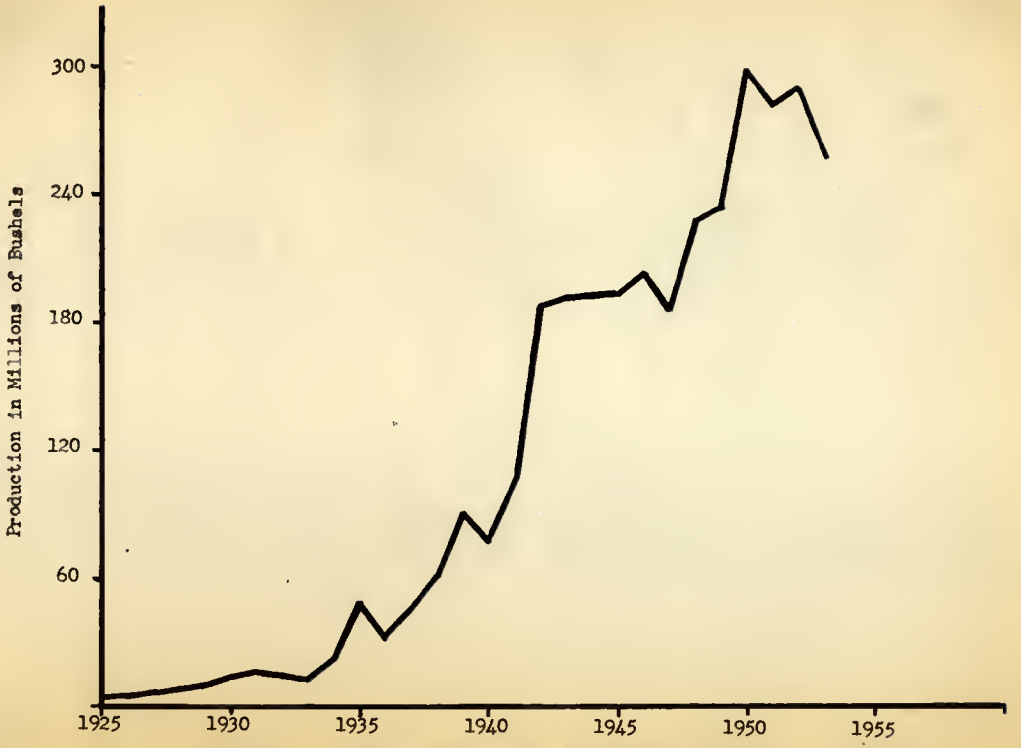


Fig. 1. Production of soybeans in the United States, 1925-52.

Table 1. SOYBEANS: Acreage, Yield and Production in the United States, 1924-1952.

Year	Acres Planted: Grown Alone	Acres Planted: Inter-planted*	Acres Planted: Equivalent Solid**	Acres Harvested: For Beans**	Acres Harvested: For Hay	Grazed or Plowed Under	Average Yield Per Acre Harvested: For Beans	Average Yield Per Acre Harvested: For Hay	Total Production: For Beans	Total Production: For Hay
	Thousand Acres						Bushels	Tons	Thousand Bushels	Thousand Tons
1924	1567	417	1782	448	1147	187	11.0	1.13	4947	1299
1925	1539	476	1785	415	1175	195	11.7	1.01	4875	1185
1926	1871	502	2127	466	1431	230	11.2	1.18	5239	1687
1927	2057	571	2350	568	1556	226	12.2	1.18	6938	1837
1928	2154	556	2439	579	1609	251	13.6	1.23	7880	1974
1929	2429	743	2807	708	1774	325	13.3	1.16	9438	2051
1930	3072	786	3473	1074	2062	337	13.0	.94	13929	1938
1931	3835	909	4304	1141	2772	391	15.1	1.26	17260	3479
1932	3704	893	4165	1001	2738	426	15.1	1.25	15158	3433
1933	3537	813	3957	1004	2506	407	12.9	1.16	13509	2917
1934	5764	858	6207	1556	4227	424	14.9	1.08	23157	4545
1935	6966	1028	7503	2915	4044	544	16.8	1.34	48901	5422
1936	6127	2115	7183	2359	3116	1708	14.3	.96	33721	3002
1937	6332	2261	7464	2586	3469	1409	17.9	1.36	46164	4731
1938	7318	2541	8587	3035	3724	1828	20.4	1.43	61906	5335
1939	9565	2710	10920	4315	4590	2015	20.9	1.48	90141	6772
1940	10487	2589	11782	4807	4819	2156	16.2	1.34	78045	6450
1941	10068	2555	11345	5889	3546	1910	18.2	1.30	107197	4616
1942	13696	2426	14912	9894	2621	2397	19.0	1.36	187524	3555
1943	14191	2475	15428	10397	3177	1854	18.3	1.21	190133	3837
1944	13118	1861	14050	10245	2577	1228	18.8	1.18	192121	3040
1945	13056	1505	13807	10740	1940	1127	18.0	1.26	193167	2451
1946	11706	1458	12434	9932	1499	1003	20.5	1.28	203395	1912
1947	13052	1408	13755	11411	1292	1052	16.3	1.22	186451	1574
1948	11987	1259	12617	10682	1111	824	21.3	1.30	227217	1446
1949	11872	1165	12456	10482	1130	844	22.3	1.32	234194	1488

Table 2 (concl.)

Year	Acres Planted: Grown Alone	Acres Planted: Inter-planted*	Acres Planted: Equivalent Solid**	Acres Harvested: For Beans**	Acres Harvested: For Hay	Grazed or Plowed Under	Average Yield Per Acre Harvested: For Beans	Average Yield Per Acre Harvested: For Hay	Total Production: For Beans	Total Production: For Hay
	Thousand Acres						Bushels	Tons	Thousand Bushels	Thousand Tons
1950	15129	1228	15744	13814	1047	883	21.7	1.31	299279	1367
1951	15190	1088	15735	13545	973	1217	20.9	1.25	282477	1216
1952***	15643	984	16136	14075	1171	890	20.7	1.10	291682	1288

*Grown with other crops.
**Acreage grown alone, with an allowance for acreage grown with other crops.
***Preliminary.
Source of data: Bureau of Agricultural Economics, United States Department of Agriculture and 1953 Soybean Blue Book, American Soybean Association, Hudson, Iowa.

used for seed and feed. The proportion of the total acreage harvested for beans increased most in the North Central Region. During the last few years soybeans have been grown almost entirely for harvest as beans in the North Central Region. But forage and green manure has continued to be the main use in other regions.

The explanation of the rapid rise of soybean production lies partly in dynamic changes in the technology of production, processing and marketing, and partly in the development of more favorable demand and price relationships during the war.

> Regional and national trends in the production of soybeans appear to have been limited by climate, topography, and soils. However, soybeans can be grown under a wider range of climatic conditions than many crops, provided adapted varieties are available. The first great contribution of the plant scientists was to select and breed the adapted varieties.
>
> Topography and the danger of soil erosion appear to constitute the factors that limit most the location of soybean acreage. For this reason soybeans for beans are concentrated on areas of level land. On level lands, soybeans have a beneficial effect on the oil and on succeeding crops. This is partly due to the physical effect on the soil and partly to nitrogen fixation.
>
> Yields of soybeans have almost doubled since 1924 mainly because of improved varieties and reduced harvesting losses and in spite of the tremendous expansion in acreage.
>
> The introduction of small combines for harvesting soybeans removed the chief bottleneck to soybean production under American conditions and simultaneously reduced the labor involved and increased the harvested yields.
>
> During the period of rapid mechanization net returns per acre probably rose more rapidly from soybeans than from other crops. Most of this occurred before the wartime expansion, however. During the war, returns per acre increased relatively more from soybeans than from corn, but the chief reason was the relatively higher price. /1

/1 Edwin G. Strand. Soybeans in American Farming, United States Department of Agriculture, Technical Bulletin No. 966, November 1948.

Prior to 1940 the acreage planted to soybeans in Kansas was of very little economic importance (Teble 2). Since that time the acreage planted to soybeans has increased from 78 thousand acres in 1940 to over 700 thousand acres in 1952.

The production of beans has increased from 312 thousand bushels in 1940 to over 7 million bushels in 1952 (Fig. 2). This acreage is located in the eastern third of the state, with most of the production being realized from southeastern Kansas.

In 1951, Cherokee County lead the state in the production of soybeans followed by Crawford, Anderson, Franklin, Lyon, Coffey, Osage, Linn, Labetto, and Bourbon in that order (Fig. 3). The production of soybeans has been increasing in such counties as Saline, Marshall and Cowley.

MONTHLY SALES OF SOYBEANS MARKETED IN KANSAS

During what months is the Kansas soybean crop marketed? According to data compiled by the State Board of Agriculture in the 1951 report of the Kansas State Board of Agriculture, of the 1950-51 crop 77 percent of the sales were made during the months of September, October, November, and December or during the harvest season. During October 48 percent of the Kansas soybean crop was marketed (Table 3). During 1951 only 23 percent of the crop in Kansas remained to be marketed after the first of January.

The sale of a large percentage of the crop during the harvesting season means that for processors to obtain a crushing supply, it must be purchased during September, October and November. It also pointed out the fact that soybeans were considered a cash crop by producers in Kansas. Evidently farm storage facilities were not adequate to store a large portion of the Kansas crop.

Table 2. SOYBEANS: Acreage, Yield and Production 1924-1952, Kansas.

Year	Acres Planted: Grown Alone	Acres Planted: Inter-planted	Acres Planted: Equivalent Solid	Acres Harvested: For Beans	Acres Harvested: For Hay	Grazed or Plowed Under	Average Yield Per Acre Harvested: For Beans	Average Yield Per Acre Harvested: For Hay	Total Production: For Beans Thousand Bushels	Total Production: For Hay Thousand Tons
	Thousand Acres						Bushels	Tons		
1924	11	—	11	2	9		11.0	1.30	22	12
1925	12	—	12	4	8		10.0	1.30	40	10
1930	27	—	27	7	20		7.5	1.10	52	22
1935	38	—	38	7	29	2	6.5	1.10	46	32
1940	78	—	78	26	43	9	12.0	1.55	312	67
1941	83	—	83	47	26	10	11.5	1.60	540	42
1942	290	—	290	212	20	58	11.5	1.65	2438	33
1943	313	—	313	244	16	53	9.5	1.15	2318	18
1944	203	—	203	185	14	4	13.7	1.40	2534	20
1945	258	—	258	235	10	13	10.0	1.20	2350	12
1946	225	—	225	198	16	11	11.0	1.10	2178	18
1947	250	—	250	230	8	12	8.5	1.20	1955	10
1948	198	—	198	176	5	17	15.0	1.35	2640	7
1949	271	—	271	257	6	8	14.5	1.35	3726	8
1950	409	—	409	397	4	8	18.0	1.40	7146	6
1951	495	—	495	401	5	89	14.5	1.45	5814	7
1952	703	—	703	640	35	28	11.5	1.05	7360	37

Source: 1953 Soybean Blue Book, American Soybean Association, Hudson, Iowa.

Fig. 2. Production of soybeans in Kansas, 1925-1953

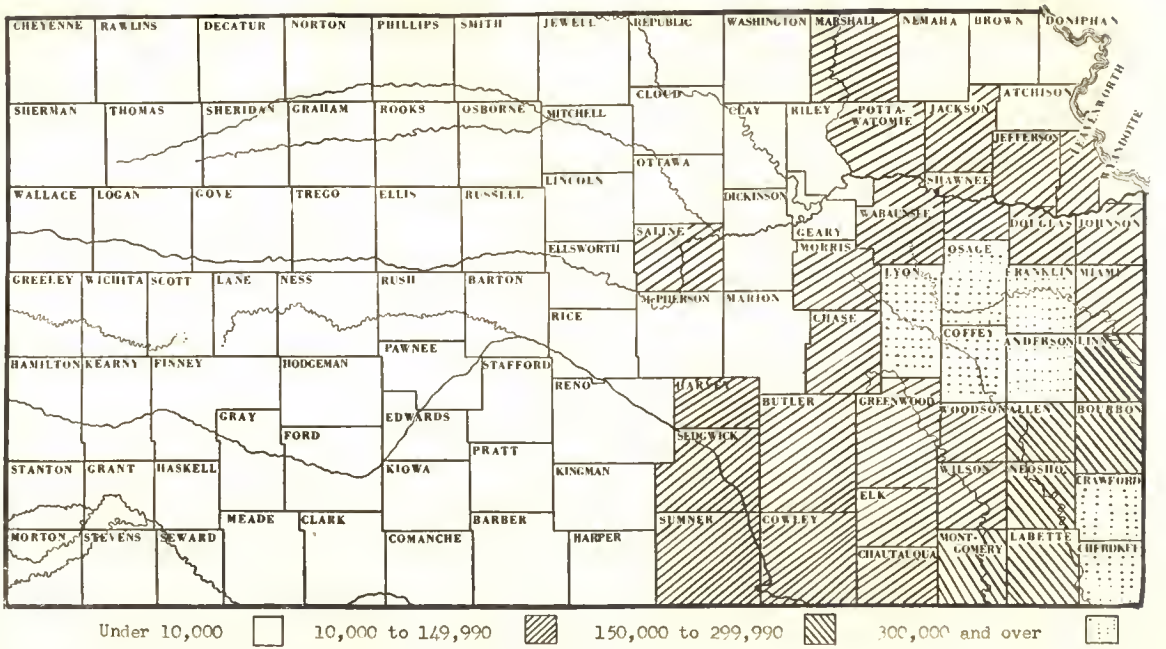


Fig. 3. Soybeans: bushels produced by counties, Kansas, 1951.

Table 3. Monthly Sales of Soybeans Marketed, Kansas: Estimated Percent of Sales Occurring Monthly, 1935-1951.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	3	2	5	20	25	5	—	—	—	15	20	5
1936	3	2	5	20	25	5	—	—	—	o5	20	5
1937	3	2	5	20	25	5	—	—	—	15	20	5
1938	3	2	5	20	25	5	—	—	—	15	20	5
1939	3	2	5	20	25	5	—	—	13	12	5	1
1940	30	5	20	10	3	1	—	—	—	6	13	16
1941	4	9	10	15	16	6	3	2	1	3	3	16
1942	10	22	11	15	8	10	1	—	5	18	35	12
1943	4	1	1	4	9	8	3	—	9	48	26	1
1944	1	5	2	1	2	3	1	1	2	55	26	7
1945	2	2	1	1	1	1	1	1	3	63	22	2
1946	2	1	1	2	2	1	1	—	7	55	24	5
1947	2	1	1	2	2	1	—	—	6	56	16	7
1948	3	1	5	2	2	2	—	—	7	61	13	4
1949	3	3	1	1	2	3	1	1	6	56	23	3
1950	3	1	1	1	2	2	1	1	6	48	17	6
1951	6	2	2	6	4	1	1	1				

Source: Report of State Board of Agriculture, 1950.

In Illinois during the 1947 and 1948 crop about 80 percent of all soybeans bought by country elevators were acquired by the end of December. Purchases by processors were at a slower rate, but substantially more than half of all soybeans crushed were bought by the end of the harvest season by both elevators and processors.

A study was made of the production and disposition of the 1947 and 1948 crop of soybeans by Illinois farmers and the findings are summarized here:

> After allowing for seed and for an insignificant quantity fed to livestock, it is seen that the bulk of Illinois soybeans is sold by farmers to local elevators. From the elevators the crop moves by rail to terminal storage, or to plants for processing, or to export channels. In the total soybean movement, the sales by farmers directly to processors aggregate about 4 percent. Nearly all of the beans sold by farmers are sold to country elevators. Soybeans sold by farmers directly to terminal elevators and all other outlets are negligible.
>
> About 18 percent of all beans sold by Illinois farmers are sold by country elevators directly to processors; the remainder reach processing or export markets after having passed through additional hands. In many cases small processors are able to obtain all of their requirements locally from farmers or nearby elevators with little or no buying cost. Large processors on the other hand find it necessary to establish a rather extensive buying organization to do this; most of these concerns stated in interviews that this would be more costly than buying through intermediary dealers.
>
> The most important of the intermediary agencies are the interior carlot dealers and commission concerns. Carlot dealers usually take title to soybeans whereas commission merchants generally arrange a transaction between the elevat r and the buyer. Neither agent takes physical possession of the beans. As there is no sharp delineation of functions or operation of these concerns, the exact movement of soybeans from elevator to processor through these channels is difficult to ascertain. Prior to the imposition of price control during World War II interior carlot dealers operated mainly as commission concerns, but they have shown no tendency to revert to that status since price control was removed. These dealers sell on commission occasionally, however, and commission concerns sometimes take title to the beans they handle. Interior carlot dealers and commission concerns together handled 74 percent of the soybeans from the 1947 and 1948 crops.

Grain merchandisers are firms which buy and sell grain (including soybeans) for their own account. Unlike carlot dealers they receive, store, mix, and condition the grain. A small part of the grain handled by these concerns comes from farmers and country elevetors, but their main sources of supply are interior carlot dealers and commission companies. Merchandisers also occasionally buy soybeans from processors, but the volume was not large during the years studied. These firms account for the largest part of the out-of-date shipment of soybeans by rail and water transportation, and they supply processors with about 10 percent of the total crop sold off the farm.

Some soybeans were sold counter to the normal trend of movement. For example, processors sold some of their purcheses back to interior carlot dealers, merchandising concerns, and commission companies. In the 2 year period, 4 percent of the soybeans were sold by farmers direct to processors, 18 percent went from farm-to-country elevetor-to-processor, 55 percent passed through interior carlot dealers or commission concerns between the elevetor and the processor, and 10 percent reached the processor after passing through the merchandiser's hands also. Net out-of-stete shipments of soybeans evereged 13 percent of beans sold by farmers for the two seasons. /1

SUPPLY AND UTILIZATION OF SOYBEANS IN THE UNITED STATES

The total supply of soybeans is composed of totel stocks beginning October 1, production during the crop year, and imports. The total supply during the 1924-25 crop year was five million bushels made up of e production of four and nine-tenths million bushels, imports of 60 thousands bushels, and a carryover of five thousand. The total supply increased to 107 million bushels in 1941-42. This supply consisted of e carryover of 690 thousand bushels, pr duction of 107 million, and imports of less than 500 bushels. The total supply reached an all-time high in the 1950-51 crop year when production reached an all-time high of over 300 million bushels, of carryovor stocks of three million bushels and imports of one million bushels.

/1 Sabin, op, cit., p. 4.

Carryover stocks of soybeans have been very small in comparison to other grain stocks at the beginning of the crop year. The soybean industry has never been considered a surplus commodity industry. The largest stocks on record to date was a carryover of 14 million bushels in 1944-45, however, preliminary estimates indicate a carryover on October 1, 1953, of 19 million bushels which would be a record.

Imports of soybeans into the U. S. were of little consequence. In the past 15 years, imports have averaged less than two million bushels.

Utilization of soybeans has kept pace with production throughout soybean history. Before 1934 less than one-fourth of the soybeans grown in the United States were used for processing. As markets expanded and production increased this proportion became consistently larger, while the proportions used for feed and seed became smaller. By 1937 about two-thirds of the crop was processed and this proportion increased to more than 80 percent during the last few years (Table 4). Seed usages have naturally increased because of increases in planted acreages. Soybeans fed to livestock on farmers where grown have not shown any appreciable change throughout the years. Exports in recent years have increased to an all-time high in 1950-51 of 27 1/2 million bushels.

Methods of Processing Soybeans

There are three commercial methods of processing the soybean for its oil and meal. These methods and the chronological order of the development of these processing techniques used in the industry are:

1. The hydraulic
2. The expeller or screw-press
3. The extraction or solvent

Table 4. SOYBEANS: Supply and Utilization in the United States, 1924-1952.

Year Beginning October 1	Supply: Total Stocks Oct. 1/1	Supply: Production/2	Supply: Imports for Consumption	Supply: Total Supply/3	Utilization: Seed	Utilization: Feed/4	Utilization: Processed for oil and Meal	Utilization: Exports/5	Utilization: Other Uses/6	Carryover Sept. 30 /7
				1,000 Bushels						
1924-25	5	4,947	60	5,012	1,900	1,207	307	—	1,596	2
1925-26	2	4,875	71	4,948	2,289	1,174	351	—	1,134	/8
1926-27	/8	5,239	67	5,306	2,525	1,311	335	—	1,133	2
1927-28	2	6,938	70	7,010	2,687	1,631	559	—	2,133	/8
1928-29	/8	7,880	77	7,957	2,984	1,473	882	—	2,548	70
1929-30	70	9,438	64	9,572	3,762	1,730	1,666	—	2,298	116
1930-31	116	13,929	54	14,099	4,724	2,763	4,069	—	2,049	494
1931-32	494	17,260	49	17,803	4,633	2,867	4,725	2,161	3,295	122
1932-33	122	15,158	13	15,293	4,490	2,264	3,470	2,450	2,561	58
1933-34	58	13,509	6	13,573	7,615	2,111	3,054	—	767	26
1934-35	26	23,157	5	23,188	10,066	2,036	9,105	19	1,643	319
1935-36	319	48,901	4	49,224	8,875	3,898	25,181	3,490	7,419	361
1936-37	361	33,721	17	34,099	9,539	2,741	20,618	19	889	293
1937-38	293	46,164	3	46,460	10,947	3,273	30,310	1,392	198	340
1938-39	340	61,906	3	62,249	14,667	4,554	44,648	4,424	-7,009	965
1939-40	965	90,141	2	91,108	15,974	5,365	56,684	10,979	1,713	393
1940-41	393	78,045	1	78,439	15,141	4,999	64,056	284	-6,731	690
1941-42	690	107,197	/8	107,887	20,385	3,925	77,151	489	-72	6,009
1942-43	6,009	187,524	/8	193,533	20,980	6,016	133,454	917	19,629	12,537
1943-44	12,537	190,133	/8	202,670	19,758	5,496	142,306	962	19,995	14,153
1944-45	14,153	192,121	4	206,278	18,911	3,529	153,402	5,090	17,607	7,739
1945-46	7,739	193,167	/8	200,906	16,745	3,727	159,460	2,858	13,760	4,356
1946-47	4,356	203,395	/8	207,751	17,455	2,638	170,245	3,880	8,140	5,393
1947-48	5,393	186,451	/8	191,844	16,066	2,503	161,397	2,972	6,289	2,617
1948-49	2,617	227,217	7	229,841	15,945	2,805	183,664	23,015	1,231	3,181
1949-50	3,181	234,194	4	237,379	19,021	2,506	195,265	13,142	4,538	2,907
1950-51	2,907	299,279	2	302,188	18,225	2,530	251,990	27,833	-2,549	4,159
1951-52	4,159	282,477	1	286,647	19,097	2,726	244,380	17,046	-176	3,564

Table 4 (concl.)

/1 Factory and warehouse stocks only, through Oct. 1, 1941; total stocks, Oct. 1, 1942 and subsequently.

/2 Crop of year listed first, e.g., the 1924 crop was 4,947,000 bushels.

/3 Sum of stocks, production and imports. The "total supply" figures for years previous to 1942-43 are incomplete to the extent that they do not include stocks on farms, in country elevators, and at terminal markets. (Such stocks were not reported previous to Oct. 1, 1942.) Figures are not adjusted for new crop soybeans used in September.

/4 Fed to livestock on farms where produced.

/5 Data not available for years previous to 1931-32. Includes shipments to U. S. territories, 1937-38 through 1950-51.

/6 Residual item. This includes soybeans fed to livestock other than on farms where the soybeans were produced. It may also include small quantities used for human food. Prior to 1931-32 it includes exports. Prior to 1937-38 it includes shipments to U. S. territories. The minus quantities shown for some years are explainable largely by unreported stocks (prior to Oct. 1942) and by the use of new crop soybeans in September of year of production.

/7 Factory and warehouse stocks only, through September 30, 1941; total stocks, Sept. 30, 1942 and subsequently.

/8 Less than 500 bushels.

Source of data: 1953 Soybean Blue Book, American Soybean Association, Hudson, Iowa.

The Hydraulic Process. In the earlier years of the processing industry the hydraulic method was the only one known. It had been used extensively throughout the South in obtaining the oil from cottonseed. This method was also used in the North and Northwest and in some Atlantic Coast plants in squeezing linseed oil from flax. When soybean oil first began to become an article of commerce, it was only natural that the hydraulic method--comparatively inefficient as it was--should have been turned to in the construction of the first soybean processing plants. In this processing method the soybeans are first heated to high temperatures if they are high in moisture and then rolled into flakes and cooked. Very high pressure is then applied to this cooked mass, with a plunger or ram slowly squeezing the oil from it. The oil itself runs out on the sides, where it is recovered and piped into vats and tanks for ultimate refinement. The residue remaining after the oil is removed is a hard compact mass, called "oil cake". The cake is then ground to produce the soybean meal.

The hydraulic method extracts approximately 8½ pounds of soybean oil and produces about 48½ pounds of meal per bushel of soybeans and remaining three pounds is wasted in the extraction process.

Because of the inability of processors to recover as much oil by the hydraulic method as they can by either of the other two, no new hydraulic type processing plants have been erected for many years. This method of soybean processing gradually began passing out of usage as plants reached obsolescence.

The Expeller Process. About 1930 a more efficient process of getting the oil from the soybeans came into general use. This became known as the "screw press" or "expeller" method. By this method the oil is removed from the heated

soybean by a continuous pressing process operating on somewhat the same principle as an ordinary household food or meat grinder. The oil is piped off for filtering to remove impurities before placing in storage. The residue remaining after removing the oil by this method is known to the trade as expeller soybean chips; when ground, as expeller soybean meal. Under it about nine pounds of oil and 48 pounds of meal are produced per bushel of soybeans.

The Extraction Method. Just as the expeller or screw press supplanted the hydraulic method, a new technological process is now displacing the expeller technique in separating the oil from the protein bearing mass in the soybean. It is known as "continuous solvent extraction." It involves both a chemical and a mechanical process. As in the other two methods, the soybeans are first heated. They are then crushed and flaked. The flakes are then put into large vertical tanks filled with organic solvents, such as petroleum hydracarbons, alcohols, etc. These chemicals have the ability to combine with the oil that is in the flakes. The combined oil and solvent mixture is then drained out of the large vertical cylinders and distilled. The solvent liquid is recovered and returned to the tanks while the crude soybean oil is run through a series of filters on its way to storage tanks.

The flakes from which the oil has been removed are relatively high in protein content. They are sold commercially as soybean flakes or when ground and toasted, as extracted soybean meal. By this process there is a recovery from 95 to 98 percent of the oil content in the bean. Using this method approximately 10 3/4 pounds of oil and 46 1/4 pounds of meal are produced from a bushel of soybeans.

Products From Soybean Processing

The yield from a bushel (60 pounds) of soybeans processed by screw presses

is about nine pounds of oil and 48 pounds of meal. The meal contains from 40 to 45 percent protein and 4.0 to 5.5 percent oil. The average yield from a bushel of soybeans processed by solvent extraction is about 10.5 pounds of oil and 45 pounds of meal. Solvent extracted meal contains 43-48 percent protein and 1.0 percent or less oil.

Crude soybean oil first attained commercial importance in the United States when large quantities were imported from the Orient to replace fats and oils exported to Europe. Factory production of crude soybean oil has increased 175 times since 1930 to 1951. The U. S. produced approximately two and one-half billion pounds in 1951 (Table 5). Since 1941, imports of oil have declined to practically zero, while U. S. production has kept pace with the increased demands made on soybean oil production. During this period of increased demand, U. S. exports have increased from five million pounds in 1930 to a high of 503.7 million pounds in 1951.

Soybean oil has a combination of properties that qualify it as an ingredient for a wide variety of manufactures food and industrial products. Soybean oil which has a low content of free fatty acid, a low refining loss, and a good flavor and color when carefully refined, was used in the manufacture of more than 50 products of human consumption (Table 6). The use of soybean oil for food was stimulated by the demand for vegetable oils during World War II. Prior to World War II in 1933 only 30 percent of the oil produced was used for edible products and 70 percent was used for non-food products (Table 7). However, since that time a complete switch-over has occurred until in 1951, 84 percent was used for food purposes and 16 percent for non-food purposes.

Of the oil used for food purposes, approximately half of it has been used

Table 5. Soybean oil, crude basis: production, trade stocks December 31, and apparent disappearance, 1930-52.

Year	Factory Production	Imports/1	Exports	Re-exports	Net Imports or net exports (-)	Factory and Warehouse Stocks Dec. 31	Apparent Disappearance
	1,000 lb.	1,000 lb.	1,000 lb.	1,000 lb.	1,000 lb.	1,000 lb.	1,000 lb.
1930	14,387	8,348	4,962	517	2,869	15,178	17,709
1935	105,056	14,249	4,111	——	10,138	31,090	103,111
1940	533,224	4,849	15,954	—	11,105	94,555	499,126
1941	585,629	759	12,066	—	11,307	113,020	555,857
1942	761,582	—	19,428	—	19,428	144,139	711,035
1943	1,233,751	/2	57,351	—	57,351	186,566	1,133,973
1944	1,245,873	—	79,513	—	79,513	123,323	1,229,603
1945	1,391,650	/2	40,463	—	40,463	209,347	1,265,163
1946	1,454,339	—	90,444	—	90,444	163,937	1,409,305
1947	1,542,984	71	109,760	—	-109,689	146,208	1,451,024
1948	1,604,320	365	85,669	—	85,304	193,199	1,472,025
1949	1,859,066	239	363,981	—	363,742	150,101	1,532,896
1950	2,074,702	/2	299,790	—	299,790	154,065	1,770,948
1951	2,472,838	—	503,717	—	503,717	281,266	1,841,920
1952	1,782,056	1	170,053	—	170,052	/4 194,307	1,698,963
Jan.-Sept./3							

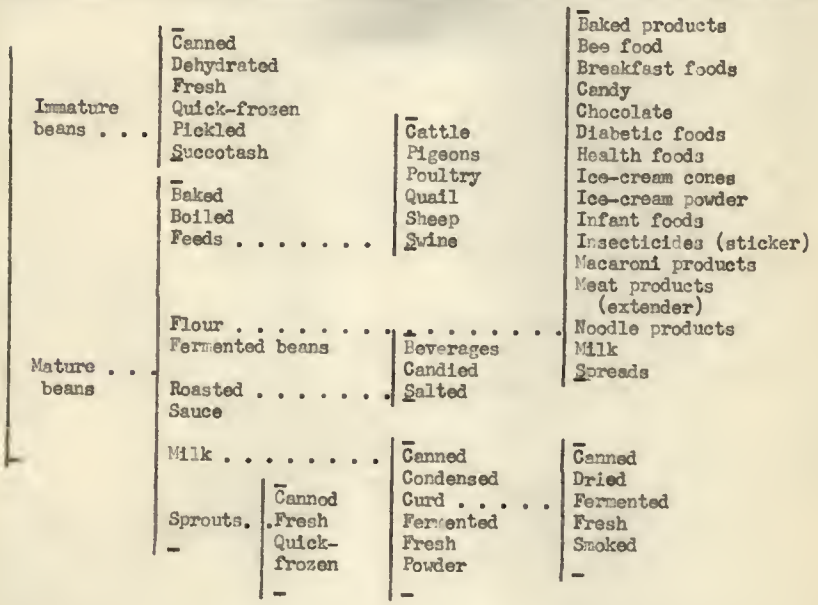
/1 Imports for consumption beginning January 1934.
/2 Less than 500 pounds.
/3 Preliminary.
/4 September 30.
Source: 1953 Soybean Blue Book, American Soybean Association, Hudson, Iowa.

Table 6. Soybean Utilization. (From U. S. Department of Agriculture Bulletin No. 2038)

SOYBEAN

- Plants
  - Forage . . . Silage; Hay; Soilage
  - Fuel*
  - Furfural
  - Green manure
  - Greens**
  - Honey plant
  - Pasture
  - Tobacco***
  - Substitute
- Bean
  - Meal . . . . Adhesive materials; Core binder; Emulsifier; Feeds . . . . . ; Fertilizers; Glue; Plastics
    - Food Products . . . . . (Cat; Cattle; Dog; Fish; Fur-bearing animals; Pheasant; Poultry; Quail; Rabbit; Sheep; Swine)
      - Beer brewing
      - Flakes
      - Flour (see Mature beans)
      - Grits
      - Seasoning powders
      - Sauce
      - Sugar
      - Milk (see Mature beans)
      - Wine
    - Industrial protein . . . . . (Artificial wool; Candy; Fire-fighting foam; Paper size; Textile dressing; Water Paint; Waterproofing; Whipping powders)
  - Oil . . . . Candles; Caulking compounds; Celluloid; Core oil; Disinfectants; Electrical insulation; Enamels; Food products . . . . (Cooking oil; Dip-coating; Margarine; Mayonnaise; Medicinal oil; Salad oil; Shortening); Fuel; Glycerin; Insecticides; Leather dressing; Lecithin . . . . . (Candy; Cosmetics; Chocolate coating; Cocoa; Emulsifier; Gasoline stabilizer; Leather tanning; Margarine; Medicines; Textile dyeing; Wood preservative); Lighting; Linoleum; Lubricant; Oilcloth; Paints; Printing ink; Rubber substitutes; Synthetic resins; Soaps . . . . . (Hard; Liquid; Soft); Varnish; Waterproof for cement; Waterproof goods

Table 6 (concl.)



*Roots and coarse stems are used as fuel in China, Manchuria, and Korea.
**In many parts of China the plants, when 3 to 4 inches high, are used as greens.
***In Manchuria and Korea the leaves are cured and smoked as tobacco.

Source: 1953 Soybean Blue Book, American Soybean Association, Hudson, Iowa.

Table 7. SOYBEAN OIL: Utilization by Classes of Products, United States, 1931-1952. Percentage of Total Domestic Disappearance.

Year	Food products				Nonfood products						Total domestic disappearance
	Margarine	Shortening	Other	Total	Soap	Paint and varnish	Other drying oil products	Miscellaneous non-food products	Loss including oil in foots	Total	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
1931	1.8	30.9	20.7	53.4	10.9	17.8	10.7	2.6	4.6	46.6	100.0
1932	*	12.4	36.1	48.5	14.2	19.1	13.1	2.2	2.9	51.5	100.0
1933	*	1.6	28.9	30.5	13.4	27.1	22.6	3.7	2.7	69.5	100.0
1934	.1	8.9	33.5	42.5	4.4	34.1	13.2	3.1	2.7	57.5	100.0
1935	1.7	50.9	20.7	73.3	2.5	12.6	5.6	.7	5.3	26.7	100.0
1936	6.4	51.2	26.7	84.3	2.3	6.5	2.2	.7	4.0	15.7	100.0
1937	17.3	49.6	11.0	77.9	5.6	8.8	1.5	.8	5.4	22.1	100.0
1938	13.1	44.9	25.9	83.9	3.6	5.0	2.1	.8	4.6	16.1	100.0
1939	15.6	44.3	25.8	85.7	2.4	4.8	2.6	.9	3.6	14.3	100.0
1940	17.5	42.5	21.5	81.5	3.5	6.0	3.3	1.5	4.2	18.5	100.0
1941	13.6	38.9	25.2	77.7	4.5	7.4	3.7	1.9	4.8	22.3	100.0
1942	18.8	47.2	18.2	84.2	4.4	3.6	1.1	.9	5.8	15.8	100.0
1943	17.5	50.1	18.1	85.7	1.4	1.8	1.6	1.3	8.2	14.3	100.0
1944	17.2	50.4	22.4	90.0	.3	1.5	1.4	1.2	5.6	10.0	100.0
1945	16.3	54.0	19.2	89.5	.3	2.0	1.6	1.3	5.3	10.5	100.0
1946	14.2	52.8	20.8	87.8	.3	2.2	2.6	1.7	5.4	12.2	100.0
1947	15.7	48.6	17.1	81.4	.4	6.1	4.8	2.5	4.8	18.6	100.0
1948	17.3	48.1	16.3	81.7	.2	6.8	4.2	2.2	4.9	18.3	100.0
1949	16.8	46.4	15.4	78.6	.1	7.2	5.9	3.0	5.2	21.4	100.0
1950	17.3	47.4	17.7	82.4	.1	6.1	4.4	2.4	4.6	17.6	100.0
1951	25.5	39.7	18.9	84.1	.1	4.8	3.6	2.9	4.5	15.9	100.0

*Less than .05 percent.
Source: 1953 Soybean Blue Book, American Soybean Association, Hudson, Iowa.

for shortening—this has been true since 1935. Utilization of soybean oil for margarine has increased from seven thousand pounds in 1933 to 469 million pounds in 1951 (Table 8). Percentagewise the oil used for food purposes, has increased from less than one-half of one percent to 25.5 percent in 1951.

Although 70 to 90 percent of the annual consumption of soybean oil in the United States has been in the food industries since 1935, there has been a rapid poundage increase in its industrial use (Table 8). The paint and varnish industry consumed the largest amount, 2 to 8 percent (Table 7). The usage of soybean oil for soap manufacture has declined to an amount of very little significance in the total usage of soybean oil.

From every bushel of soybeans about 80 percent of the resultant product was soybean meal and 20 percent crude soybean oil. In the preceding discussion mention was made of the increase in soybean oil production—however, now that 80 percent of the soybean crop is made into meal, some idea is gained as to the phenomenal increase in production of soybean meal. Between 1925 and 1938 the domestic production of meal was below a million tons per year (Table 8). Starting in 1938-39 crop year the production of soybean meal exceeded one million tons and has increased since then to over 5½ million tons in 1952. The United States was in need of high protein feed in the 20's and 30's and imported between 12 to 28 thousand tons during this time. During the 1940's and 1950's the United States exported soybean meal from a low in 1945-46 of less than a thousand tons to 181,000 tons in 1950-51.

The principal use of soybean meal in the United States was as a livestock feed (Table 8).

It can be estimated that from 90 to 95 percent of the total domestic disappearance has been for this use. Amounts used for feed have increased

Table 8. SOYBEAN OIL: Utilization by Classes of Products, United States, 1931-1951.

Year	Food products				Nonfood products					Total domestic disappearance
	Margarine	Shortening	Other/1	Total	Soap	Paint and varnish	Other drying oil products/2	Miscellaneous non-food products	Loss including oil in foots/3	Total
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds
1931	622	10,869	7,261	18,752	3,816	6,256	3,773	923	1,625	16,393	35,145
1932	3	4,889	14,166	19,058	5,571	7,485	5,139	844	1,158	20,197	39,255
1933	7	489	9,153	9,649	4,235	8,568	7,150	1,182	867	22,002	31,651
1934	24	2,735	10,284	13,043	1,354	10,451	4,062	949	823	17,639	30,682
1935	1,740	52,452	21,366	75,558	2,549	13,003	5,784	749	5,468	27,553	103,111
1936	14,261	113,897	59,270	187,428	5,023	14,471	4,821	1,532	8,959	34,806	222,234
1937	31,791	90,798	20,037	142,626	10,274	16,143	2,685	1,367	9,926	40,395	183,021
1938	39,835	137,133	79,247	256,265	10,897	15,183	6,601	2,403	14,046	49,130	305,395
1939	70,822	201,599	117,297	389,718	11,177	21,720	11,633	4,199	16,265	64,994	454,712
1940	87,103	212,317	107,468	406,888	17,612	29,828	16,422	7,442	20,924	92,238	499,126
1941	75,634	215,967	140,147	431,748	24,737	41,594	20,816	10,550	26,412	124,109	555,857
1942	133,346	335,555	129,530	598,431	31,510	25,307	8,115	6,132	41,540	112,604	711,035
1943	198,020	568,405	205,263	971,688	15,428	20,462	18,512	14,884	92,999	162,285	1,133,973
1944	211,105	620,257	274,856	1,106,218	3,258	119,105	17,543	14,295	69,184	123,385	1,229,603
1945	206,642	683,011	242,769	1,132,422	4,219	25,624	20,133	16,443	66,322	132,741	1,265,163
1946	200,681	743,527	292,744	1,236,952	3,545	30,435	36,490	24,443	77,440	172,353	1,409,305
1947	227,595	705,280	248,047	1,180,922	5,375	89,491	69,316	36,737	69,184	270,103	1,451,024
1948	255,213	707,530	239,211	1,201,954	2,794	100,195	61,728	32,308	73,046	270,071	1,472,025
1949	257,287	712,154	235,933	1,205,374	1,991	109,893	90,415	45,556	79,667	327,522	1,532,896
1950	305,791	839,641	312,801	1,458,233	1,448	107,263	78,599	43,160	82,245	312,715	1,770,948
1951	469,490	730,795	349,276	1,549,561	1,677	87,762	66,671	52,582	83,665	292,357	1,841,918

Compiled as follows:

Utilization in margarine: 1931 through June 1950, from reports of the Commissioner of Internal Revenue; July 1950 and subsequently, from Bureau of the Census.

Table 8 (concl.)

Utilization in other products, factory consumption, from Bureau of the Census, Animal and Vegetable Fats and Oils, except as noted.

/1 Mainly utilization in salad and cooking oils, mayonnaise, and salad dressings, and direct use in homes, bakeries, restaurants and institutions. Includes unreported disappearance of soybean oil; that is, the difference between total domestic disappearance and total factory consumption, including loss and oil in foots.

/2 Difference between total estimated use in drying-oil products and factory consumption in paint and varnish.

/3 Foots are used in nonfood products, largely in the manufacture of soap and fatty acids. Estimated since June 1942 as the difference between crude oil used in refining and production of refined oil.

Source: 1953 Soybean Blue Book, American Soybean Association, Hudson, Iowa.

along with its production from 26 thousand tons in 1924-25 to over 5 million tons in 1951-52 (Table 9).

Although research chemists have been studying the value of soybean meal for industrial purposes, the tonnage thus consumed was small in comparison with the quantity produced. The tonnage used for food, industry and other nonfood usages has ranged from 18 thousand tons in 1934 to 199 thousand tons in 1946-47 (Table 9).

The use of meal in the form of flour, grits, and flakes for human food has become important in several European countries, in North America, and in the Orient. Less than one percent of the production of soybean meal was used in making soy flour in years preceding World War II. During the war the manufacture of flour greatly increased, and the quantity produced in 1943 was equivalent to about three percent of the total soybean crop.

The question has been asked, what has been the trend in usage of soybean meal in comparison with other oilseed cake and meal? This relation is given in (Table 10).

Of the total oilseed cake and meal used for livestock use, the soybean meal has taken over as the leader in furnishing high protein feed for livestock. As a percent of the total oilseed cake and meal used—soybean meal now comprises between 60 to 65 percent of the total oilseed meals used for livestock. This percentage has gradually increased from five percent of the total in 1930 to a high of 66 percent in 1950.

SOYBEAN CRUSHING CAPACITY

Hieronymous made the following statements in his revised Ph.D. thesis:

> The first crushing of domestically produced soybeans was at Chicago Heights, Illinois, in 1921. During the early 1920's several established

Table 9. SOYBEAN OIL MEAL AND CAKE: Supply and Utilization in the United States, 1924-1951.

Year Beginning October 1	Supply 1,000 Tons: Domestic Production	Imports	Total Supply	Utilization 1,000 Tons: Exports	Food, Industry and other Non-feed*	Feed
1924-25	7.6	18.3	25.9	—	—	25.9
1925-26	8.6	19.8	28.4	—	—	28.4
1926-27	8.3	23.9	32.2	—	—	32.2
1927-28	13.7	47.7	61.4	—	—	61.4
1928-29	21.5	69.5	91.0	—	—	91.0
1929-30	40.7	73.5	114.2	—	—	114.2
1930-31	98.6	24.0	122.6	—	—	122.6
1931-32	114.7	18.6	133.3	—	—	133.3
1932-33	84.3	28.3	112.6	—	—	112.6
1933-34	73.9	25.0	98.9	—	—	98.9
1934-35	220.4	64.2	284.6	—	18.0	266.6
1935-36	613.1	20.0	633.1	—	19.0	614.1
1936-37	495.8	55.7	551.5	—	20.0	531.5
1937-38	724.1	15.5	739.6	—	21.0	718.6
1938-39	1,064.4	12.3	1,076.7	35.0	22.0	1,019.7
1939-40	1,348.8	12.1	1,630.9	62.3	23.0	1,275.6
1940-41	1,543.4	8.1	1,551.5	25.4	35.0	1,491.1
1941-42	1,844.9	0	1,844.9	19.7	40.1	1,785.1
1942-43	3,200.3	0	3,200.3	20.9	105.5	3,073.9
1943-44	3,446.0	0	3,446.0	16.1	107.1	3,322.8
1944-45	3,698.5	0	3,698.5	10.0	61.4	3,627.1
1945-46	3,837.3	—	3,837.3	.9	181.4	3,655.0
1946-47	4,086.4	0	4,086.4	141.7	199.3	3,745.4
1947-48	3,832.7	0	3,832.7	95.7	353.8	3,383.2
1948-49	4,330.5	3.2	4,333.7	150.6	25.6	4,158.0
1949-50	4,585.6	26.1	4,611.7	47.4	47.3	4,517.0
1950-51	5,896.8	32.8	5,929.6	181.1	39.5	5,709.0
1951-52**	5,703.7	24.1	5,727.8	41.8	48.0	5,638.0

*Estimated.
**Preliminary.
Source: 1953 Soybean Blue Book, American Soybean Association, Hudson, Iowa.

Table 10. By-Product Feeds: Estimated Use for Food, 1930-1952.

Year beginning October 1	Soybean Cake & Meal	Cottonseed Cake & Meal	Linseed Cake & Meal	Total Oilseed Cake & Meal	Soybean Cake & Meal as Percent of Total Oilseed Meal & Cake
	1,000 tons	1,000 tons	1,000 tons	1,000 tons	
1930	123	1,821	334	2,392	5%
1931	133	1,740	204	2,166	6%
1932	113	1,680	202	2,107	5%
1933	99	1,679	142	2,054	5%
1934	287	1,504	202	2,158	13%
1935	620	1,725	264	2,793	22%
1936	548	1,995	273	3,026	18%
1937	733	2,367	177	3,452	21%
1938	1,054	2,014	203	3,481	30%
1939	1,292	1,869	393	3,777	34%
1940	1,520	1,808	741	4,386	35%
1941	1,770	1,821	891	4,623	38%
1942	3,013	2,077	795	6,028	50%
1943	3,327	1,790	998	6,259	53%
1944	3,630	1,981	459	6,208	58%
1945	3,658	1,434	563	5,807	63%
1946	3,745	1,434	370	5,837	64%
1947	3,383	1,953	606	6,241	54%
1948	4,156	2,271	620	7,303	57%
1949	4,514	2,372	670	7,835	58%
1950	5,709	1,849	732	8,641	66%
1951	5,400	2,550	650	8,900	61%
1952	5,700	2,575	475	9,000	63%

Source: THE FEED SITUATION. United States Department of Agriculture, Bureau of Agricultural Economics, Washington.

firms processing corn and oil seeds other than soybeans, and some Midwest feed manufacturers, started processing soybeans. The supply of raw materials was too short to insure steady operations. These early processors took the lead in promoting the culture of soybeans in the Midwest. It is interesting to note that from the very beginning the processing capacity has led the production of soybeans. Of the 1924 crop, 307,000 bushels were crushed in the United States. During 1933-34 the volume crushed was about three million bushels. Between 1933 and 1939 production increased from 13.5 million to 90 million bushels while processing volume increased from 3 to 57 million bushels. The second large increase was in 1942 as a result of the increased war demand for oils and high protein feeds. Production jumped from 97 million bushels in 1940 to 193 million in 1943, at which general volume it seems to have leveled off. The crush increased from 59 million bushels in 1940 to 133 million in 1942-43, 153 million in 1944-45, 170 million in 1946-47, 161 million in 1947-48, and 183 million in 1948-49.

For the most part the soybean processing industry consists of plants which crush only soybeans. A few crush soybeans most of the time but not exclusively. In addition, a large number of mills, mainly cottonseed crushing plants, handle some soybeans during off seasons. Since they are of minor importance this latter type of plant is omitted.

By 1937 there were 26 soybean processing plants in the United States; by 1939 there were 47. By 1939 the industry had begun to take shape. The leading production area was Illinois; it was also the leading processing area. The number of plants in the various states approximates their proportionate importance in production. The relative importance of oilseed crushers not specializing in soybeans had materially decreased. By 1939 there was a marked tendency for soybeans to be processed near the point where they were produced and for each plant to have its own supply area. This tendency has continued down to date. The transportation economics are such that plants are located near their source of raw materials.

In 1942 there were 79 plants in the United States whose main operation was the processing of soybeans. They had an estimated capacity of 106 million bushels per year. By 1944 the capacity had increased to 173 million bushels in 137 plants, an increase of 61 percent. There was a further increase of 23 plants in 1945 for a total of 160 with a capacity of 189 million bushels. In 1948 there were 185 plants with a capacity of about 200 million bushels.

There is a considerable amount of integration in the soybean processing and product industries. Large plants are generally associated with firms that are also engaged in either the manufacture of feed or the refining of oil. Integration tends to follow one of the two major product lines but not both. In many of the cases it should be considered that the processing plant is a part of an integrated feed manufacturing or oil product business because of the nature of the origin of the business. Originally oil refineries and manufacturers of food products and feed manufacturers integrated toward their source of supplies of raw

materials, that is, they entered the soybean processing field. Processing plants should not be considered as subsidiaries or branches of large firms. They are, in the main, major divisions and operate independently. Large plants are not integrated backward toward soybean sources.

Integration in small firms is of one pattern and varies only in degree. They buy raw materials direct from farmers, including in their operations the grain merchandising functions, or they buy direct from country elevators. In general, their oil is sold into regular wholesale channels. Part, and in some cases all, of the meal is sold to retailers and farmers. Most small plants have a considerable "back door" or retail business. By selling to retailers they are able to sell at a minimum distance from plant.

There are three methods by which oil is separated from the remainder of the soybean: (1) the expeller, or continuous process method; (2) the solvent extraction method; and (3) the hydraulic-press method. The hydraulic-press method is the least efficient and is so minor that it can be disregarded here. The expeller process is the oldest and most widely used in the United States. About nine pounds of oil and 48 pounds of meal containing 41 percent protein and 4 percent oil are obtained from a 60-pound bushel of soybeans. Of more recent development is the solvent process. This method yields 11 pounds of oil and 46 pounds of meal from a 60-pound bushel. The meal contains 44 percent protein.

The solvent process is the most efficient, yielding two pounds more oil and two pounds less meal. Oil, on a pound basis, is the more valuable of the two products. There are indications that the average oil content of soybeans is increasing. This tends to make the advantage even more marked. In recent years, the expansion of the solvent process has been at a rapid rate. In 1941, 22 percent of the total processing in the United States was by this method; in 1944, 27 percent; in 1945, 31 percent; in 1948, about 38 percent; in 1949, 42 percent; and indications for 1950 are about 50 percent.

The expansion of the solvent process has been largely an addition to the capacity of the industry. Solvent equipment cannot be substituted for expeller. It requires a new plant. As yet firms do not seem to be retiring much expellor equipment when the solvent process is installed.

The solvent process is somewhat more expensive than the expeller. About twice as large a capital investment in plant per bushel of capacity is required. On the basis of current building costs and assuming a 20 year life expectancy of plant, the extra capital cost amounts to only about one-fourth to one-half cent per bushel. There is no authoritative basis for estimating the extra operating cost of the solvent process. The best estimate available, which we consider reliable, is about 3 cents per bushel. Meal from the solvent process is not as desirable as that from expeller mills. It sells at a discount of about $1 per ton. This is the equivalent of 2½ cents per bushel of soybeans. This discount on

44 percent meal is probably a temporary phenomenon arising out of reluctance of feed manufacturers to change their formulas to compensate for the lower fat content and from farmer prejudice.

The total cost disadvantage of the solvent process amounts to about 11 cents per bushel, the advantage is the value of two pounds of oil. Oil would have to sell for 5.5 cents per pound to completely eliminate the advantage of the solvent process, a much lower price than can be reasonably anticipated.

The crushing capacity in all years has been more capacity to crush than there have been supplies of soybeans. The growth of the solvent process has added to the capacity and its advantage is great enough that its expansion may be expected to continue. Clearly, all of the solvent capacity will be used during the conversion period. The marginal expeller capacity may be expected to go out of use as the solvent capacity expends. Forcing the retirement of plants that have only one use leads to a situation of intense competition. For the most part, expeller plants represent sunk capital. They will operate so long as variable costs can be realized.

In an industry with a large number of firms it would be expected that the least efficient plants would be forced out by the growth of the solvent process. But soybean processing is an industry with a small number of firms. The large firms own both kinds of plants. They tend to average out the earnings of each plant. Each firm buys raw materials and sells products on the basis of average cost rather than on marginal cost. The average costs of the large firms tend to be similar. The result is that large firms share the supplies of soybeans; the effect of an increasing capacity is to reduce, by a fairly equal proportion, the volume of crush of each firm.

The firms most affected by the expansion of the solvent process are those that have only expeller equipment. They are medium-sized and small firms and they possess certain advantages enabling them to compete with the large firms. They buy a part of their requirement direct from farmers, taking an elevator margin. A large proportion of their purchases is delivered to their plants saving an average of about 2 cents per bushel inbound freight cost. They have developed local outlets for meal, a part of it being sold at retail with a standard mark-up of $10 per ton, which amounts to 24 cents per bushel of soybeans. /1

Crushing capacity of soybean mills has increased faster than production, as was pointed out by Hieronymous. The estimated crushing capacity

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/1 T. A. Hieronymous, Risking in Soybeans, Revised Ph.D. Thesis, University of Illinois, Urbana, Illinois.

for the 1951-52 season on a ten month basis was 284 million bushels--proving again that the crushing capacity has increased faster than production--during that year the production amounted to 282 million bushels, out of which only 244 million were processed for oil and meal.

Of the estimated industry total of 190 soybean mills, 107 of these mills were located in Illinois, Iowa, Ohio, Indiana, Minnesota, Missouri, Kansas, and Nebraska or the central soybean producing states (Table 11). These eight states have within their boundaries 85 percent of the crushing capacity, with Illinois leading with a high of 41 percent of total crushing capacity. Kansas has an estimated three percent of the total crushing capacity and crushed only two percent of total bushels crushed. It is estimated that Kansas crushes 4½ million bushels of soybeans annually (1951-52). Actual crushing in Kansas has not exceeded the production in this state, at least this was true during the 1951-52 crop year.

According to the 1953 Soybean Blue Book published by the American Soybean Association, six mills were located at Emporia, Coffeyville, Fredonia, Girard, and Wichita. Available statistics on Kansas soybean processors can be found in Table 12.

PRICES RECEIVED FOR SOYBEANS IN THE UNITED STATES

The price which farmers receive for soybeans in the United States is determined by several factors, including: (1) the price users will pay processors for soybean oil; (2) the price users will pay processors for soybean meal; (3) the processing margin, or the amount that processors are able to obtain for their services; and (4) transportation and other handling costs on beans and products.

The price paid for a bushel of soybeans by processors is determined by

Table 11. Estimated Crushing Capacity of Soybean Oil Mills and Estimated Capacity Utilized, By Areas and States, U. S., 1951-52 Season (1)

State	Number of Soybean Mills: Total	%	Pure	%	Mixed	%	Est. Crushing Capacity 10 Month Basis: 1,000 Bu.	%	Soybeans Crushed 1951-52 Season(1): 1,000 Bu.	%	Crushing Capacity Utilized: %
	No.		No.		No.						
Central Soybean Producing States											
Illinois	30	16	27	22	3	5	115,925	41	84,999	40	73
Iowa	29	15	27	22	2	3	45,191	16	32,796	16	73
Ohio	14	8	14	12	0	0	27,122	9	22,501	11	83
Indiana	10	5	10	8	0	0	22,984	8	19,754	9	86
Minnesota	6	3	5	4	1	1	10,889	4	9,003	4	83
Missouri	9	4	7	6	2	3	10,482	3	6,738	3	64
Kansas	6	3	5	4	1	1	7,388	3	4,596	2	62
Nebraska	3	2	3	2	0	0	1,810	1	1,556	1	86
Area Total	107	56	98	80	9	13	241,791	85	181,943	86	75
Other Soybean Producing States											
Kentucky	3	2	3	2	0	0	7,470	3	5,434	3	73
Arkansas	10	5	1	1	9	14	6,137*	2	5,385	3	88
N. Carolina	13	7	2	2	11	16	2,497*	1	2,043	1	82
Oklahoma	6	3	1	1	5	7	1,270*	—	785	—	62
Tennessee	6	3	3	2	3	5	5,653*	2	(2)		
Mississippi	13	7	2	2	11	16	4,824*	2	(2)		
Georgia	6	3	1	1	5	7	1,950*	1	(2)		
California	4	2	1	1	3	5	1,513*	1	(2)		
S. Carolina	7	3	0	0	7	10	1,052*	—	(2)		
Va., Florida & Texas	3	2	2	2	1	1	887*	—	(2)		
Alabama	3	2	1	1	2	3	886*	—	(2)		
N.Y., Pa., & Delaware	5	3	4	3	1	2	6,116	2	(2)		
Wisc., N. & S. Dakota	4	2	3	2	1	2	1,961	1	(2)		
Area Total	83	44	24	20	59	87	42,216	15	29,747	14	70
Industry Total	190	100	122	100	68	100	284,007	100	211,690	100	75

Table 11 (concl.)

(1) October 1951 through July 1952.
(2) Information not available.
*Cottonbelt states crushing capacity estimated on 6-month basis in order to allow for crushing of other seeds.

Source: 1953 Soybean Blue Book, American Soybean Association, Hudson, Iowa.

Table 12. Kansas Soybean Processors, Type of Process, Crushing Capacity, Storage Capacity, and Servicing Railroads.

Processor	Type of Process	Crushing Capacity (Tons/Day)	Storage Capacity (Bushel)	Servicing Railroads
Kansas Soya Products Co. Inc., Emporia, Ks., and Kansas City, Ks.	3, screw press Hexane Solvent	40 120	300,000	MKT, ATSF
Consumers Cooperative Ass'n. Soybean Mill Coffeyville, Ks.	2 expellers	55	330,000	
Archer-Daniels-Midland Co., Fredonia, Ks.	Expeller plant			MP, ATSF, SLSF
Producers Cooperative Ass'n., Girard, Ks.	2, screw press	40	200,000	SLSF, ATSF
Kansas Soya Products Co., Inc., Emporia, Ks.	5, screw press	100	225,000	R.I.
Soya-Rich Products Inc., Wichita, Kansas	2, screw press Blaw-Knox Hexane Solvent	40 150	75,000	ATSF, MP, R.I. M. V.

Source: The Soybean Blue Book, 1953, American Soybean Association, Hudson, Iowa.

the supply and demand for soybean oil and meal. A processor will pay within approximately 30 cents per bushel of what the oil and meal portions are worth at that time. The 30 cents is considered the processing margin taken by processors in arriving at the price paid for a bushel of soybeans. The processor also takes into consideration what he can sell the 8½ pounds of oil and 48 pounds of meal for, before he makes a bid.

The general trend in prices since 1934 has shown a gradual price rise geared to the inflationary pressures, large consumer buying power in the United States, increases in exports by aid and restriction of world trade in fats and oils. The period since 1934 has been influenced several times by man-made price floors and ceilings. The all-time record price paid for a bushel of soybeans on the Chicago market was June, 1947 (Table 13). Prices showed a gradual decline from a high in May of 1925 to a low in the depression years of 44 cents in December, 1932 (Table 14). From that time, the opening of World War II prices moved up and down within a narrow range. With the beginning of World War II due to factors already discussed, prices rose in response to war demands. With the ending of hostilities of World War II until the present, prices have declined somewhat but have kept pace with export demands, increased livestock usage, in response to unprecedented consumer demand and inflationary pressures.

A weekly tabulation of price for No. 2 yellow soybeans on the Kansas City market as published by the "Kansas City Grain Market Review" was used to reflect prices applicable to Southeast Kansas (Table 15).

The availability of cost quotations representative to Kansas proved to be the greatest limitation in this study. Since the issuance of cash quotations by the Grain Market Review beginning in April of 1949, a short price

Table 13. Soybeans, No. 2 Yellow: Average price per bushel at Illinois country shipping points, by months, 1942- 1/

Year beginning October	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Average
	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
1942													
1943													
1944													
1945													
1946	3.22	3.17	2.88	3.07	3.20	3.93	3.62	3.12	3.12	3.30	3.17	3.14	3.25
1947	3.38	3.69	3.94	4.23	3.43	3.52	3.88	4.00	4.14	3.79	3.19	2.73	3.66
1948	2.43	2.55	2.52	2.40	2.18	2.20	2.15	2.25	2.20	2.50	2.77	2.20	2.36
1949	2.20	2.10	2.20	2.20	2.25	2.45	2.68	2.90	3.00	3.10	2.75	2.45	2.52
1950	2.30	2.72	2.95	3.10	3.25	3.25	3.25	3.24	3.04	2.94	2.87	2.77	2.97
1951	2.80	2.90	2.95	2.90	2.90	2.88	2.82	2.92	3.17	3.22	3.25	2.98	2.97
1952	2.85	2.89	2.90	2.85	2.82	2.94	2.95	2.87	2.76				
1953													
1954													
1955													
1956													
1957													
1958													
1959													

1/ Monthly averages October 1942 - September 1946 are not available.
Bureau of Agricultural Economics, Division of Statistical and Historical Research. Compiled from reports of the Grain Branch, Production and Marketing Administration.

Table 14. Monthly average prices received by farmers for soybeans in the United States, 1925-1952.[1]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1925	259	264	276	277	281	270	271	240	238	227	218	217
1926	238	233	239	227	237	267	271	231	227	197	185	183
1927	190	203	198	207	215	220	214	206	191	186	170	164
1928	120	169	185	193	206	213	212	201	189	172	169	170
1929	182	193	213	219	230	241	246	215	187	179	169	170
1930	185	191	200	207	211	216	196	190	180	164	148	144
1931	146	140	142	138	139	129	112	94	82	58	52	61
1932	62	59	66	65	64	61	58	58	57	55	45	44
1933	45	45	48	58	86	98	104	94	85	68	69	73
1934	81	101	116	126	126	145	154	125	105	95	89	111
1935	119	126	120	118	121	119	98	73	69	68	69	72
1936	76	77	78	78	83	85	105	119	110	107	112	130
1937	142	150	152	166	174	150	132	102	90	86	83	83
1938	88	93	89	85	87	86	85	75	71	64	63	67
1939	72	69	73	78	87	83	75	64	73	73	82	97
1940	103	96	101	100	96	79	73	67	69	67	84	81
1941	89	84	89	107	119	123	130	129	161	142	143	147
1942	165	178	119	176	173	163	162	158	157	158	158	159
1943	159	160	165	167	172	173	170	168	169	180	180	181
1944	182	185	189	191	193	193	191	190	193	204	205	205
1945	206	210	213	213	215	217	216	212	207	206	209	209
1946	209	211	212	214	216	217	231	235	213	228	309	275
1947	293	300	367	362	301	307	309	307	305	311	343	369
1948	411	297	323	364	374	390	366	291	245	227	236	236
1949	227	205	212	208	218	210	227	260	214	209	195	209
1950	211	212	225	248	271	280	293	242	226	203	254	270
1951	290	308	310	312	313	298	286	271	259	262	277	283
1952	278	278	276	272	277	302	300	305	283	271	271	275

[1]Prices in cents per bushel.
Source: U. S. Department of Agriculture. Crops and Markets. Washington: Government Printing Office December 1924 to January 1951.

Table 15. Cash Prices of No. 2 Yellow Soybeans - High (Weekly - Saturday)

January	February	March	April	May	June	July	August	September	October	November	December
					1949						
			9- 2.27	7- 2.41	4- 2.30	2- 2.45	6- 2.77	3- 2.65	1- 2.34	5- 2.21	3- 2.35
			16- 2.35	14- 2.42	11- 2.37	9- 2.50	13- 2.80	10- 2.52	8- 2.37	12- 2.15	10- 2.34
			23- 2.35	20- 2.35	18- 2.39	16- 2.52	20- 2.89	17- 2.40	15- 2.29	19- 2.20	17- 2.36
			30- 2.36	28- 2.30	25- 2.42	23- 2.64	27- 2.82	24- 2.31	22- 2.26	26- 2.27	24- 2.31
						30- 2.72			29- 2.23		30- 2.30
					1950						
7- 2.33	4- 2.29	4- 2.41	1- 2.68	6- 2.96	3- 3.07	1- 3.10	5- 3.03	2- 2.75	7- 2.26	4- 2.65	2- 2.86
14- 2.33	11- 2.30	11- 2.44	8- 2.69	13- 2.86	10- 3.05	8- 3.10	12- 2.70	9- 2.60	14- 2.16	10- 2.70	9- 2.87
21- 2.30	18- 2.34	17- 2.52	15- 2.78	20- 2.93	17- 2.88	15- 3.23	19- 2.65	16- 2.55	21- 2.31	18- 2.85	16- 2.99
28- 2.31	25- 2.36	25- 2.57	22- 2.86	27- 3.08	24- 2.90	22- 3.07	26- 2.80	23- 2.25	28- 2.49	25- 2.78	22- 3.02
			29- 2.97			29- 3.12		30- 2.24			29- 3.06
					1951						
6- 3.10	3- 3.25	3- 3.34	7- 3.36	5- 3.36	2- 3.30	6- 2.95	3- 2.90	8- 2.90	6- 2.83	3- 2.97	1- 3.03
13- 3.16	10- 3.28	10- 3.36	14- 3.36	12- 3.36	9- 3.16	13- 3.03	11- 2.90	15- 2.80	13- 2.83	10- 3.01¼	8- 3.08¾
20- 3.24	17- 3.36	17- 3.34	21- 3.36	19- 3.36	16- 3.11	20- 3.00	18- ---	22- 2.68	20- 2.96	17- 3.02	15- 3.05
27- 3.24	24- 3.36	24- 3.36	28- 3.36	26- 3.29	22- 3.03	27- 2.97	25- 2.92	29- 2.77	27- 3.99½	24- 2.99	22- 2.98½
		31- 3.36			29- 2.93						29- 2.94
					1952						
5- 2.96	2- 2.98	1- 2.91	5- 2.87	3- 2.84	7- 3.15	5- 3.17	1- 3.20	5- 3.21	3- 2.97	7- 2.88	5- 2.95
12- 2.97	9- 2.96	8- 2.92	12- 2.87	10- 2.89	14- 3.17	12- 3.16	8- 3.25	12- 3.18	10- 2.92	14- 2.90	12- 2.93
19- 2.92½	16- 2.99	15- 2.98	19- 2.79	17- 2.94	21- 3.16	19- 3.20	15- 3.30	19- 2.98	17- 2.89	21- 2.91	19- 2.92
26- 3.00	23- 2.95	22- 2.95	26- 2.80	24- 3.01	28- 3.17	26- 3.23	22- 3.25	26- 2.97	24- 2.80	28- 2.97	26- 2.87
		29- 2.92½					29- 3.21		31- 2.80		

Source: Kansas City Grain Market Review, Kansas City Board of Trade, Kansas City, Missouri

series was obtained.

SEASONAL MOVEMENT OF SOYBEANS IN THE UNITED STATES

The production of farm products are seasonal in nature. Harvesting of cereal grains and oilseeds such as soybeans are harvested in a relatively short time. Soybeans as previously mentioned are harvested during the months of October and November. The major portion of the production is marketed by the first of January. The consumer of the many products of soybeans desire a steady supply throughout the year. The soybean processor is the one who has to purchase the beans during harvest and store and process the bean, as the consumer needs are expressed. For a commodity such as soybeans consumption must be matched with production and this is brought about by storage and by adjustments and consumption which takes place as a result of seasonal changes in price.

A study of the seasonal movement of soybean prices are of value to the producer because these indexes can be useful in determining the best time of the year to market soybeans. /1 Of course, the farmer should take into consideration the storage cost and the expected higher price and determine whether it will profit him to store for later marketing. This seasonal index should also be of value to the soybean processor along with a future determination of prices in order to determine whether to hedge or carry an open position.

The index of average seasonal variation of prices received by farmers

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/1 A seasonal movement of prices refers to a time series which have variations which repeat themselves with remarkable similarity at regular intervals.

for soybeans in the United States from 1925 to 1953 inclusive showed a wide range of variation (Fig. 4). The index of variation reached its low of 89.7 during the month of October and then rose gradually (with the exception of January to February to a high of 109.3 in June. The variation between the high and the low months was 19.6 points. A general statement can be made on the increase in price from October to June--remembering this is an average seasonal price--it can be said that prices on the average increased 15 1/3 cents from October to June. It was determined in previous review of literature that the cost of farm storage averaged 6 1/2 percent of the October price--on an average this would amount to 10 1/4 cents for seven months. On the average, farm storage of soybeans has paid the producer 9 cents after deduction for storage charges.

The second aspect of short time price changes, namely index of irregularity or the extent to which individual cases failed to reflect this average pattern are numerous in this study. Like most agricultural commodities, soybean prices exhibit erratic and unpredictable price movements. /1

> An actual count of the number of increases and decreases from the preceding month was also taken to give an indication of the probability of an underlying seasonal movement at that period of the year. A count of the number of times a month was up from the preceding month showed in general that during the first six months of the year, the number of times the price was up was greater in number than the times down from the preceding month. January prices showed that 22 times out of 25 years, January was higher than December (Table 16). The latter

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/1 Index of irregularity is the average deviation of the percentages of trend for particular months about the value of the index of average seasonal variation for that month. A band of the size of the index on either side of the index of average seasonal variation includes approximately 60 percent of the individual years comprising the average. A narrowing of the band indicates a greater conformity to the average seasonal pattern.

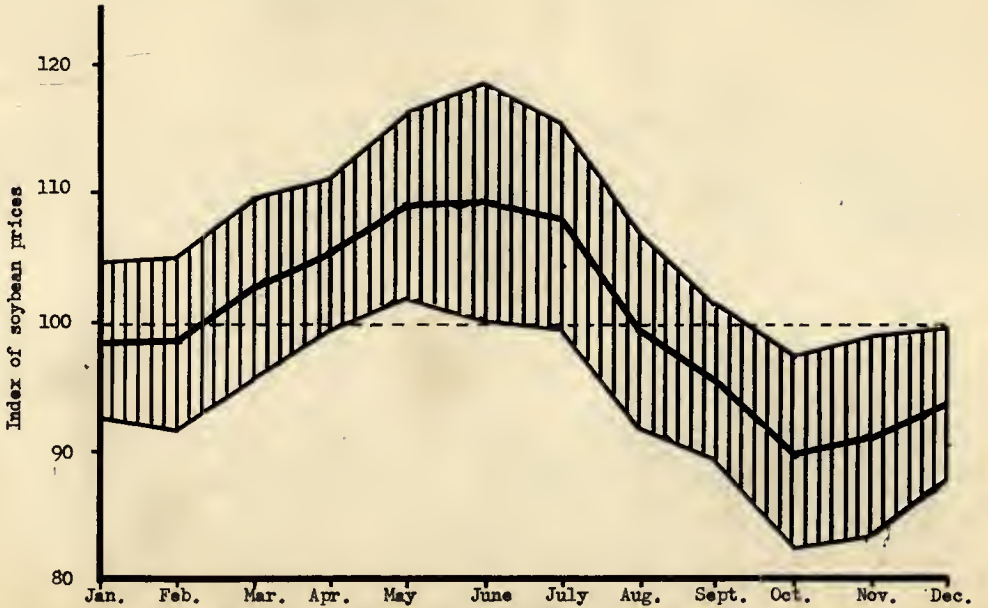

Fig. 4. Index of average seasonal variation of prices received by farmers for soybeans in the United States, 1925-52.

Table 16. Average seasonal movement of soybean prices in the United States, 1925-1950.

Month	Average seasonal		Times high or low/1		Monthly movement/2	
	Index of seasonal variation	Index of Irregularity	Times month is high of year	Times month is low of year	Times up from preceding month	Times down from preceding month
January	98.5	6.1	3	9	22	3
February	98.4	6.6	2	2	18	8
March	100.6	7.1	1	1	23	5
April	105.2	6.9	0	0	17	9
May	109.0	7.2	4	0	23	5
June	109.3	9.3	4	0	16	11
July	108.0	8.8	5	0	11	17
August	99.3	7.6	2	2	3	24
September	95.2	6.1	1	1	5	23
October	89.7	7.5	0	6	6	21
November	91.0	7.9	2	6	13	12
December	98.7	6.0	5	6	17	7
Total or Average	100.0	7.3	29	33	174	145

/1 Where two months were equal in price and high and low for the year, both were entered.
/2 No entry for months of no change from preceding month.

six months of the year showed a predominance of times down from preceding months. Twenty-four out of 27 years the August price was lower than the July price. /1

An actual count was also taken of the number of times a particular month was high or low for the year (Table 16). During the period 1925-52, ten months out of the year rated at least one high—April and October were the only months not showing a high month. Fifteen of the 29 times the high months were found to be May, June, July, and August. Months rating the high distribution for the period were December and July.

Times a particular month was low for the year also lends some help in interpreting the seasonal variation in prices. Of interest is the fact that the months of April, May, June, and July did not rate as low months for the period studied. Twenty-seven times out of 33 years the low months were October, November, December, and January.

An index of average seasonal variation of prices was calculated for the period of 1947-52 inclusive (Fig. 5), in hopes this index would give some information of a current nature to be of value.

The indexes varied from a low of 88.6 in October to a high of 109.4 in June, or 20.8 points. This index also showed a minor low in February which perhaps was the result of a severe drop off in prices during that month in 1948 and 1949.

SEASONAL MOVEMENT OF SOYBEAN PRICES IN KANSAS

The average seasonal variation of prices received by farmers for soybeans in Kansas followed a pattern similar to that of the United States.

/1 Ewasiuk, W. J., Unpublished Master's thesis, "Soybeans in Kansas," Kansas State College, Manhatten, Kansas.

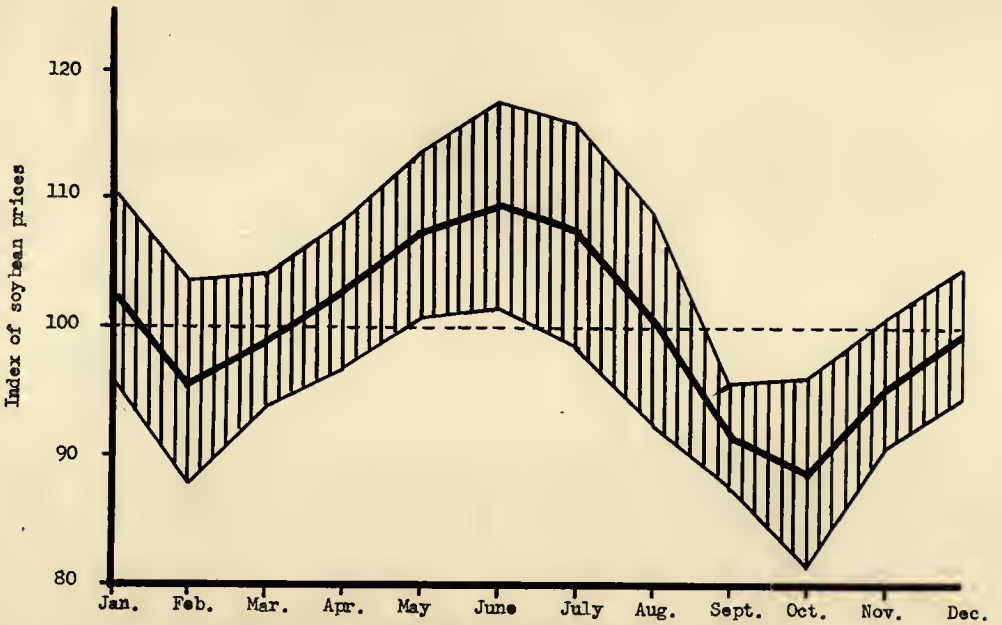

Fig. 5. Index of average seasonal variations of prices received by farmers for soybeans in the United States, 1947-52.

Of the period, 1925 to 1952 inclusive, the index showed a wide range of variation from a low in October of 88.8 to a high in June of 112.4 or 23.6 points (Fig. 6). The seasonal index also showed a minor low of 94.6 occuring in March. A general statement can be made as to the etoring of eoybeans on Kansas farms and the profitability of holding until June. On the average, it is expected that the price increase from October until June would amount to 39 cents. Using an example similar to the one used for prices received by farmers in U. S., the reward for marketing eoybeans in June rather than October would have been 28 1/2 cents after deduction of storage costs in Kansas.

Reference is made to the index of irregularity which ehows a variation of 6.2 to 10.6 (Table 17). This indicates that the band on either side of the eeasonal index indicates non-conformity to the seasonal pattern. The actual count of the number of times a particular month was high or low for the year revealed June and July were high months the greater number of times. This count also revealed that the months of October, November, December, and Janusry represented the greatest number of low months. This count pointed out that the months of May, June, July, August have been the low months only 3 times out of 53 low years. The months of May and August were not low for any year. The month of October was never the high month for the period studied. June and July were high 23 out of a poesible 53 timee.

As a measure of the conformity of actual price to the seasonal index, a count as to how many times a certain month was higher or lower than the preceding month was made. The months of January, February, March, April, May, and June showed a greater number of ups than downs from the preceding month. The last eix months conformed to the seasonal index showing a greater number of times the particular month was down from the preceding month.

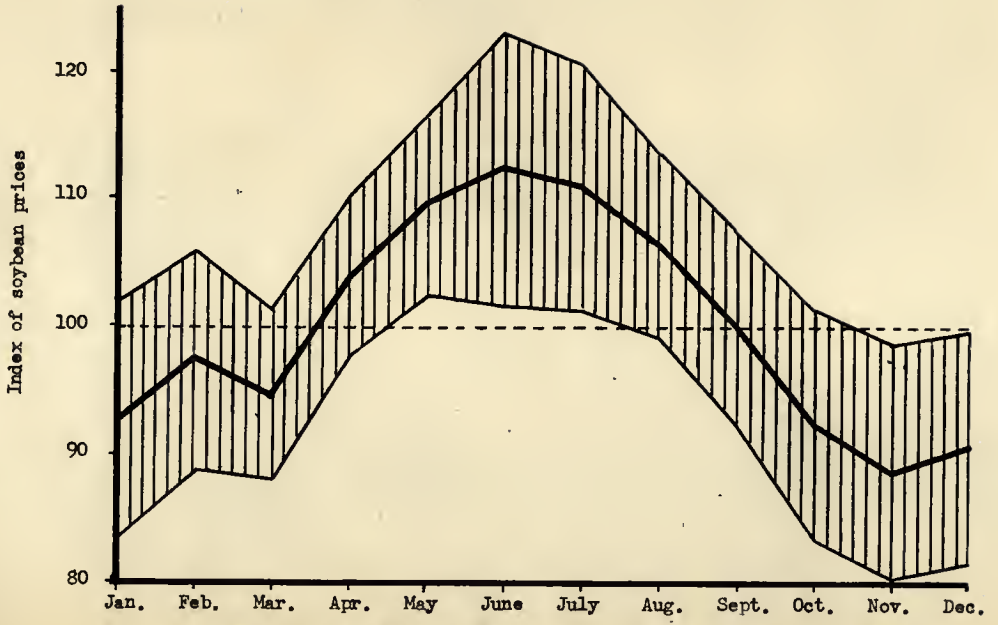

Fig. 6. Index of average seasonal variations of prices received by farmers for soybeans in Kansas, 1925-52.

Table 17. Average seasonal movement of soybean prices in Kansas, 1925-1950.

Month	Average seasonal		Times high or low/1		Monthly movement/2	
	Index of seasonal variation	Index of Irregularity	Times month is high of year	Times month if low of year	Times up from preceding month	Times down from preceding month
January	92.8	9.2	2	9	18	6
February	97.4	8.5	1	5	17	3
March	94.6	6.6	3	2	17	3
April	103.9	6.2	4	2	14	4
May	109.5	7.0	7	0	19	4
June	112.4	10.6	11	2	10	9
July	111.0	9.7	10	1	9	12
August	106.5	7.3	6	0	7	14
September	100.0	7.5	2	2	4	17
October	92.4	9.0	0	7	8	18
November	88.8	10.0	3	7	10	13
December	90.7	9.1	4	5	13	4
Total or Average	100.0	7.5	53	42	146	107

/1 Where two months were equal in price and high and low for the year, both were entered.
/2 No entry for months of no change from preceding month.

To get a more representative picture of conditions more current to the actual situation the index of seasonal variation of prices received by farmers in Kansas was calculated for the period 1947-52 (Fig. 7). This seasonal variation of prices exhibited the same pattern characteristics as the previous seasonals. The range of deviation from high to low was 23.4 points. In comparing the range of the seasonal for the period 1925-52 and the seasonal for 1947-52, it was noted that the range was much narrower during the latter period indicating a flattening out of the seasonal variation.

The index of irregularity again was very wide indicating erratic and unpredictable price fluctuations.

SEASONAL MOVEMENT OF SOYBEAN MEAL PRICES IN THE UNITED STATES

Monthly tabulation of average price per ton for soybean meal, bagged, in carlots, 41 percent protein, at Chicago by months, 1930-52 was tabulated for studying the seasonal movement of prices (Table 18). An index of average seasonal variation of prices of soybean meal in the United States was calculated for the years of 1936-52 inclusive. The index showed very little indication of a pronounced seasonal, such as the soybean index exhibited. The range in variation was from a low in April of 96.7 to a high of 105.3 in August—or a range of 8.6 points. It was also noted that this seasonal index of the price of soybean meal exhibited two lows, April and October (Fig. 8).

> The more steady demand for soybean meal throughout the season and the addition of marketing margins to the final product tended to dampen the possibility of the reflection of the seasonal price variation of soybeans in the soybean meal market. /1

/1 Ewasiuk, op. cit.

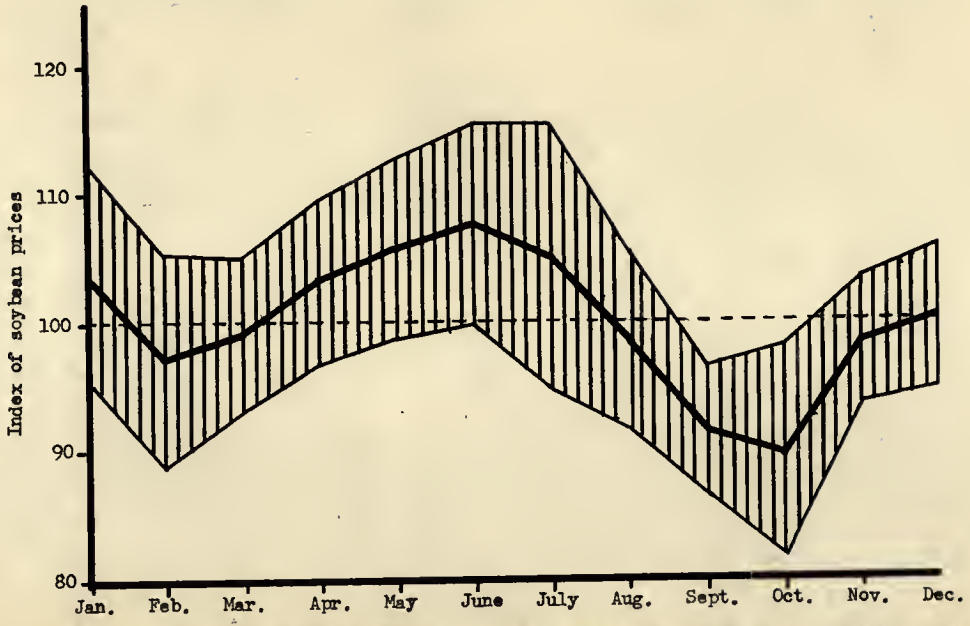

Fig. 7. Index of seasonal variation of prices received by farmers for soybeans in Kansas, 1947-52.

Table 18. Soybean Oil Meal. Average Price Per Ton, Bagged, in Carlots, 41 Percent Protein, at Chicago by months, 1930-1952.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
						Dollars Per Ton						
1930	51.80	48.25	48.20	50.15	50.70	48.75	46.00	47.80	47.50	44.00	41.20	40.00
1931	39.30	36.60	33.15	31.90	28.60	25.80	24.90	23.35	21.40	18.60	23.85	23.00
1932	20.45	18.75	18.90	19.90	19.95	20.20	20.05	22.60	23.70	22.75	21.70	21.70
1933	21.70	21.70	22.60	23.70	28.30	28.85	39.20	39.00	34.85	31.70	30.15	30.50
1934	30.60	31.50	32.50	33.25	33.60	34.50	34.50	37.75	39.50	38.50	38.85	41.20
1935	40.70	38.45	37.10	33.80	33.20	31.70	29.05	24.00	22.85	25.60	24.40	25.50
1936	25.15	23.90	22.30	23.30	24.80	26.10	38.90	44.30	39.70	36.90	39.15	43.00
1937	44.10	41.50	41.10	47.60	48.35	39.20	37.30	34.90	34.20	28.80	29.50	28.80
1938	30.00	29.60	28.10	26.00	26.30	25.30	26.95	26.15	27.00	24.60	24.40	26.20
1939	26.30	24.70	24.45	24.70	26.30	25.95	24.70	25.70	33.70	28.30	32.70	34.95
1940	33.90	29.95	30.45	29.65	28.65	24.40	22.25	24.60	27.00	25.90	30.50	29.60
1941	29.75	26.60	26.85	27.50	28.10	29.70	33.80	36.20	41.40	37.95	39.10	42.50
1942	46.45	46.45	44.85	41.00	38.30	37.90	41.80	42.60	43.50	42.70	46.60	39.00
1943	39.35	39.60	40.60	40.60	40.55	40.40	40.40	51.90	51.90	51.90	51.90	51.90
1944	51.90	51.90	51.90	51.90	51.90	51.90	51.90	51.90	52.00	52.00	52.00	52.00
1945	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00
1946	52.00	52.00	52.00	52.00	62.50	66.00	97.00	93.15	66.00	79.50	93.35	80.70
1947	71.90	65.40	81.05	72.15	68.55	76.30	89.75	91.90	102.70	91.05	92.90	101.50
1948	110.25	89.00	84.75	86.20	86.60	94.25	96.90	84.40	81.50	66.80	79.25	78.00
1949	73.45	65.80	67.40	70.55	71.00	75.40	85.55	100.30	83.15	74.80	69.40	68.80
1950	66.00	65.05	69.65	73.30	82.60	85.15	96.40	78.20	65.85	64.90	73.35	76.40
1951	77.20	82.55	79.65	75.45	76.55	76.30	80.50	77.40	82.80	86.25	86.65	86.65
1952	86.65	87.00	87.00	99.65	102.65	106.70	105.05	117.20	103.35	93.70	88.00	85.05

Source: Fats and Oil Situation. Bureau of Agricultural Economics, U. S. Department of Agriculture. Beginning June 1950, prices are on basis of 44 percent protein.

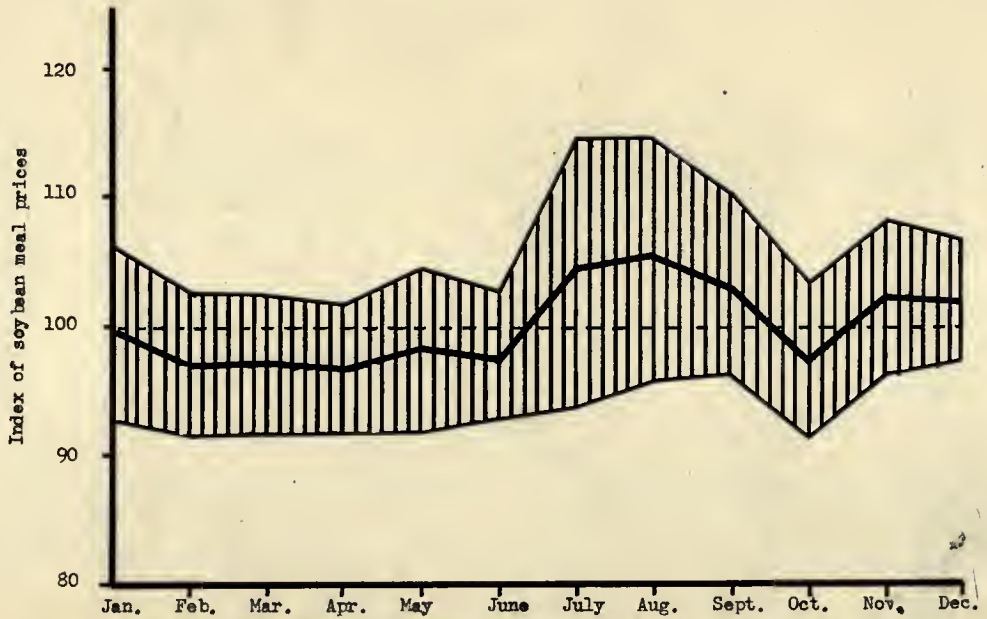

Fig. 8. Index of average seasonal variation of prices of soybean meal in the United States, 1936-1952.

During the first six months of the year very little price variation is noted. The last six months of the year with the exception of October show a somewhat higher level of prices.

An actual count of the number of times a certain month was high or low for the period proved to be of very little value (Table 19). The last six months of the year exhibited a greater number of high months, which is in conformity with the seasonal. The low month of the year could be found in all of the months. The count of preceding months higher or lower clouded the picture more than ever. /1

An index of average seasonal variation of soybean meal prices was calculated for the period 1947-52. The seasonal movement observed was much greater than for the 17-year period. The range of deviation was from a low of 92.4 in January to a high of 110.1 in July or 17.7 points (Fig. 9).

SEASONAL MOVEMENT OF SOYBEAN OIL PRICES IN THE UNITED STATES

A monthly tabulation of average price per pound in tank cars at Midwestern mills 1930-52 was prepared (Table 20). The seasonal movement of soybean oil prices did not reflect the wide range of variation as did soybeans. The seasonal movement of oil prices moved within a range of 8.8 points from a low of 95.6 in July to a high of 104.4 in March (Fig. 10). The movement of the soybean oil seasonal is within a narrow range with an index of irregularity of 7.4 or very similar to the range of the seasonal. Two lows will be observed by inspecting the seasonal—which indicates that July is .9 points lower than October. The seasonal movement indicates that the

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/1 Where two months were equal in price both were counted.

Table 19. Average seasonal movement of Soybean Oil Meal in United States, 1930-1952.

Month	Average seasonal		Times high or low/1		Monthly Movement/2	
	Index of seasonal variation	Index of Irregularity	Times month is high of year	Times month is low of year	Times up from preceding month	Times down from preceding month
January	99.3	6.7	8	4	9	8
February	96.9	5.6	1	7	4	14
March	97.0	5.4	1	3	10	9
April	96.7	4.9	1	5	12	7
May	98.1	6.3	1	2	14	6
June	97.3	5.4	1	5	10	11
July	104.3	10.5	5	3	12	7
August	105.3	9.4	5	2	12	9
September	103.1	7.0	4	2	9	11
October	97.3	6.1	3	3	17	3
November	102.2	5.9	4	1	13	8
December	102.0	4.7	7	4	9	9
Total or Average	100.0	6.5	41	40	131	92

/1 Where two months were equal in price and high and low for the year, both were entered.
/2 No entry for months of no change from preceding month.

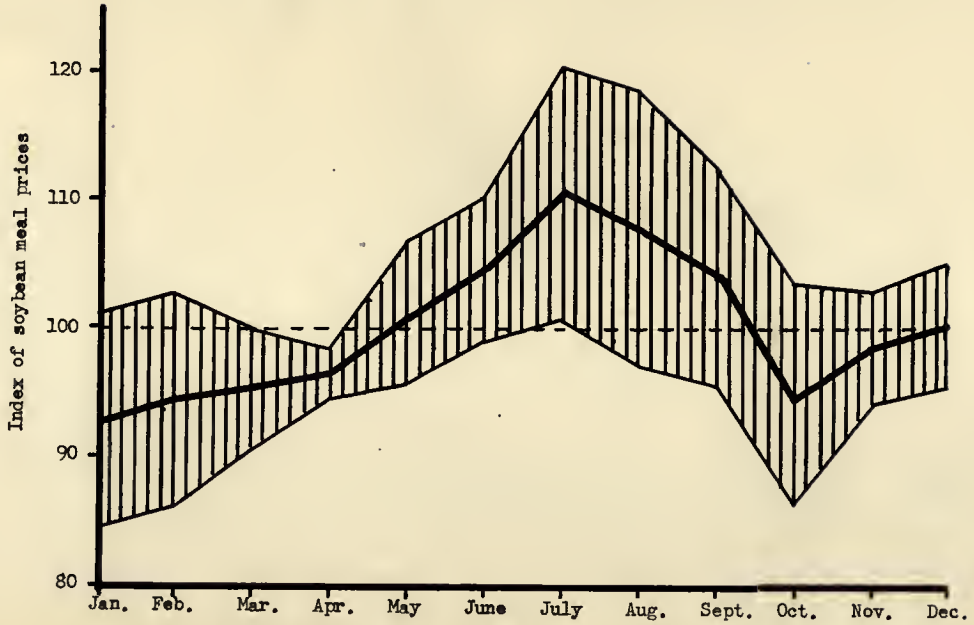

Fig. 9. Index of average seasonal variation of prices of soybean meal in the United States, 1947-52.

Table 20. Soybean Oil, Domestic Crude: Average Price Per Pound in Tank Cars at Midwestern Mills, by Months, Oct. 1930-Dec. 1952. /1

Year	:Jan.	:Feb.	:Mar.	:Apr.	:May	:June	:July	:Aug.	:Sept.	:Oct.	:Nov.	:Dec.
1930	8.4	8.4	8.4	9.0	8.9	8.9	9.3	9.3	9.3	8.8	7.4	6.7
1931	6.4	6.0	5.7	5.8	6.2	5.7	6.1	6.0	5.3	5.1	4.4	3.8
1932	3.3	3.2	3.1	3.0	3.0	3.0	3.1	3.1	3.2	3.4	2.9	3.0
1933	3.0	3.2	3.5	3.4	4.5	6.1	7.4	8.0	6.8	6.0	6.2	6.2
1934	5.6	5.6	5.9	6.0	6.0	5.5	5.8	5.7	5.8	6.1	6.3	7.3
1935	7.8	8.1	9.1	8.4	8.8	8.6	7.8	7.1	7.7	8.1	8.1	8.1
1936	7.6	7.2	6.8	6.8	6.3	6.0	7.9	8.0	8.2	8.0	8.0	9.1
1937	9.8	9.9	9.8	9.8	9.0	8.2			[illegible]	5.8	5.6	5.2
1938	5.8	6.1	6.4	5.9	5.7	5.2	5.9	5.7	5.2	5.0	5.1	5.1
1939	4.9	4.8	4.9	4.7	4.9	4.8	4.2	4.0	5.6	5.0	4.7	5.3
1940	5.2	5.4	5.6	5.5	5.0	4.7	4.6	4.2	3.9	3.9	4.2	4.5
1941	5.1	5.1	6.1	7.6	8.7	9.6	9.8	9.5	10.5	10.4	9.8	10.1
1942	11.4	11.7	11.8	11.8	11.8	11.6	11.2	11.4	11.7	11.8	11.8	11.8
1943	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
1944	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
1945	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
1946	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	18.8	24.2	24.6
1946	26.0	28.4	33.6	27.4	21.4	18.2	17.2	15.9	18.8	20.7	25.6	26.2
1948	26.6	19.6	21.4	24.5	26.3	27.3	22.1	22.1	22.8	18.6	19.1	17.3
1949	14.3	12.3	10.8	10.5	10.8	9.4	9.7	12.9	11.4	10.1	9.6	10.2
1950	10.8	11.4	12.8	13.1	13.8	13.2	12.9	14.5	15.0	14.6	17.1	19.6
1951	20.6	21.1	20.5	20.5	19.5	16.4	14.5	15.4	14.0	13.8	13.2	12.6
1952	11.2	10.7	10.2	9.1	10.1	11.2	11.3	11.5	11.2	10.9	11.8	12.9

/1 Prices in cents per pound.

Source: Bureau of Agricultural Economics, U. S. Department of Agriculture. Monthly prices. Oct. 1929 through Sept. 1938, compiled from Oil Paint and Drug Reporter; Oct. 1938 through Dec. 1952 compiled from The National Provisioner.

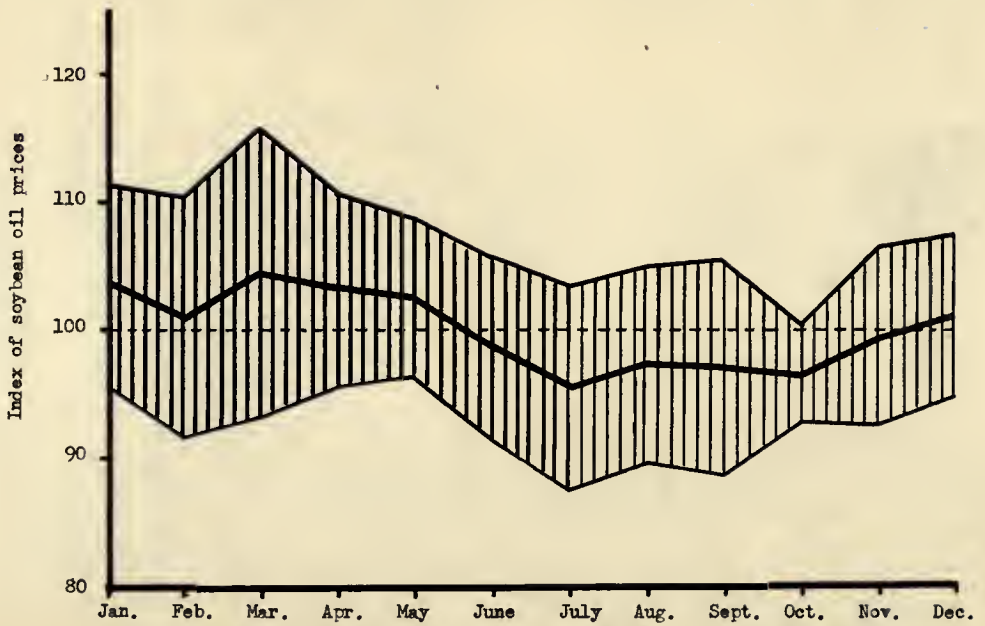

Fig. 10. Index of average seasonal variation of prices of soybean oil in the United States, 1936-52.

months of December, January, February, March, April, and May are to be found above the base line while the remaining six months are below. In general, the seasonal reflects a gradual decline in price from March to October and small increases in price from October until March.

Of particular interest in the calculation of the soybean oil seasonal was the low index of irregularity in October of 3.6. It has been pointed out in other writings that the reason for this low index was the reflection of the heavy marketings of soybeans during that month. /1 The shaded area depicting the index of irregularity did not move away from the base line represented by 100 on the figure. This observation means that while there was a seasonal trend there was little expectation that it could be realized in a particular year. The actual count of soybean oil prices of times high or low for the year or number of times up or down from the preceding year substantiated this conclusion (Table 21).

The index of average seasonal variation of soybean oil was calculated for the years of 1947-52 to express current conditions (Fig. 11). The range of this index was from a low of 89.6 in July to a high of 106.8 in December. The seasonal index again produced two lows, July and October. As found in the 1936-52 index, the index of irregularity was wide indicating the impossibility of making a general statement as to the seasonal movement of soybean oil prices.

When a comparison of the index of the seasonal price variation of soybean meal and soybean oil was made, an almost perfect inverse relationship existed (Fig. 12). /2

/1 Ewasiuk, op. cit.

/2 Ewaiuk, op. cit.

Table 21. Average seasonal movement of Soybean Oil Meal in Kansas, 1930-1952.

Month	Average seasonal		Times high or low/1		Monthly Movement/2	
	Index of seasonal variation	Index of Irregularity	Times month is high of year	Times month is low of year	Times up from preceding month	Times down from preceding month
January	103.5	7.9	2	3	8	10
February	101.0	9.2	2	1	9	7
March	104.4	11.3	1	0	10	7
April	103.1	7.5	1	1	6	9
May	102.4	6.3	1	0	9	7
June	98.6	7.2	1	3	5	12
July	95.6	7.8	1	1	9	9
August	97.3	7.6	0	3	7	8
September	97.0	8.2	2	1	10	7
October	96.5	3.6	1	2	5	12
November	99.4	6.7	1	3	9	8
December	101.0	6.2	4	3	11	5
Total or Average	100.0	7.4	17	21	98	101

/1 Where two months were equal in price and high and low for the year, both were entered.
/2 No entry for months of no change from preceding month.

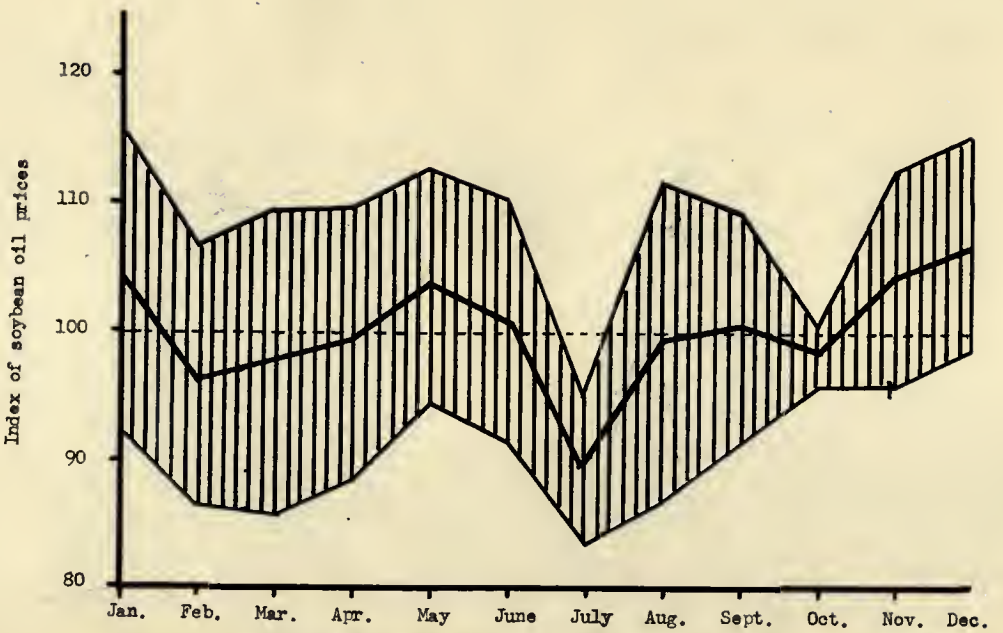

Fig. 11. Index of average seasonal variation of prices of soybean oil in the United States, 1947-1952.

Fig. 12. Index of average seasonal variation of prices of soybean oil and soybean meal in the United States, 1936-1952.

The price users have paid for soybean oil and soybean meal and have both contributed to the establishment of the market value of the soybean. When Fig. 12 was examined it appeared that a declining price of one of the joint products, which would have tended to lower the prices of the soybean, was offset by an increasing price of the other joint product.

FUTURES TRADING

Hedging may be defined as the practice of offsetting one risk of price change by assuming an additional risk, equal in size and opposite in the expectation of gain or loss. Futures trading is not a fool-proof method of operating with complete immunity to price changes. Hedging is not the direct transfer of risks, but rather the assumption of additional risks.

A typical hedge against a price decline by a wheat miller in anticipation of a price decline will serve to illustrate the hedging mechanization. The miller to protect himself against a price decline on purchased cash wheat can hedge his purchases by selling a futures contract on a like amount of wheat. A typical hedging transaction covering this situation follows:

In the CASH market	In the FUTURES market
On September 1st	
He BUYS	He SELLS
5,000 bushels of wheat shipped from country elevator at $2.00 per bushel.	5,000 bushels of December wheat futures at $2.00 per bushel.
On October 20th	
He SELLS	He BUYS
flour based on wheat equivalent of 5,000 bushels priced at $1.85 per bushel.	5,000 bushels of December wheat futures at $1.85 per bushel.
For a loss of 15 cents per bushel.	For a gain of 15 cents per bushel.

This wheat miller has purchased 5,000 bushels of wheat from a farmer or grain firm, and along with this purchase he assumes the risk that the price will decline before the flour can be milled and sold. However, the miller did not wish to assume this risk—so through the mechanics of a commodity exchange he contracts to deliver and sell 5,000 bushels of wheat at a future date. In the cash market, should the price decline so that the flour equivalent sells for 15 cents less than it cost, the miller has lost money on this side of the transaction. However, in the futures market if the price has moved in a similar direction a gain of 15 cents is realized. If the prices of cash wheat of a specific quality in the country and futures wheat of contract grade change in the same direction, gains resulting from price increase will be exactly offset by losses. This is considered to be a perfect "hedge."

A typical hedge against a price decline would be the case of a miller who forward sells flour and feed--thus to protect himself against a price advance by buying in the futures market. A typical illustration of the transaction is as follows:

In the CASH market	In the FUTURES market
On September 1	
He SELLS	He BUYS
flour based on wheat equivalent of 5,000 bushels priced at $2.00 per bushel.	5,000 bushels of December wheat futures at $2.00 per bushel.
On October 20	
He BUYS	He SELLS
5,000 bushels of wheat shipped from country elevator at $2.15 per bushel.	5,000 bushels of December wheat futures at $2.15 per bushel.
For a loss of 15 cents per bushel.	For a profit of 15 cents per bushel.

In the previous illustrations the actual ownership does not change hands but the effective ownership does. The price change risk is shifted from the miller to the person who makes the agreement to buy or sell as the case may be. The person taking the opposite end may be a speculator or another hedger. However, it is more likely that the person taking the opposite end of the transaction will be the speculator because hedgers are likely to be more often "short" than "long" in the futures market.

A speculator is one who buys a futures contract with the expectation of selling it later at a higher price or just the opposite--sells a contract for future delivery expecting the price to decline and buys the contract back at a lower price. The speculator who assumes the risk by reason of his own point of view as to future expectations and his knowledge of the market is the one making the futures market liquid. The speculator is a very necessary part of the futures market.

The basic need for hedging arisss from the necessity that someone owns the various commodities while they are in progress through the marketing system. Commodities are produced seasonally and the greater percentage of the production is marketed during the harvest season. This risk element enters the marketing system because someone owns these commodities until consumers are willing and able to buy. The consumer wants a ready supply throughout the year and the processor of this commodity must stand ready to fill these demands and likewise assume the risk of ownership of large inventories.

Futures trading is defined as the buying and selling of grain for future delivery and are called "futures delivery contracts". A grain futures contract is an agreement between two people--one agrees to sell and deliver and the other one agrees to buy and receive, (1) a certain kind and quantity of grain, (2) to be delivered during a specified delivery month, (3) at a specified price, and (4) under the terms of the rules and regulations of the exchange.

The force tending to hold cash and futures prices together is the deliverable character of the futures contract. A futures contract may be settled by making an offsetting contract of comparable size or making or taking

delivery. It is this deliverable character of the futures contract that tends to cause cash and futures prices to move together.

Forces causing differences between cash and futures prices are as follows: (1) quality and convenience differences, (2) grade differences, (3) ordinary carrying charge, and (4) risk premiums for carrying deferred deliveries.

Hieronymous in his revised Ph.D. thesis set out the criteria for an optimum risk shifting system: (1) a marketing system for risk shifting must reach the market--it must reach the hands of those persons or firms who will carry them for the smallest risk premiums, (2) a marketing system for risk must also serve as a means for reducing risks, (3) a satisfactory risk-shifting system must provide stable and predictable differences between the prices of commodities for delivery at different times, (4) prices must not be susceptible to manipulation or influenced by technical conditions, (5) volume of trading must be large enough to permit the instantaneous execution of hedges, and (6) the volume of trading must be great enough that the placing of no one hedge can materially influence prices. /1

The next phase of this study will endeavor to search out by various means the third criterion for a risk shifting system. An examination will be made as to whether there has been a stable and predictable difference between the prices of commodities for delivery at different times. The price spread between cash and various futures prices will be charted to determine if there is a change in the basis throughout the term of the contract and the amount of the change.

/1 Hieronymous, op.cit. p.

RELATIONSHIP BETWEEN CASH SOYBEANS AND THE CHICAGO SOYBEAN FUTURES

An examination was made of the futures price series from 1948-49 through 1952-53. It was felt that this period would reflect more accurately the price movement of futures and cash. A longer series was not used because trading in futures contracts were suspended as of February 19, 1943, and trading was not resumed until July 7, 1947. The period prior to this time would be of little value to this study because of the relatively small volume of trading in soybeans on the Chicago market. The volume of trading on the Chicago market has increased from 1½ billion bushels in 1948-49 to nearly 3 billion bushels in 1951-52.

The cash price series used in this relationship study were obtained from the "Kansas City Grain Market Review". Tabulations from this source were obtained from this publication starting on April 4, 1949, and continued weekly through 1953 to date. This price series was believed to represent a more precise picture of the value of soybeans in this area. Illinois track country station bids were used prior to the publication of price quotations by the "Kansas City Grain Market Review".

The trading months of January, May, July, and November were used in making the relationship studies. The weekly Saturday high price quotations were used for reasons to be given in another section. In some cases, Friday high quotations were substituted in case of no market on the Saturday date.

Figures 11 through 33 present in graphic form the price movement and the net differences between Kansas City No. 2 yellow soybeans and the Chicago futures prices, weekly Saturday high for the contract month under examination. An examination of the price movements reveal that there is no stable and predictable basis movement. Rather it is a situation of wide spreads at

various times throughout the year--narrowing at certain times and even crossing from one to eight times. There is no pattern as to the size of the spreads or when the cash and futures cross.

Conclusions--Cash-Futures Soybean Relationships

The drawing of conclusions as to the desirability of using futures soybeans as a hedging commodity to offset the uncertainty of future prices of cash soybeans, we must recall our criteria for judging the usability of this practice. There must be a stable and predictable basis or spread between the cash and futures market.

In reviewing the price spreads and the actual price spreads or net differences for the period 1949-53, it can be pointed out that inconsistencies have been too great to prove of value. The predictability of the spread cannot be forecast with any degree of accuracy.

The futures-cash relationships of 1952-53 do lend some hope of using futures soybeans as a hedging commodity. The futures relationships during 1952-53 did not cross after October and the net differences were more stable than any of the other series examined.

Cash and Futures Soybean Relationships, 1949-50

In examining the price movement of cash and futures soybeans for the year 1949-50, only the May, July, and November contracts were plotted. The May future cash relationship reveals that there was a very narrow spread between the two price series (Fig. 23). Both the cash and futures prices advance from the opening of the contract until it closed. By actual count the two price series cross four times, however, there is a correlation of $\pm.98$

indicating that the two series were closely associated. The actual price spread or net differences between the two series (Using cash soybeans as a base) varied from a + 21 to a - 4 cents per bushel (Fig. 24).

The July futures cash relationship showed a similar positive correlation of +.88 which indicates the two series were closely associated (Fig. 30). The two series moved along with a narrow spread and crossed only once during the duration of the contract. Again the two price series advanced from the opening in November until its closing in July. The actual price spread or net differences throughout the contract varied inconsistently from + 18½ to - 13 cents per bushel (Fig. 31).

The futures cash spread for the November future portrays a very wide and violent price movement by both cash and futures (Fig. 34). The coefficient of correlation, an indication of the association of the two series, indicated a + .50 or only a fair association between the series. The cash-future relationship indicated a wide spread at beginning of the contract and a narrowing of the spread at its close. The actual price spread or net differences varied from a - 82 to + 16 cents per bushel (Fig. 35).

In appraising the possibilities of hedging the purchase of cash soybeans in the Chicago soybean futures market, it appears that from the inspection of the price spread and net differences during 1949-50 it would have been impossible to eliminate uncertainty by hedging in soybeans.

Cash and Futures Soybean Relationships, 1950-51

In reviewing the movement or the basis change of cash and futures soybeans for 1950-51, four of the dominant futures were plotted. The January, May, July, and November futures were graphed and net differences determined

to portray the possibilities of executing a near perfect hedge.

The January future cash relationship opened with a very wide spread of 60 cents per bushel in April and closed out with a net difference of three cents in January (Fig. 16). By inspection it is noted that the two price series crossed in September and that both price series generally advanced from the beginning of the contract until its close. Note also the price decline during the harvest period indicating the seasonality of soybean price movement. The actual price spread or net difference (using cash soybeans as a base) varies from a - 82 to + 18 cents per bushel (Fig. 17). The coefficient of correlation of the two price series bears out the inconsistency of the price movement. The correlation was + .27 indicating the two series were not closely associated.

The plotting of the May future-cash relationship for this year showed the price spread between the two series followed each other very closely. The coefficient of correlation of + .92 indicates a close association between the series. In examining the plot for the criteria outlined for a perfect hedge, it is noted that the two price series cross twice throughout the contract. The basis is unstable and unpredictable (Fig. 21). The actual price spread or net difference between the two series varies from -42 cents to a low of three cents per bushel. It will also be noted that price ceilings were imposed on this commodity at the end of the contract.

The July futures-cash relationship for this year was influenced by price ceilings and perhaps did not present the true picture had price ceilings not been imposed. The coefficient of correlation was + .97 indicating a very close association of the two series perhaps due partly to price ceilings (Fig. 28). The two series cross three times within duration of the c[illegible]

contract. The actual spread or net differences vary from ⁄ 15 3/4 to - 12 3/4 cents per bushel (Fig. 29).

The November futures-cash relationship shows a very wide spread at the beginning of the contract and a gradual narrowinf of the spread at its close (Fig. 32). Again this plot shows the pegging of price ceilings on the cash commodity and perhaps does not present a clear picture. The actual price spread or net differences again indicate the instability and unpredictable of the future-cash relationship, (Fig. 33).

Cash and Future Soybean Relationships, 1951-52

In inspecting the relationship between the cash and futures soybean price spread and actual differences for 1951-52, the dominant futures months of January, May, and July were plotted.

The January futures-cash relationship was plotted, showing again the effect of price ceilings--perhaps the association of cash and futures prices are distorted for the period of March through May. The price spread between the two price series opened at a wide spread and eventually narrowed to a spread of six cents (Fig. 15). Within the duration of the January contract the two price series cross five times indicating a very poor basis on which to hedge. The coefficient of correlation of ⁄ .49 of the two series indicates an association of price movements. The actual price spread or net differences between cash and futures prices reveals a variation of differences between - 49 and ⁄ 9 (Fig. 17).

The May future-cash relationship on inspection showed that this series cross eight times within the duration of the contract (Fig. 20). The two price series moved within a narrow range, however, it was difficult to determine

just when a plus or minus net difference appeared. This is a good example of a very poor basis between cash and futures on which to hedge, although the coefficient of correlation proved to be ≠ .64. The net differences varied from - 22 to ≠ 12 cents per bushel (Fig. 22).

The relationship between the July futures-cash price series--again presented a movement similar to the May future. The cash and futures price spread was narrow and moved within a narrow range. The two series crossed two times during the trading in July futures, in fact the two series moved within such a narrow range that the coefficient of correlation of ≠ .92 indicated a high degree of association between the two price series. The actual price spread or net differences again presented an inconsistent picture as to the basis which should be stable throughout the contract in order to be of value for hedging purposes. The net differences varied from ≠ 16 to -12 3/4 cents per bushel (Fig. 29).

Cash and Futures Soybean Relationships, 1952-53

The 1952-53 cash-future relationships were plotted in order to bring the picture up to date. The future contracts of January, May, and July were plotted for this purpose. At last some confidence can be placed in the possibilities of using the soybean futures for hedging. An inspection of these three futures revealed that the cash and futures prices have moved along together, although there are inconsistencies in the net differences. It must be remembered this relationship is only one among many which shows stability. Whether this relationship is a happenstance or whether the futures market is at last moving in a similar direction, only time will tell.

The January future-cash relationship revealed that the two price series

did cross, however, it is noted that the basis between the two, after the last week in September, do move along together (Fig. 13). This relationship is of value to the soybean processor because he hedges his purchases after October 1. The spread between the two series vary from a ⁄ 10 to ⁄ 20 cents per bushel (Fig. 14).

The May future-cash relationship exhibited a spread very similar to the January future. The price spread did not cross after the last week in September (Fig. 18). The future price series remained above the cash by an amount which offered some hedging possibilities. The actual price spread or net differences after the first of October varied from ⁄ 7 to ⁄ 25 (Fig. 21).

The July future-cash relationship revealed the best possibilities for successful hedging. The futures price series remained above the cash throughout the duration of the contract (Fig. 25). It was also noted that the price series did not cross at anytime from September until the close in July. The actual price spread or net differences did show inconsistencies but not as variable as the other comparisons. The net differences all showed a plus net difference varying from ⁄ 2½ to ⁄ 23 (Fig. 26).

Fig. 13. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and January futures soybeans, Chicago, weekly (Saturday high), 1952-53.

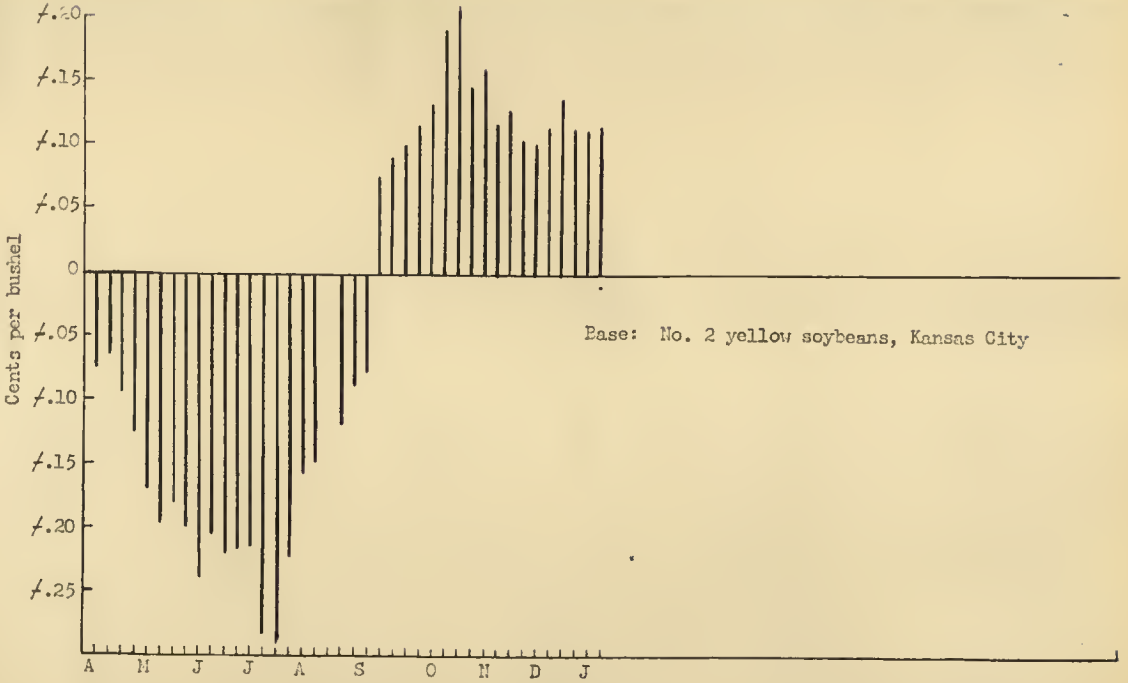

Fig. 14. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and January futures soybeans, Chicago, weekly (Saturday high), 1952-53.

Fig. 15. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and January futures soybeans, Chicago, weekly (Saturday high), 1951-52.

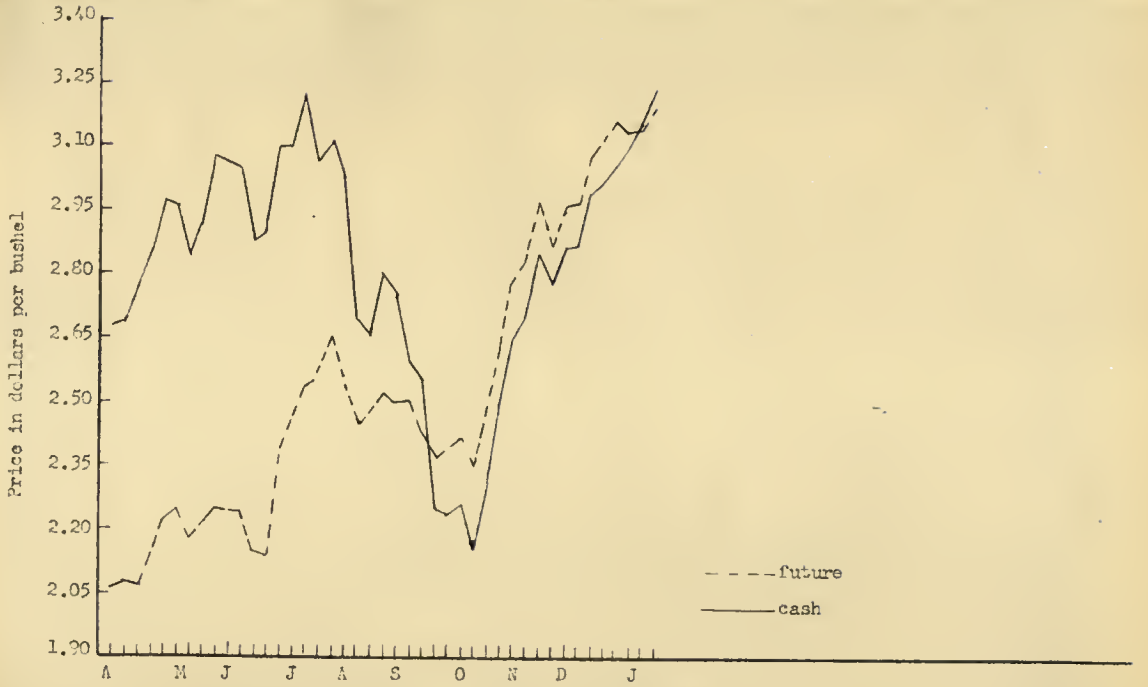

Fig. 16. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and January futures soybeans, Chicago, weekly (Saturday high), 1950-51.

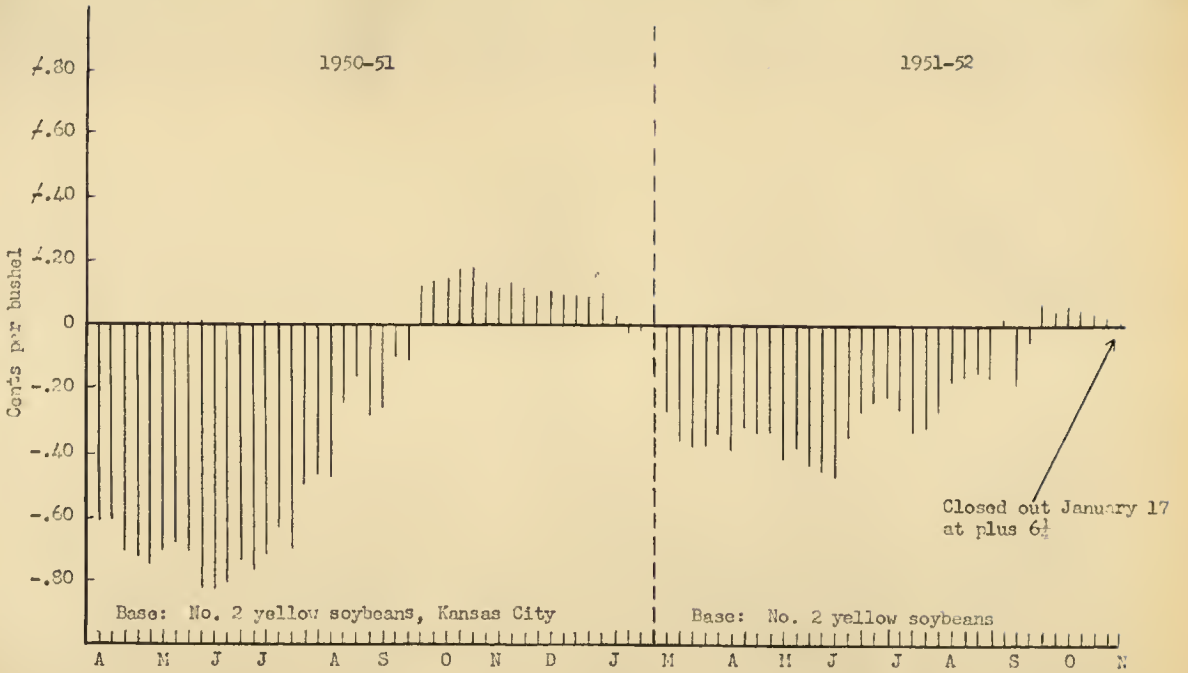

Fig. 17. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and January futures soybeans, Chicago, weekly (Saturday high), 1950-51 and 1951-52.

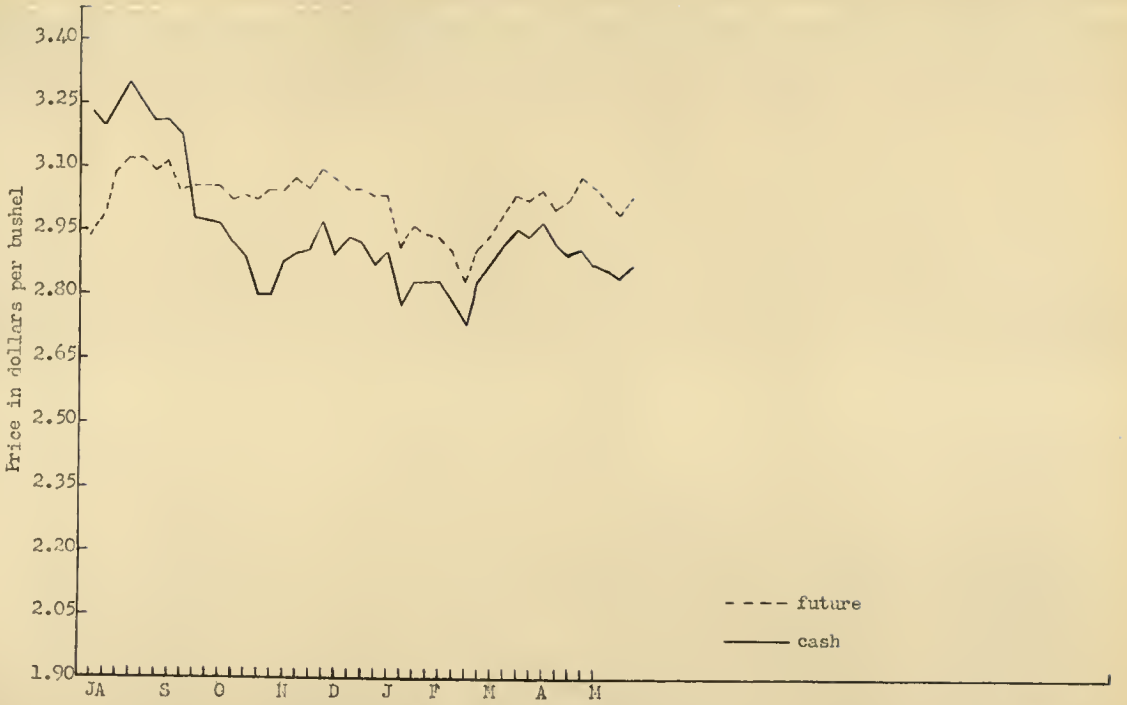

Fig. 18. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Friday high) and May futures soybeans, Chicago, weekly (Friday high), 1952-53.

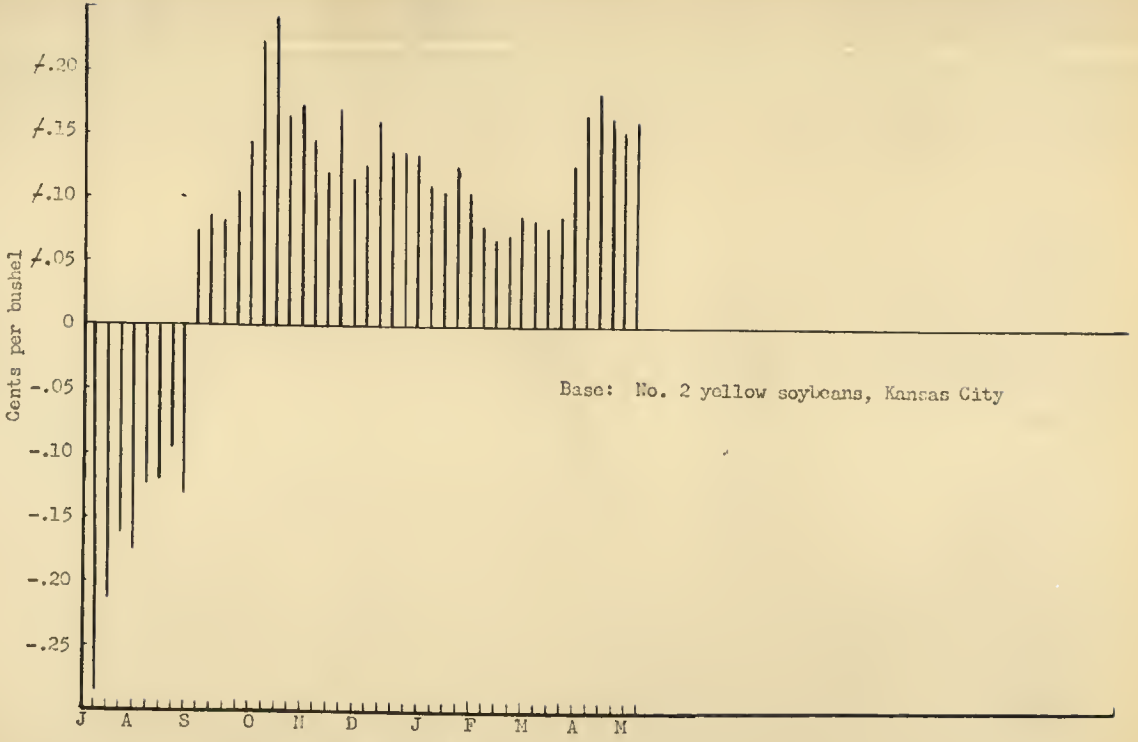

Fig. 19. Actual price spread between No. 2 yellow soybeans, Kansas City, weekly (Friday high) and May futures soybeans, Chicago, weekly (Friday high), 1952-53.

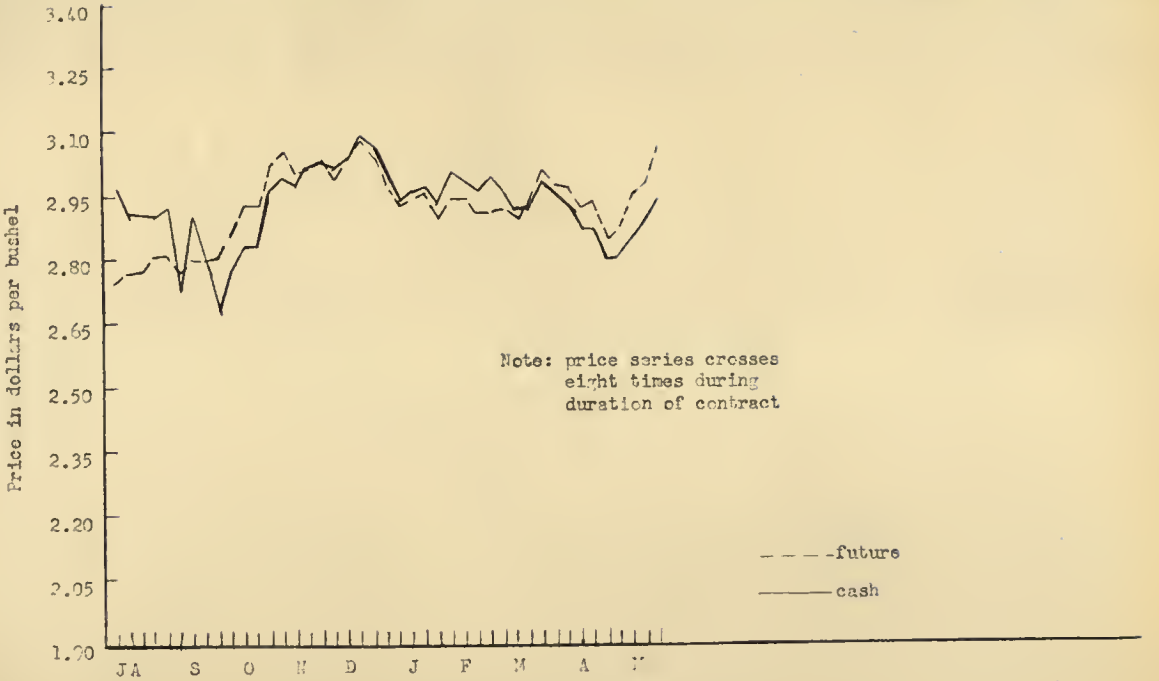

Fig. 20. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and May futures soybeans, Chicago, weekly (Saturday high), 1951-52.

Fig. 21. Price [illegible] between U. S. [illegible] corn, Kansas City, weekly (saturday high) and [illegible], Chicago, weekly (saturday high), 1965 -71.

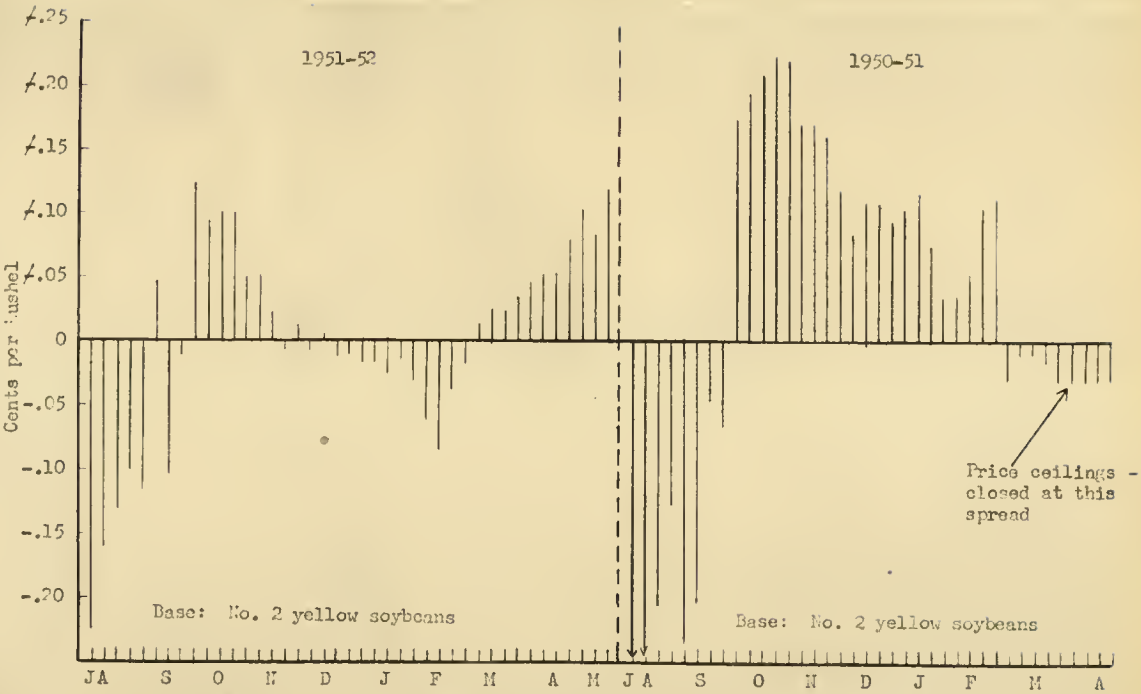

Fig. 22. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and May futures soybeans, weekly (Saturday high), Chicago, 1951-52 and 1950-51.

Fig. 23. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and May futures soybeans, Chicago, weekly (Saturday high), 1949-50.

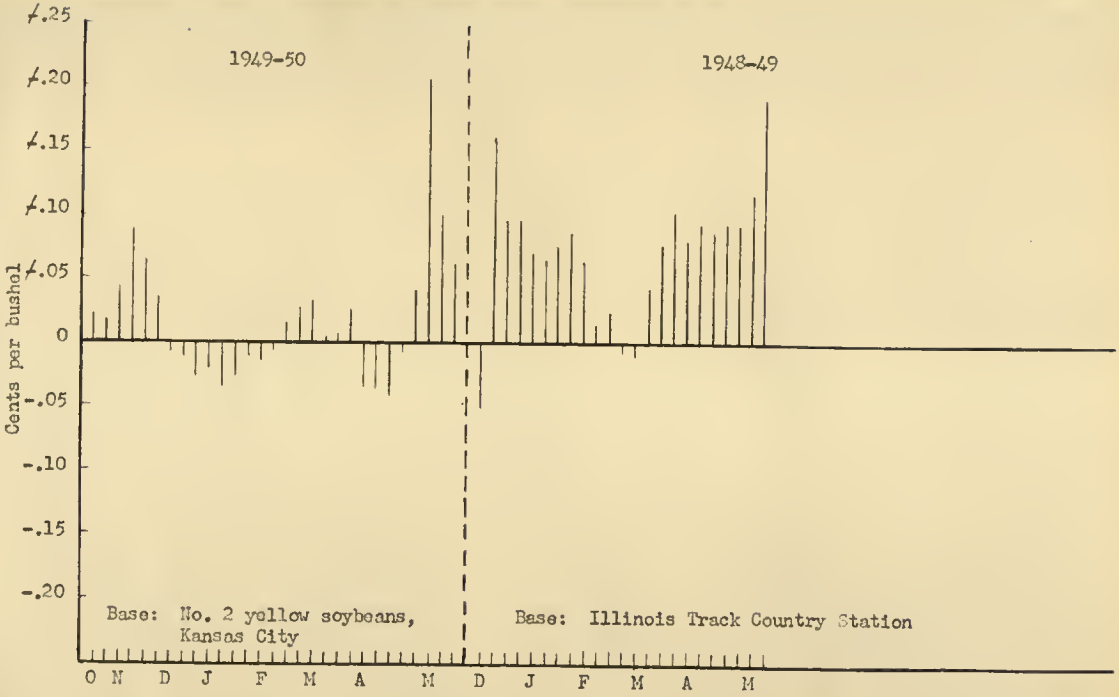

Fig. 24. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high); soybeans, Illinois Track Country Station and May futures soybeans, Chicago, weekly, 1949-50 and 1948-49.

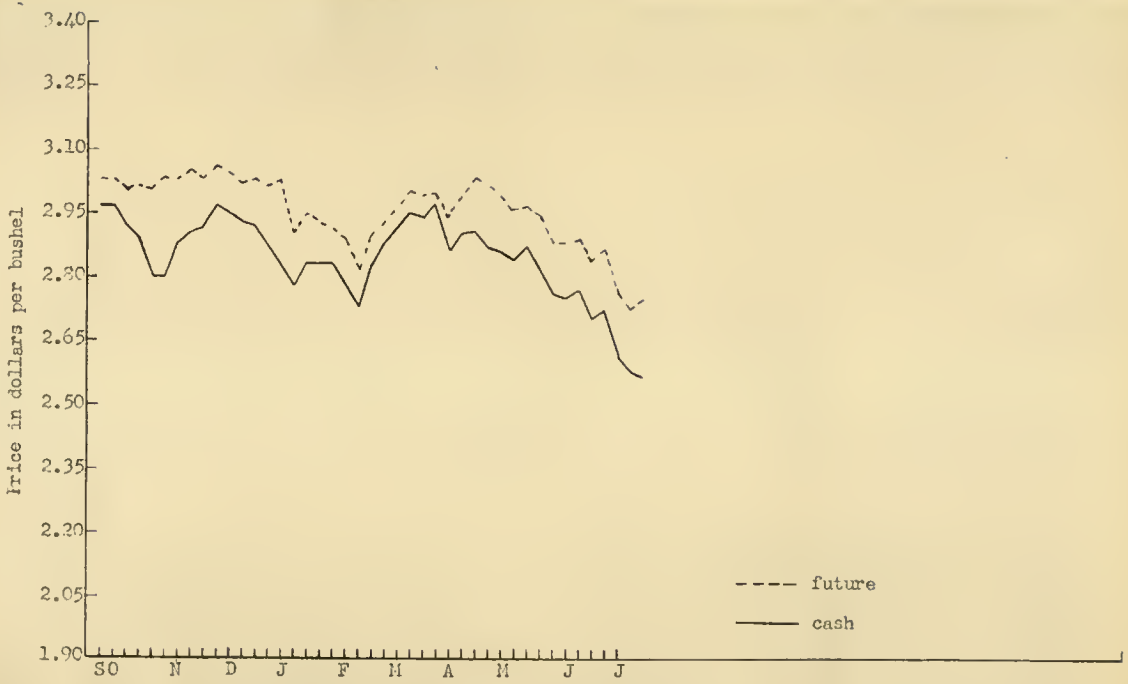

Fig. 25. Price spread between No. 2 yellow soybeans, Kansas City, weekly, (Friday high) and July futures soybeans, Chicago, weekly (Friday high), 1952-53.

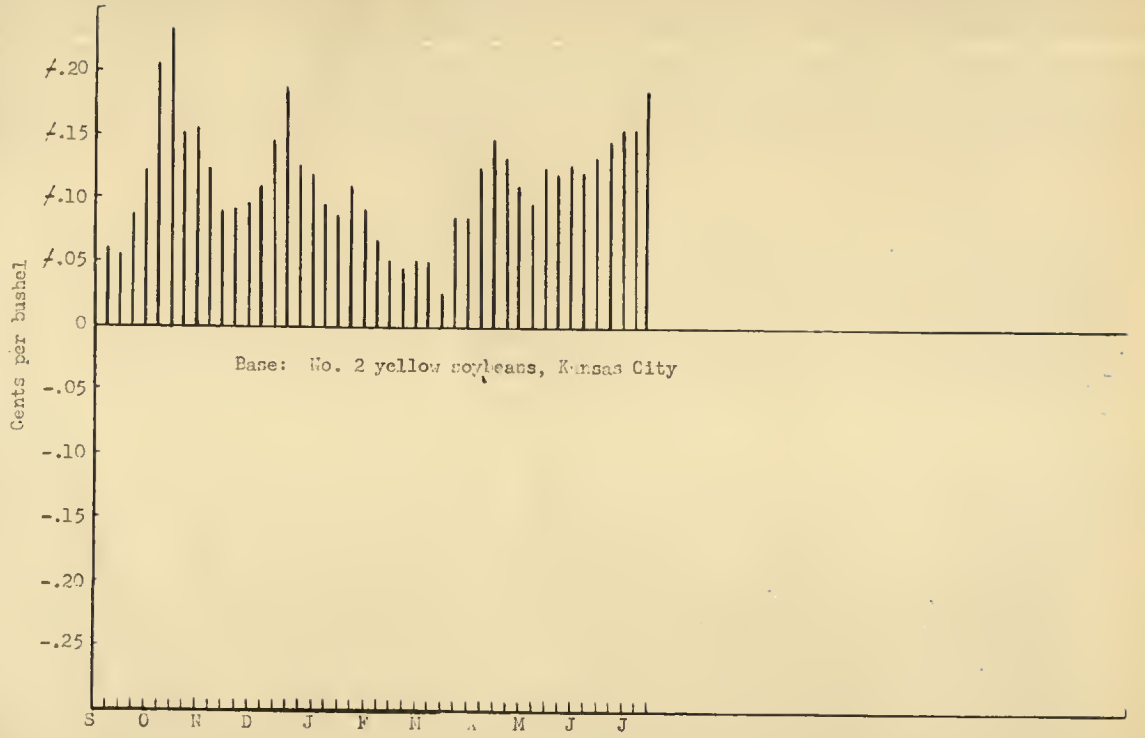

Fig. 26. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Friday high) and July futures soybeans, Chicago, weekly (Friday high), 1952-53.

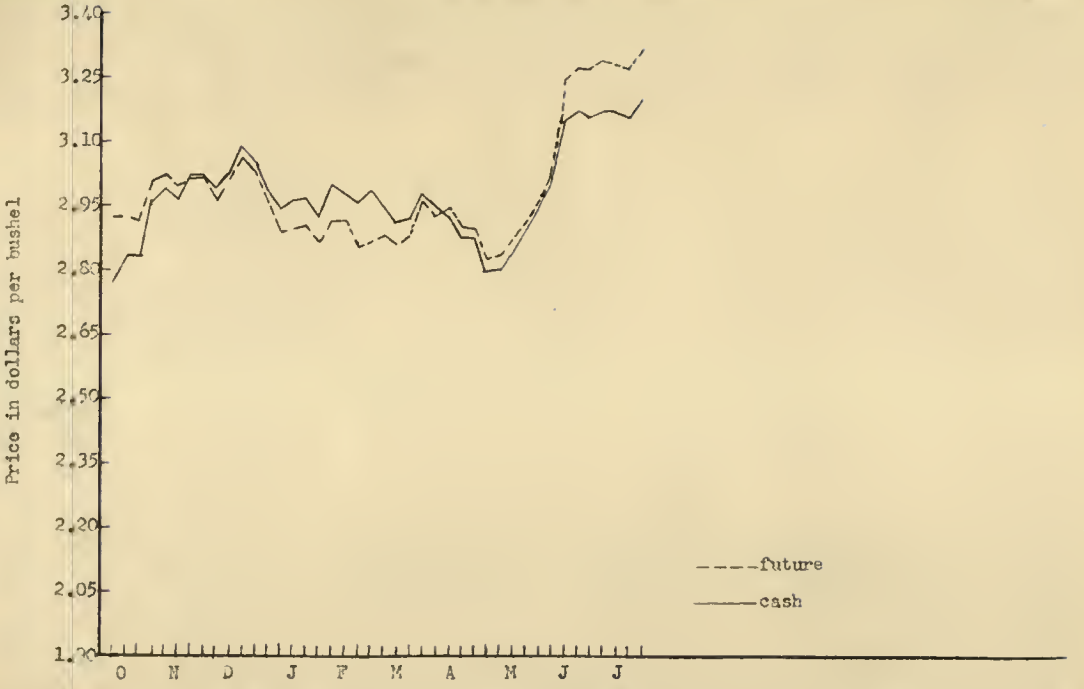

Fig. 27. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and July futures soybeans, Chicago, weekly (Saturday high), 1951-52.

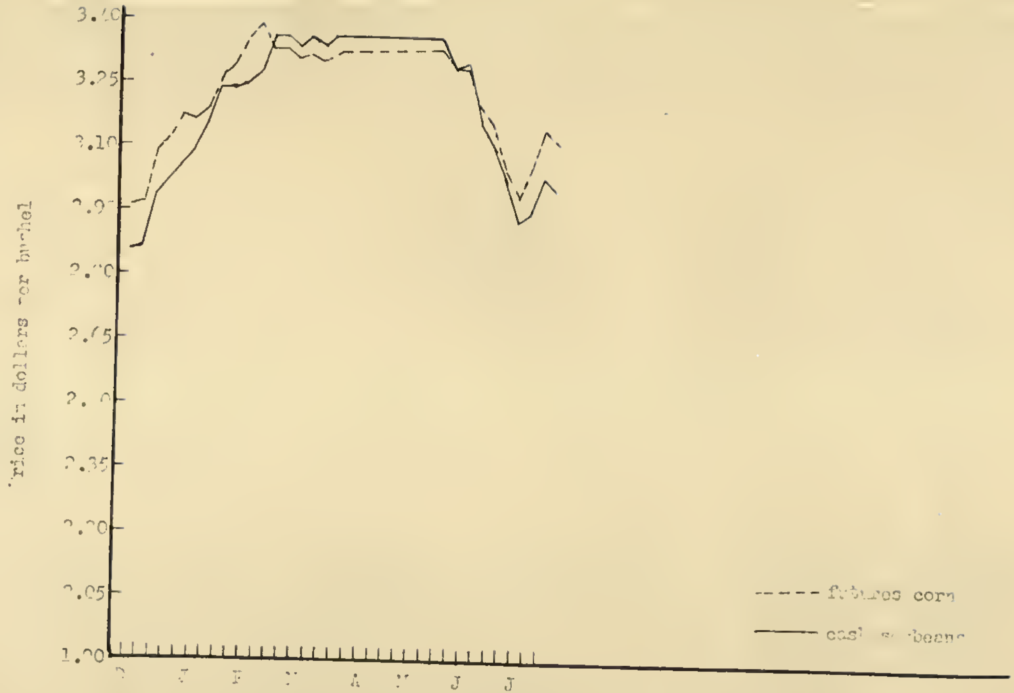

Fig. 23. Price spread between No. 2 yellow soybeans, [illegible] City, weekly (Saturday bid) and [illegible] soybeans, Chicago, weekly (Saturday bid), [illegible].

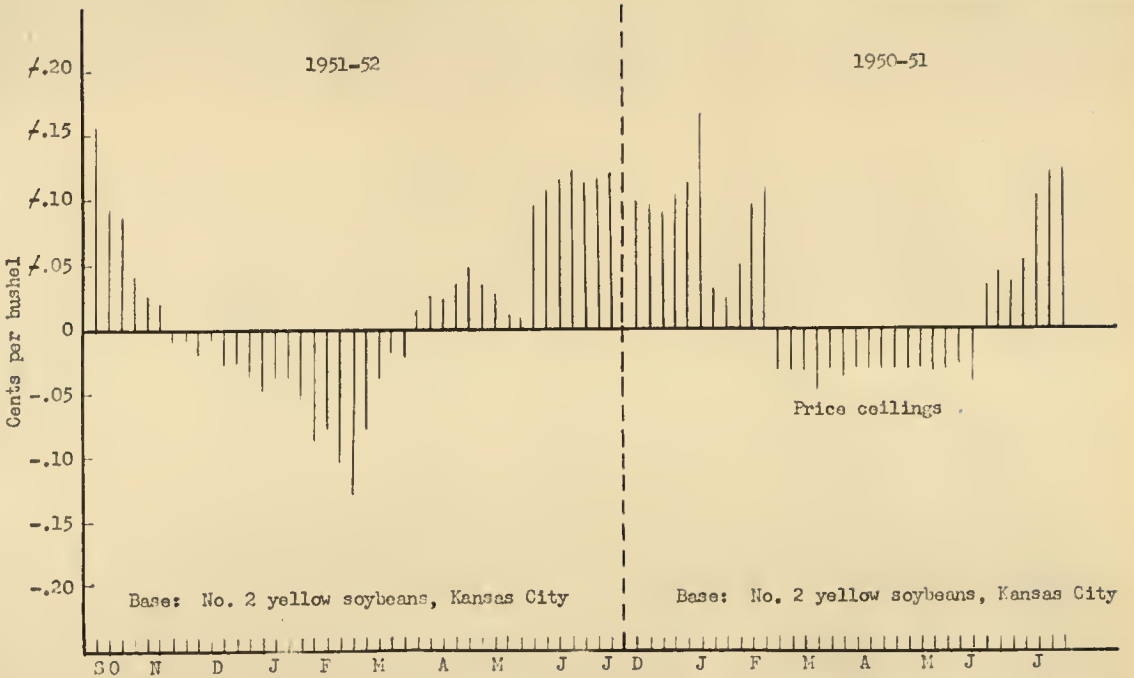

Fig. 29. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and July futures soybeans, weekly (Saturday high) Chicago, 1951-52 and 1950-51.

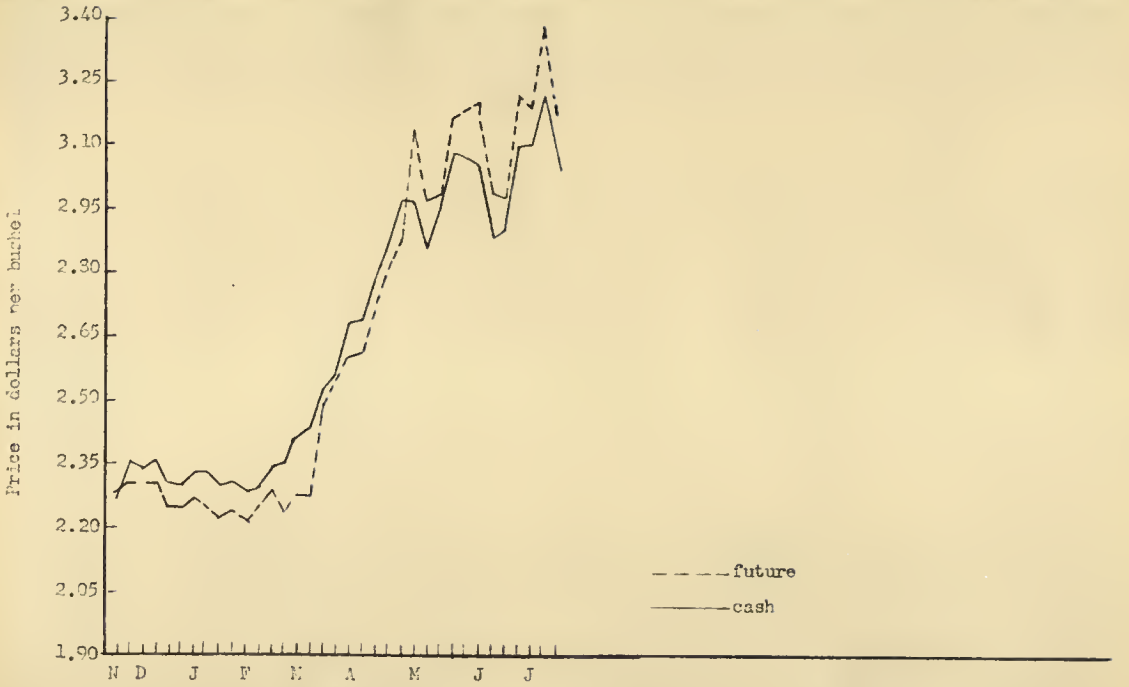

Fig. 30. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and July futures soybeans, Chicago, weekly (Saturday high), 1949-50.

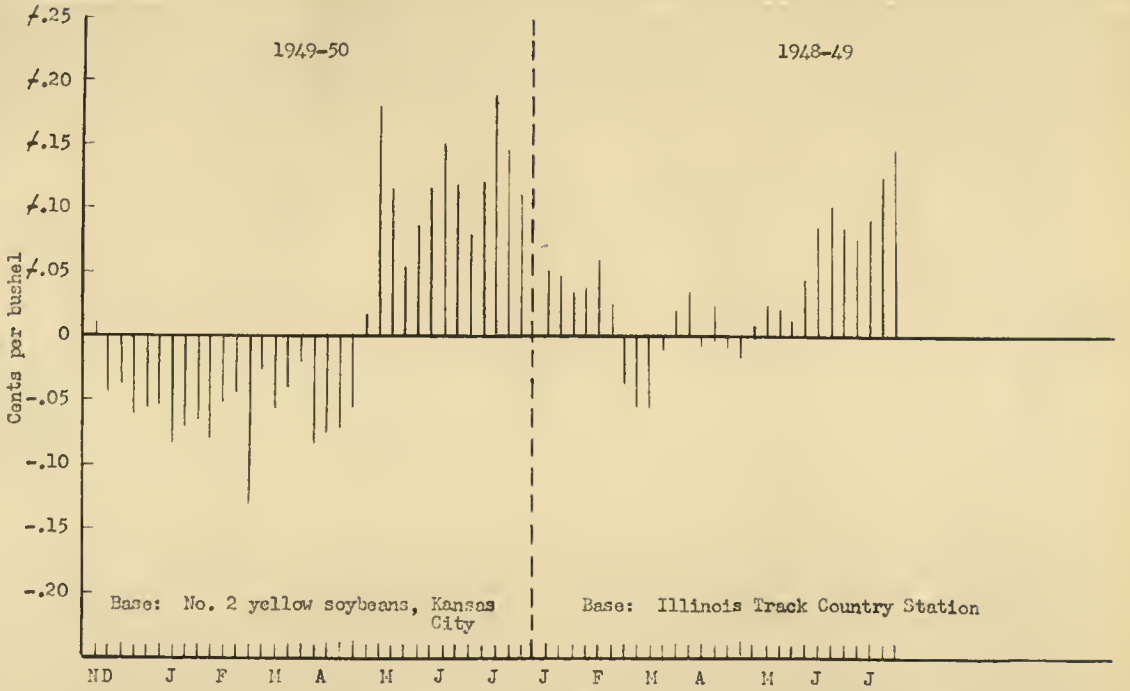

Fig. 31. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) or soybeans, Illinois Track Country Station and July futures soybeans, Chicago, weekly, 1949-50 and 1948-49.

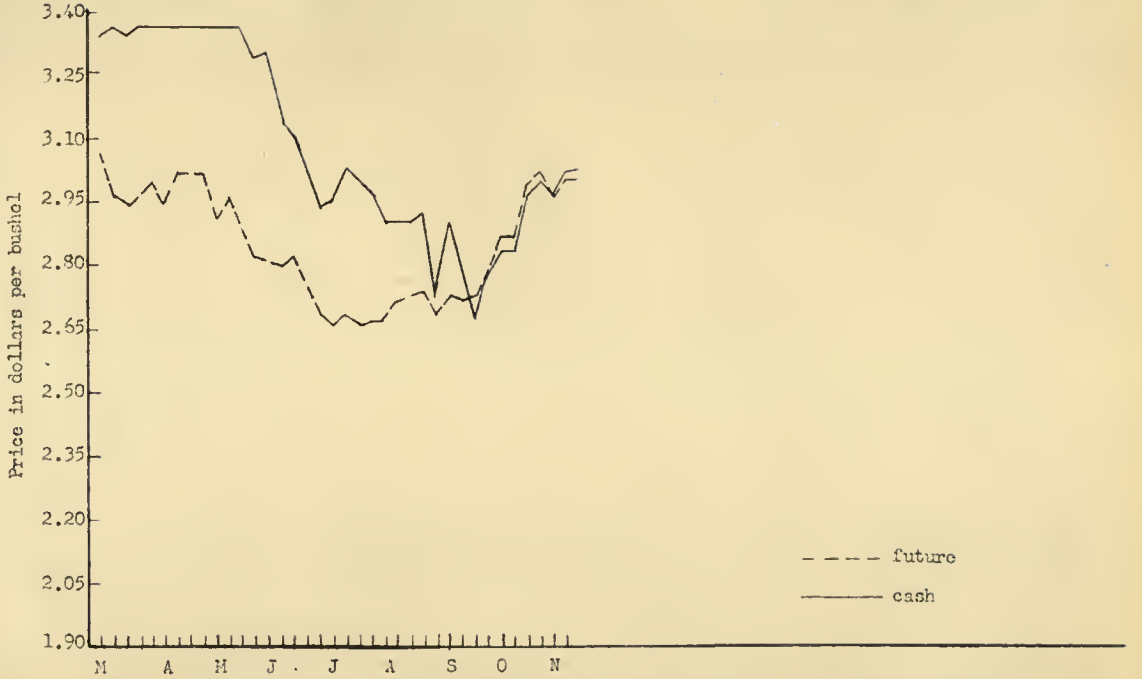

Fig. 32. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and November futures soybeans, Chicago, weekly (Saturday high), 1951.

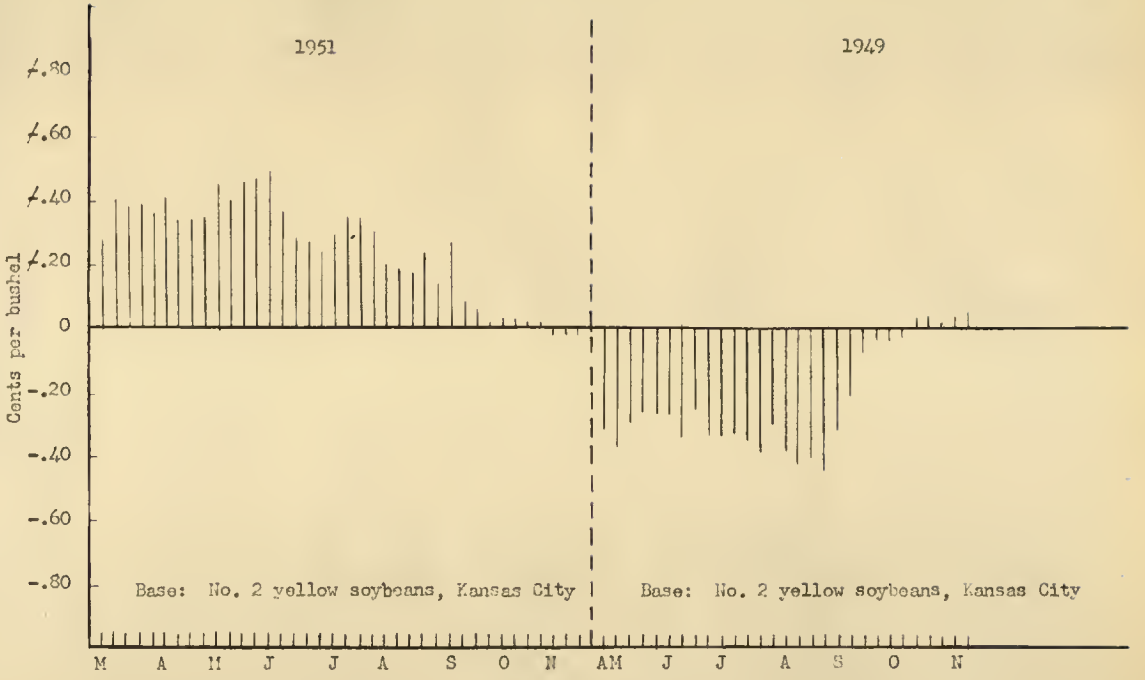

Fig. 33. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly, (Saturday high) and November futures soybeans, Chicago, weekly (Saturday high), 1951 and 1949.

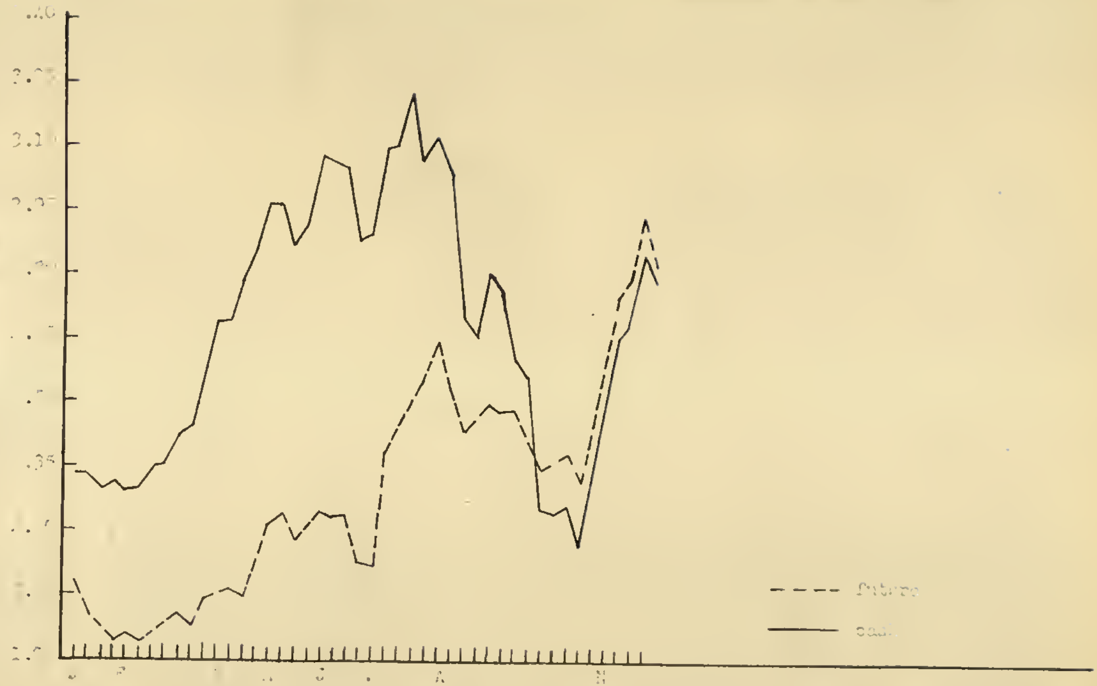

Fig. 34. [illegible] between No. 2 yellow soybeans, Kansas City, [illegible] and November futures soybeans, Chicago, weekly (Saturday high), [illegible].

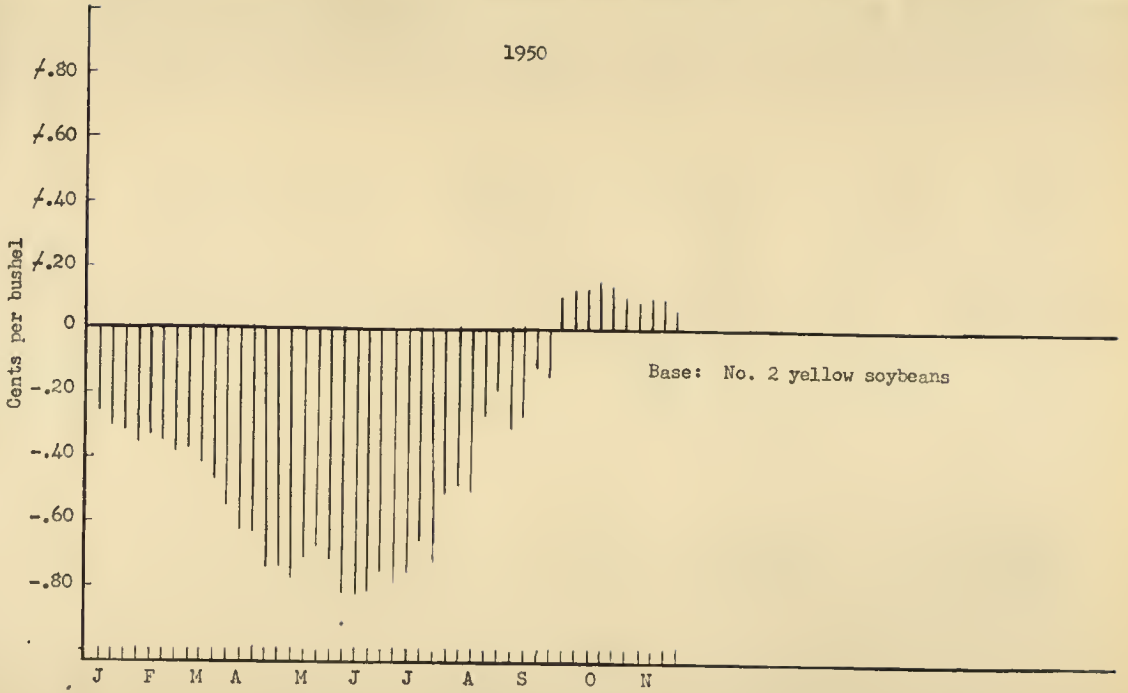

Fig. 35. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and November futures soybeans, Chicago, weekly (Saturday high), 1950.

RELATIONSHIP BETWEEN CASH SOYBEANS AND CHICAGO FUTURE CORN

It has been suggested that futures corn, Chicago, might be expected to provide a market in which to hedge the purchase of cash soybeans. Many authors have expressed the view that soybeans and corn compete for acreage in the soybean area. It is also assumed that the feed supply, of which corn is a major crop, has an affect on the price received for soybeans. Jordan points out that the relation between the price of corn and the price of supplements also affect the feeder's willingness to buy supplements—which in turn has an affect on soybean prices.

It is not illogical to assume that corn and soybean price series might move with a stable and predictable spread or basis. In this relationship study cash prices as tabulated from the "Kansas City Grain Market Review" were used for the weekly cash price. The May and July futures contracts for Chicago corn published by the same publication was used in plotting the corn futures for the years of 1949-52.

The price spread or net differences (using cash soybeans as a base) were plotted for the relationship study of cash soybeans and May futures corn 1951-52. The price spread or basis between series was very wide. The price movement of futures corn was very smooth tending to advance by an amount equal to the carrying charge. Cash soybeans exhibited a violent price fluctuation in comparison to futures corn (Fig. 36). The two price series appear to move together, however, a correlation coefficient of $\pm$ .44 was obtained indicating that the two price series were not too closely associated. The actual price spread between the two series varies from a - 88 to - 128 cents per bushel (Fig. 37). The spread between cash soybeans and futures corn for 1950-51 was wide with the cash soybeans showing irregular fluctuations in

comparison to corn (Fig. 38). The correlation coefficient between these two series was / .84 indicating the price series were more closely associated than were the previous comparison; however, the net differences varied from - 64 to - 163 cents per bushel (Fig. 39).

The association of the two price series in 1949-50 indicated a wide and varying spread (Fig. 40). The actual price spread or net differences again proved the inadequacy of futures corn as a hedging medium (Fig. 41).

The plotting of the July futures corn and cash soybeans for 1949-52 indicated the inadequacy of futures corn, Chicago, as a hedging medium (Figs. 42, 44, and 46). The net differences although all minus showed many inconsistencies so as to render this hedging procedure unuseable (Figs. 43, 45, and 47).

Using the criteria of a stable and predictable basis or spread between futures corn and cash soybeans, the study reveals that it will be impossible to hedge with any degree of certainty in the Chicago corn futures.

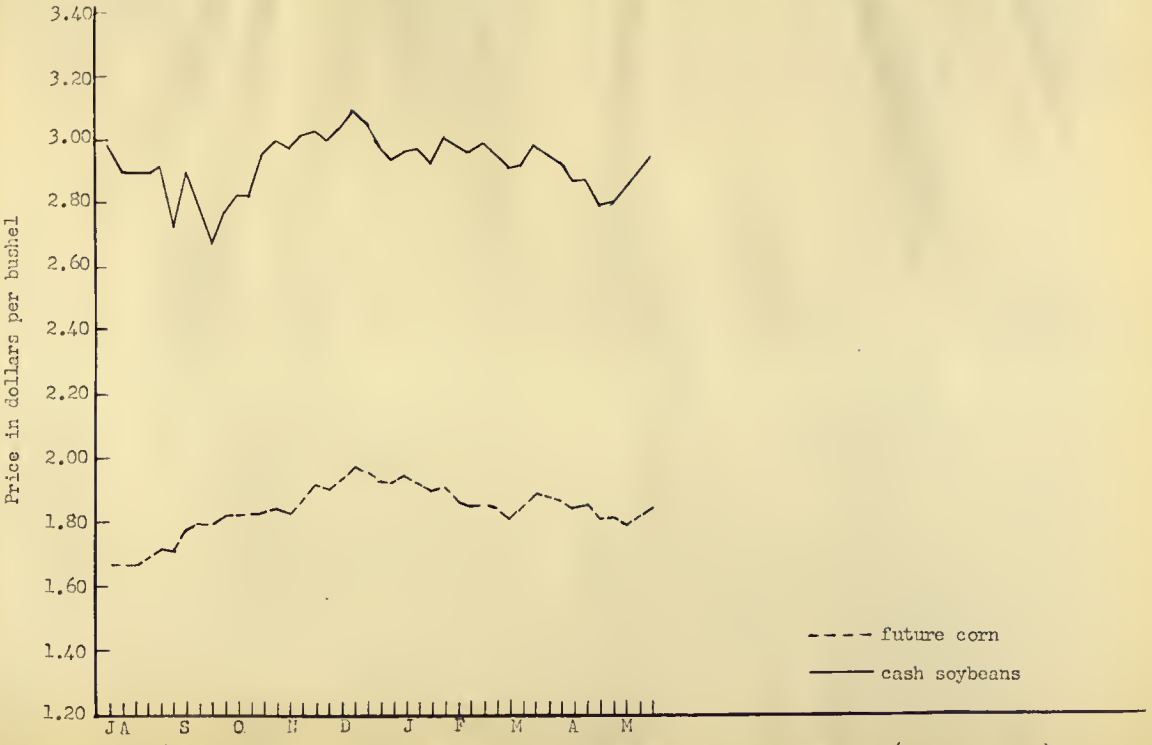

Fig. 36. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and May future corn, Chicago, weekly (Saturday high), 1951-52.

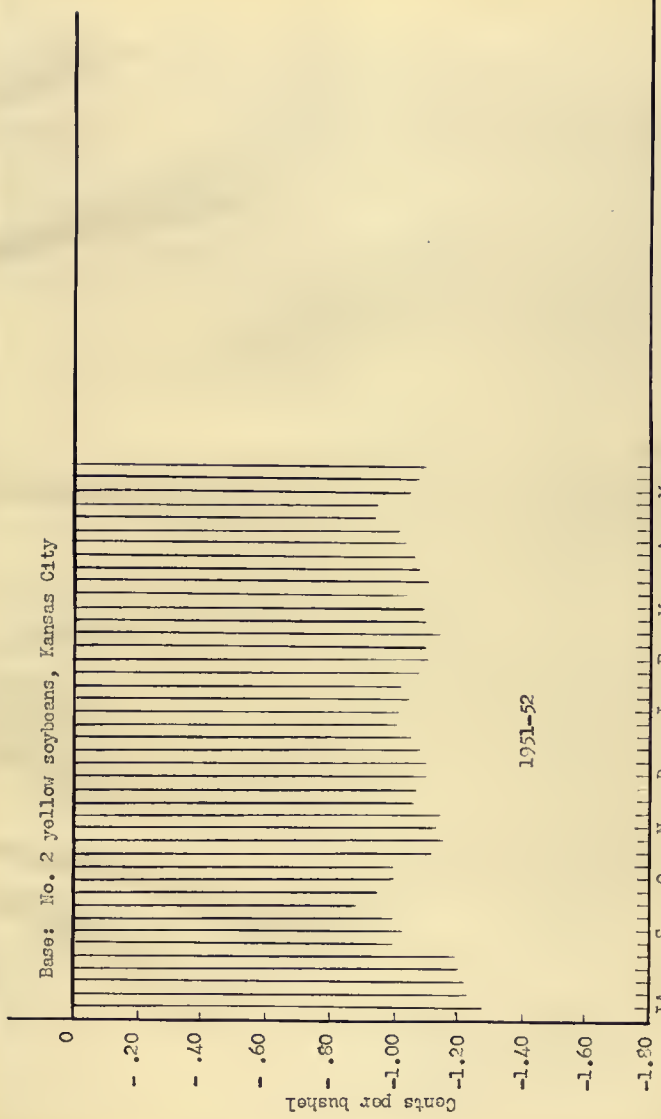

Fig. 37. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City weekly (Saturday high) and May futures corn, Chicago, weekly (Saturday high), 1951-52.

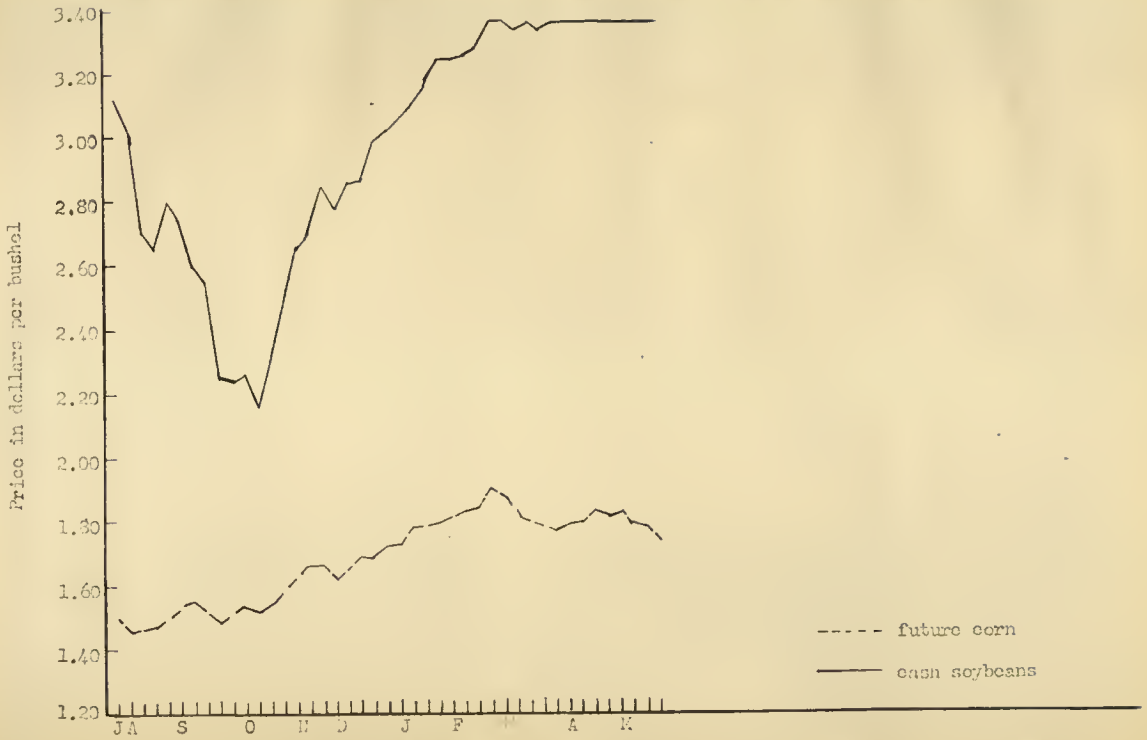

Fig. 38. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and May future corn, Chicago, weekly (Saturday high), 1950-61.

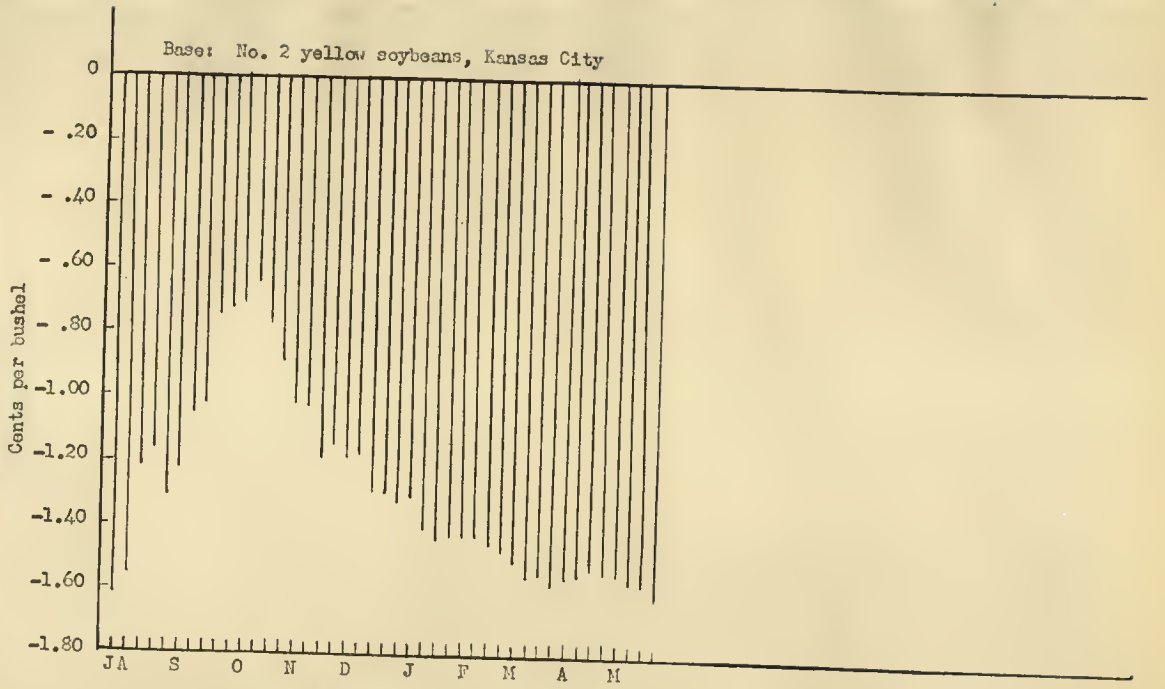

Fig. 39. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and May futures corn, Chicago, weekly (Saturday high), 1950-51.

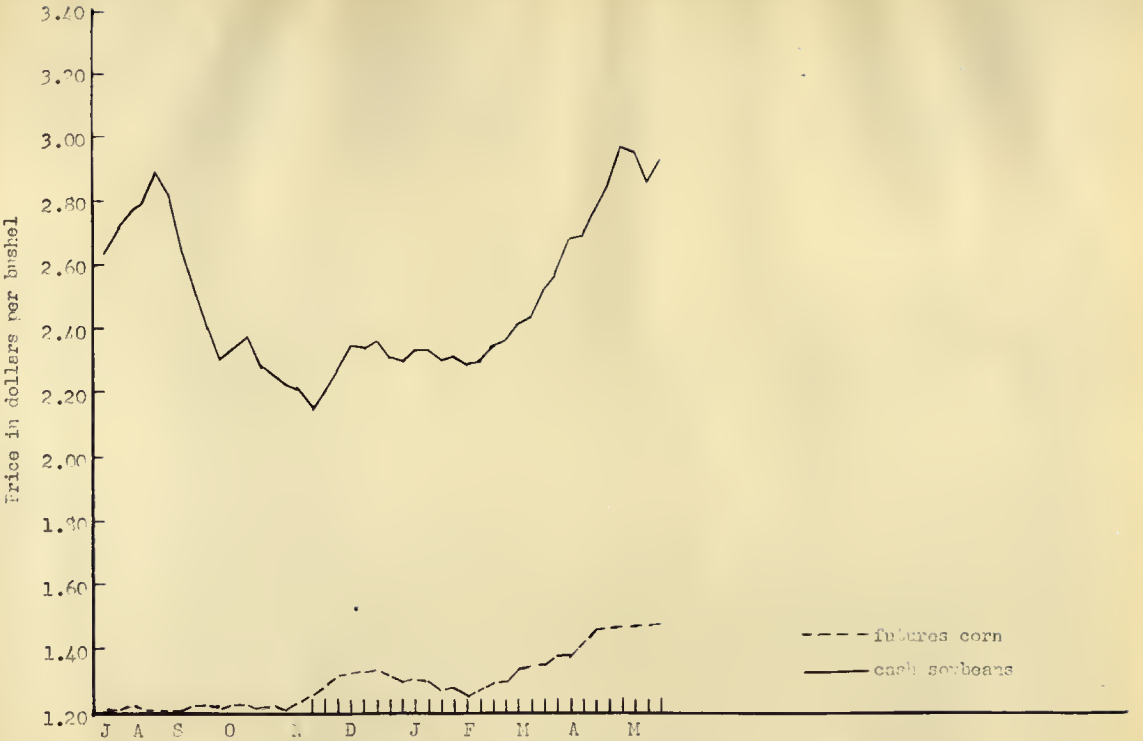

Fig. 40. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and May futures corn, Chicago, weekly (Saturday high), 1949-50.

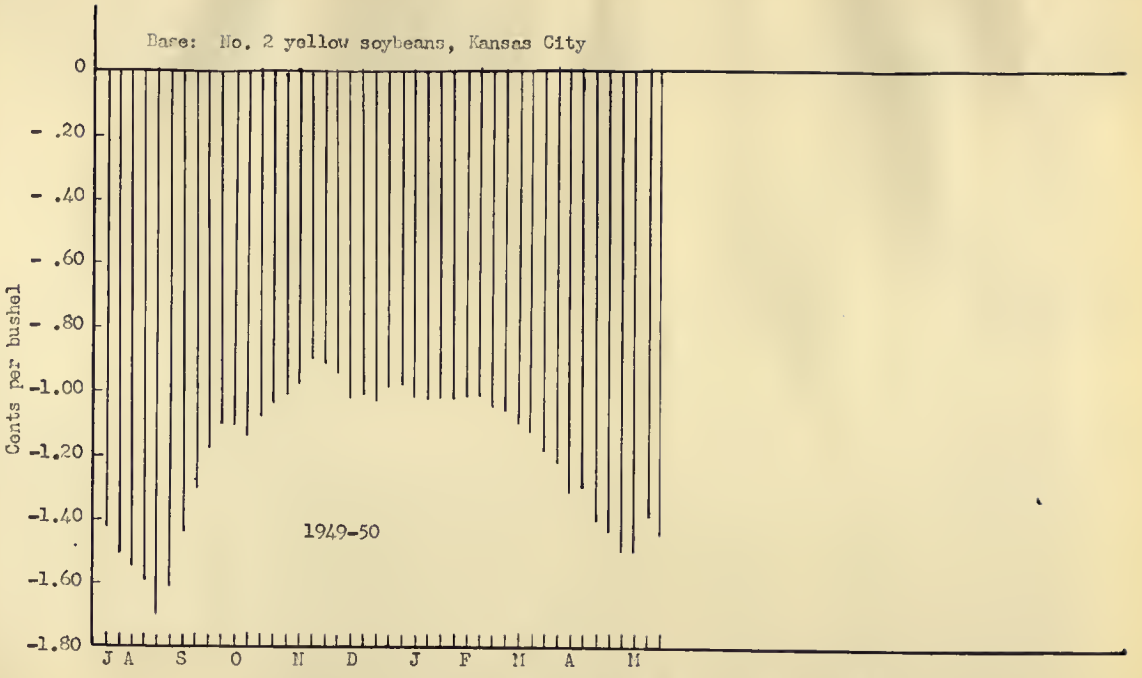

Fig. 41. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and May futures corn, Chicago, weekly (Saturday high), 1949-50.

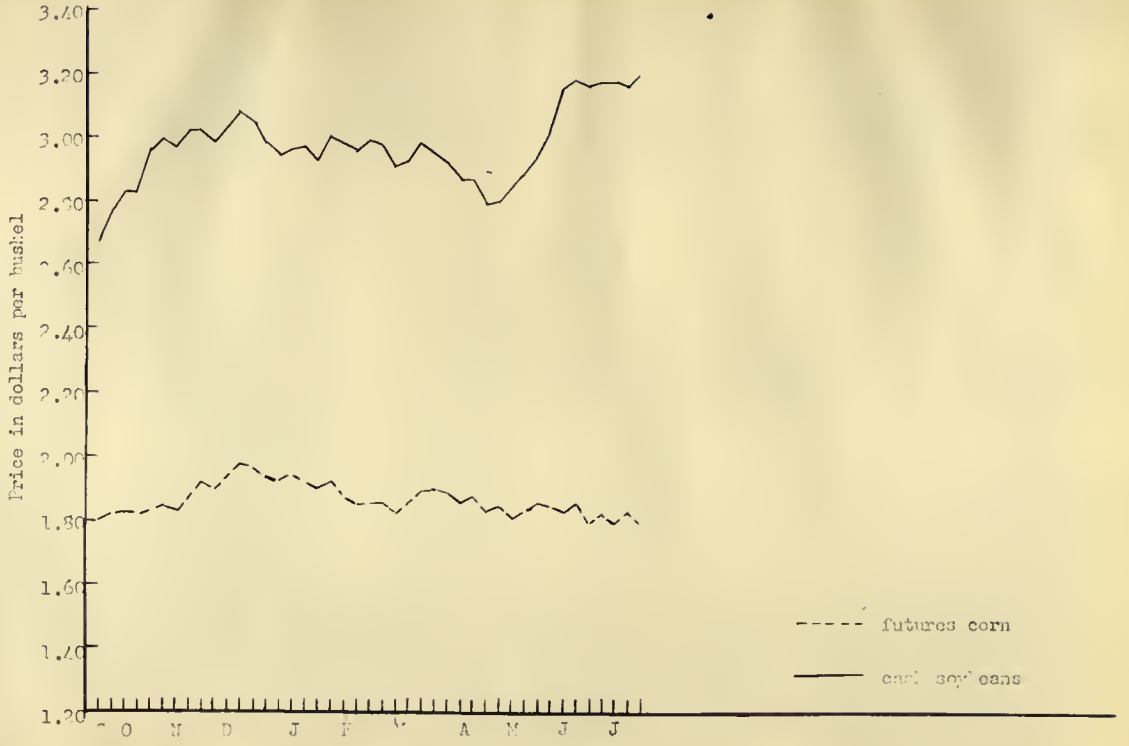

Fig. 42. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and July futures corn, Chicago, weekly (Saturday high), 1951-52.

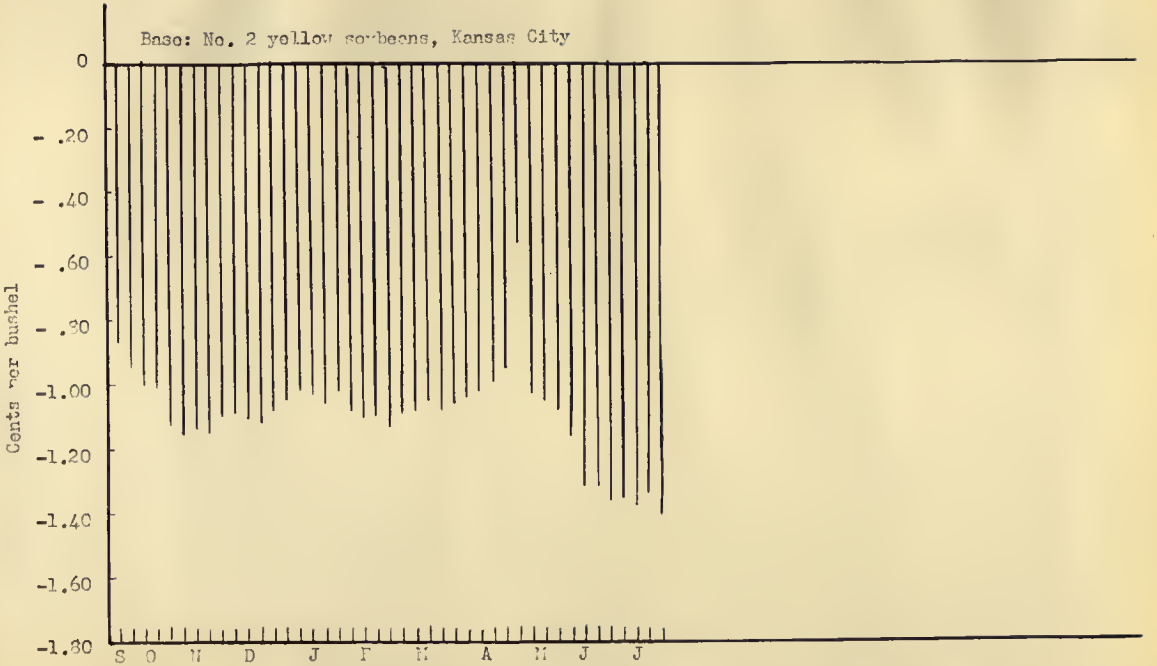

Fig. 43. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and July futures corn, weekly (Saturday high), 1951-52.

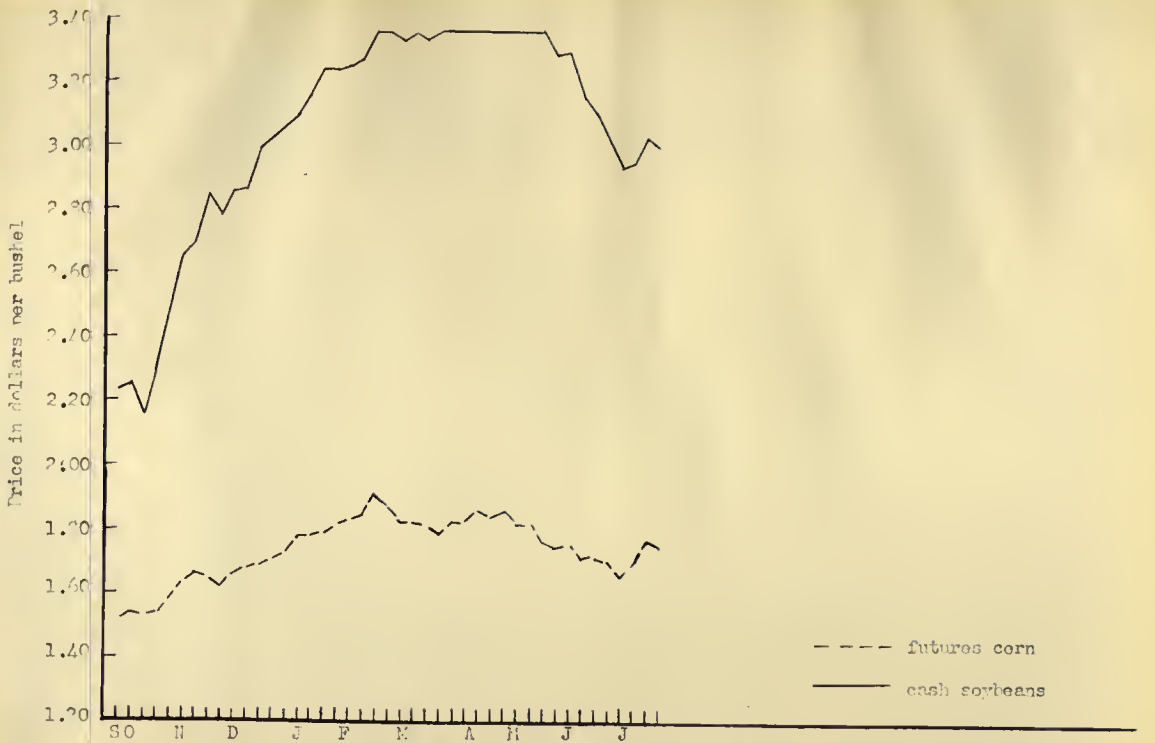

Fig. 44. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday highs) and July futures corn, Chicago, weekly (Saturday high), 1950-51.

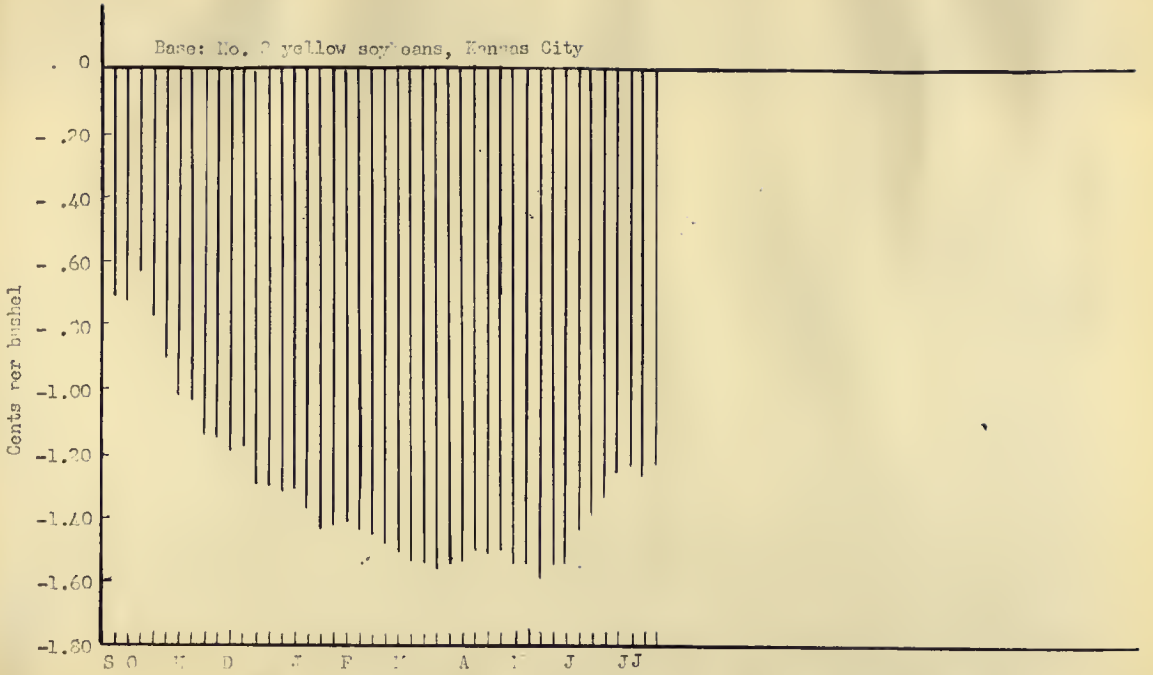

Fig. 45. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and July futures corn, weekly (Saturday high), 19[illegible]- 1.

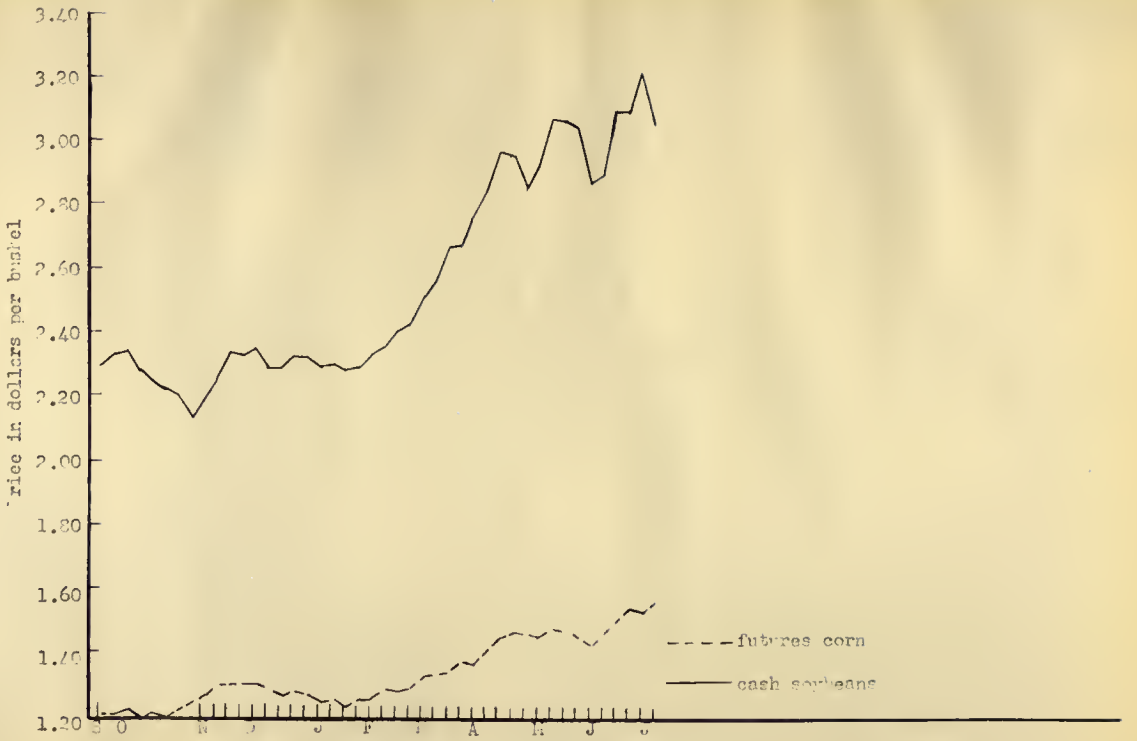

Fig. 46. Price spread between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and July futures corn, Chicago, weekly (Saturday high), 1972-73.

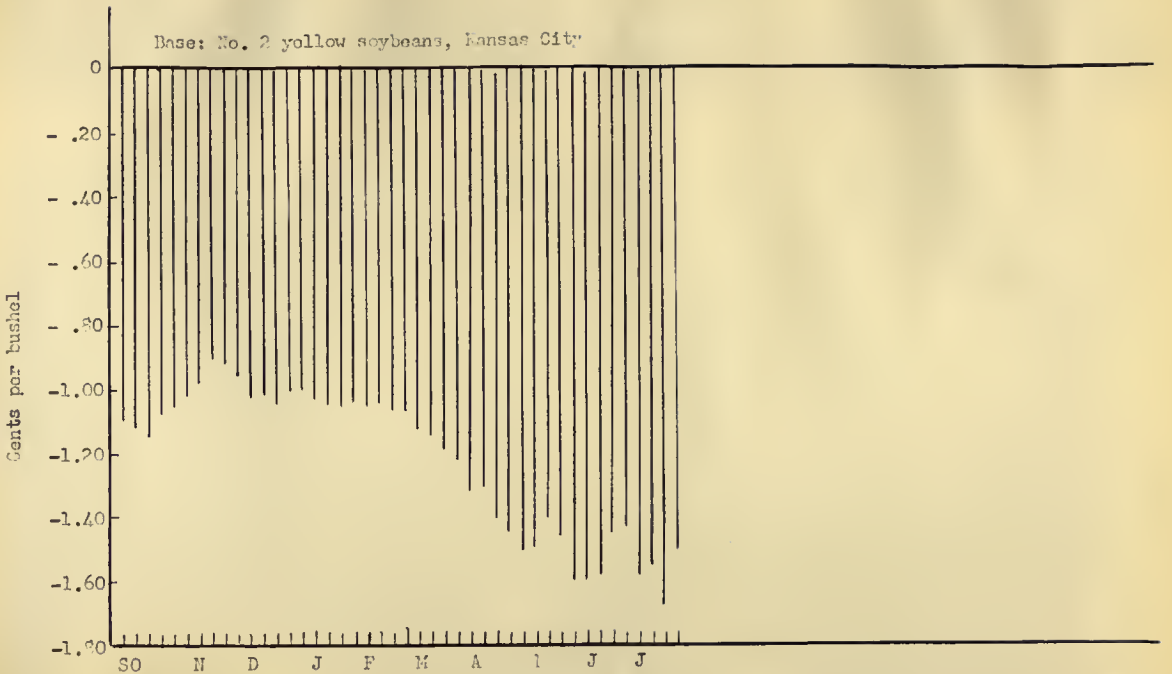

Fig. 47. Actual price spread (plus or minus) between No. 2 yellow soybeans, Kansas City, weekly (Saturday high) and July futures corn, weekly (Saturday high), 1949-50.

RELATIONSHIP BETWEEN SPOT SOYBEAN OIL AND NEW YORK SOYBEAN OIL FUTURES

A relationship study between spot soybean oil and futures oil prices were plotted in an effort to suggest perhaps the hedging of the oil production of a processing plant in the soybean oil futures. The same criteria, the stability and the predictability of the basis and spread, as was used in judging the value of the futures soybean and corn, was used in judging the possibilities of hedging the oil production in oil futures.

The tabulation for the price per pound of soybean oil, crude, Decatur, and immediate, Saturday high, was obtained from the commodity pages of the "Wall Street Journal". The tabulations for the May and July future soybean oil quotations, New York, (Friday high) was secured from the Memphis Merchants Exchange Clearing Association. The quotations which are compared in this part of the study are end-of-the-week quotations. It is believed that the comparison or relationship studied will be valid and will reflect the stability of the price spread.

An inspection of the graphs reveals a very close association between the spot and futures oil prices. The two price series move in the same general pattern. The spread between spot and futures oil prices is very narrow.

In inspecting of the May futures-spot oil price spreads for the period 1950-51 and 1951-52 shows a close association between the two price series (Fig. 48). The two price series cross once within duration of the contract. The spread between the series is very narrow, however, an inspection of the actual price spread or net differences exhibits a variation of - $3\frac{1}{2}$ to + $3\frac{1}{2}$ cents per pound (Fig. 49). If the variations were multiplied by about ten

to place them on a bushel of soybeans basis, it becomes quite apparent that there was considerable probability of large losses by hedging in the oil market.

By examining a similar comparison for the May 1950-51 future-spot oil price relationship, an analogous situation was found as to price spreads and differences. The movement of the two price series was not as regular and smooth as the previous spread, yet the plot reveals a close association between the prices (Fig. 50). The plot also exhibits a wider spread throughout the duration of the contract with the exception of the period during which price ceilings were imposed. The actual price spread or net differences showed a wide variation of - 4½ to + 2 cents per pound (Fig. 51).

The July futures-spot soybean oil relationships were also studied for the contract years of 1950-51 and 1951-52. The two price series showed evidence of moving along very closely together. If a coefficient of correlation were obtained for these two series, it is quite evident that a high positive correlation would be obtained (Fig. 52). The actual price spreads or differences present a different story---the basis changes from a - 1 to + 2 cents per pound (Fig. 53).

The July future-spot soybean oil price relationships for 1950-51 revealed the same set of conditions as reviewed in other plots of this series. The general movement of the two prices was closely associated, however, the two series did cross (Fig. 54). The actual price spread or net differences between the two series exhibit a variation of - 3 to + 1½ cents per pound (Fig. 55).

These few simple price comparisons between futures-spot soybean oil prices indicate that perfection has not been reached as to stability and

predictability of the basis. It is true that the two series move in the same general direction but not by equal amount. After reviewing these plots it seems highly impossible for a processing firm to successfully hedge the oil equivalent of soybeans in the oil futures market.

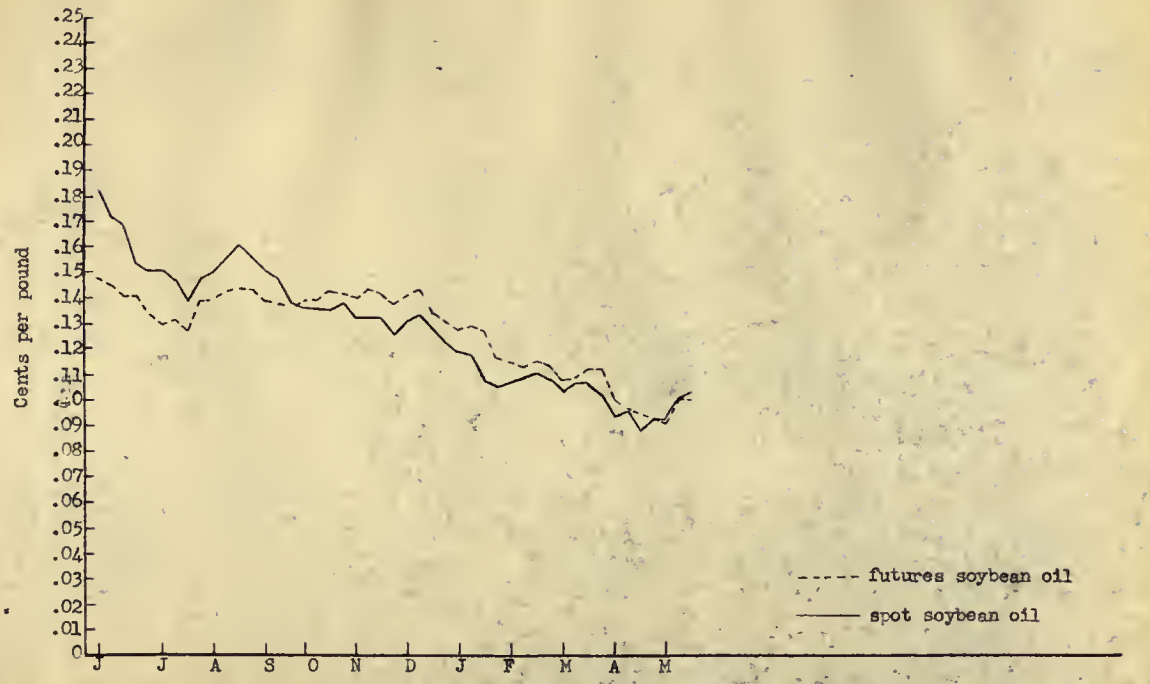

Fig. 48. Price spread per pound between soybean oil, crude Decatur, immediate, weekly (Saturday high) and May futures, crude soybean oil, New York, weekly (Friday high), 1951-52.

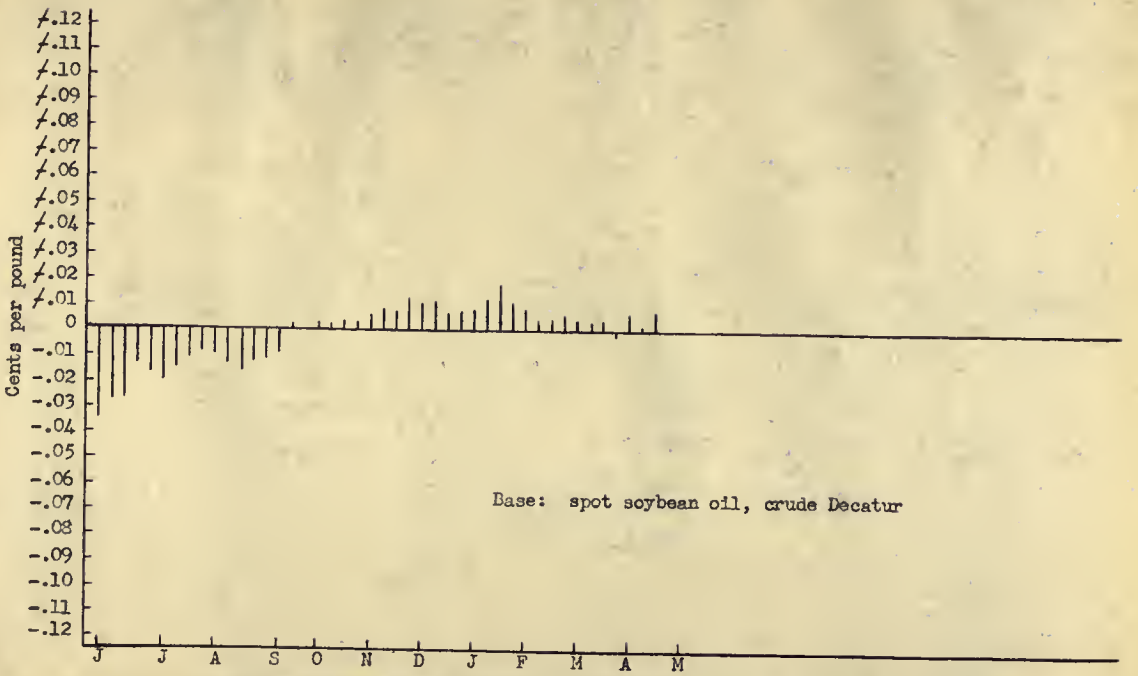

Fig. 49. Actual price spread per pound (plus or minus) between soybean oil, crude Decatur, weekly (Saturday high) and May futures, crude soybean oil, New York, weekly (Friday high), 1951-52.

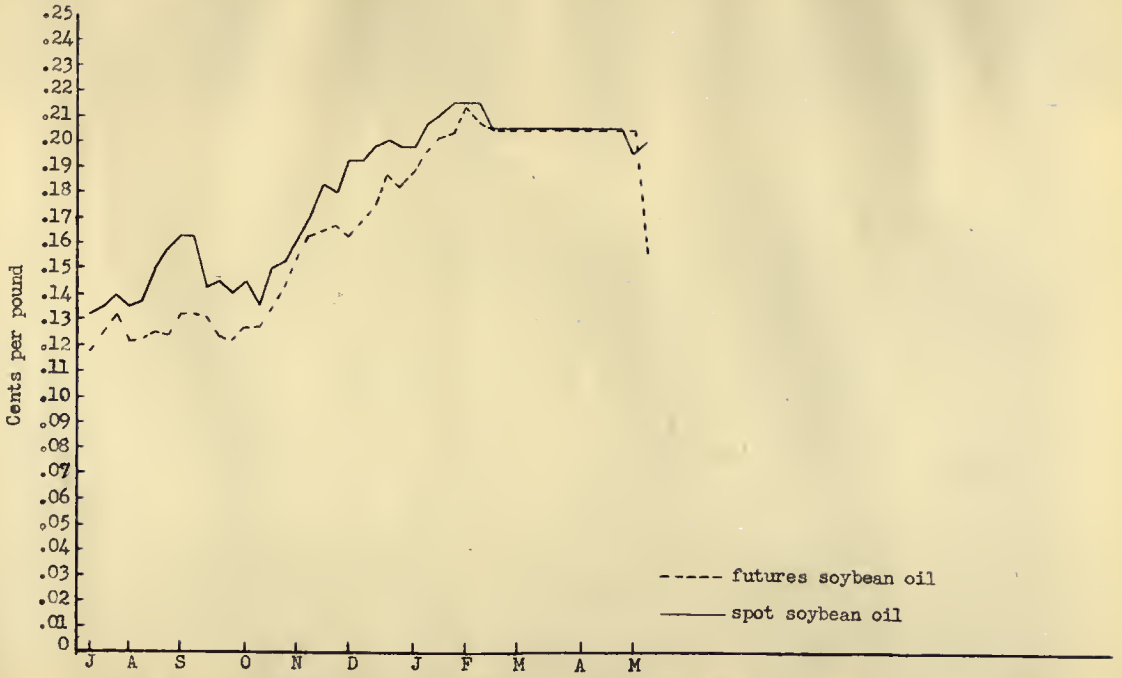

Fig. 50. Price spread per pound between soybean oil, crude Decatur, weekly (Saturday high) and May futures, crude soybean oil, New York, weekly (Friday high), 1950-51.

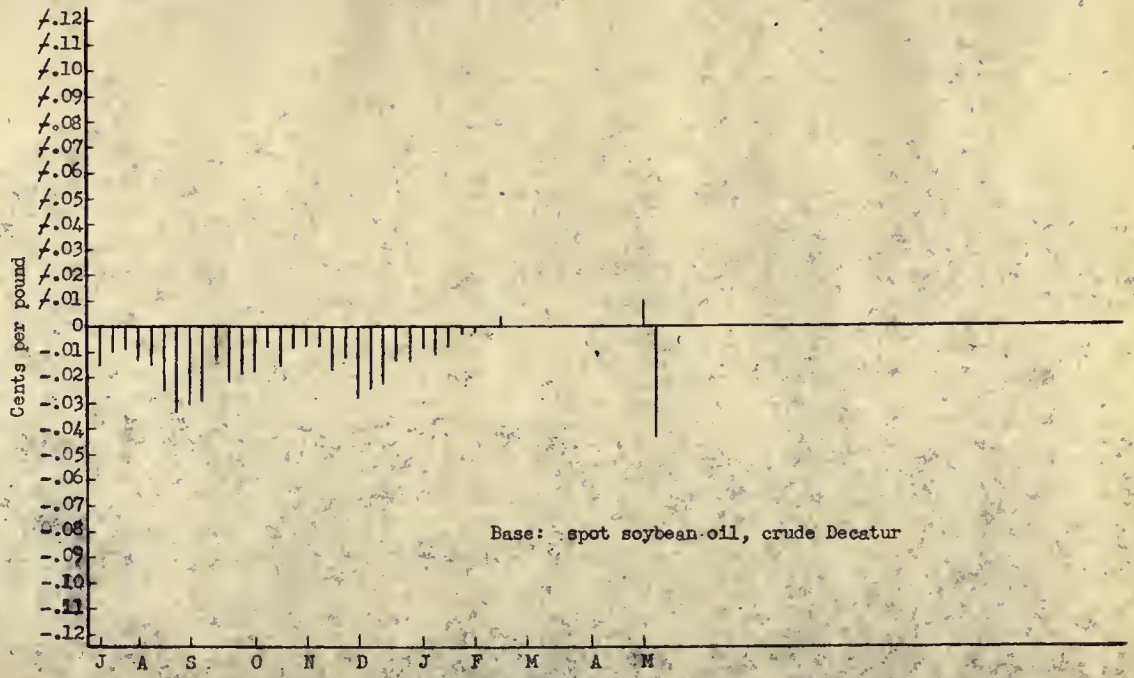

Fig. 51. Actual price spread per pound (plus or minus) between soybean oil, crude Decatur, weekly (Saturday high) and May futures, crude soybean oil, New York, weekly (Friday high), 1950-51.

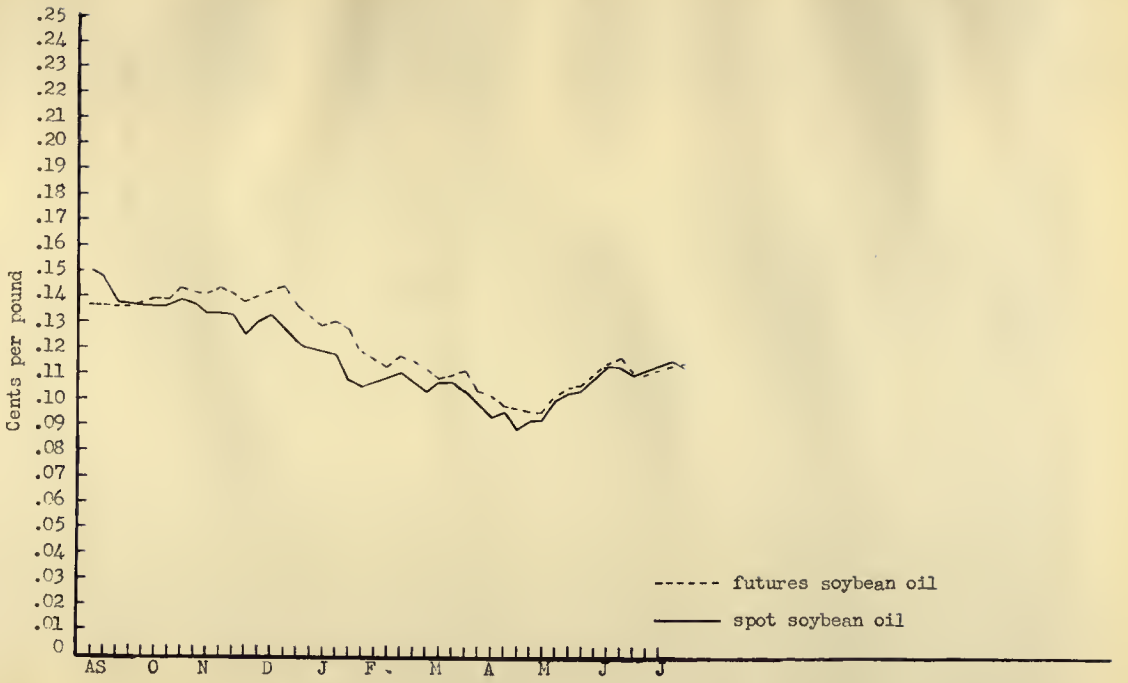

Fig. 52. Price spread per pound between soybean oil, crude Decatur, weekly (Saturday high) and May futures, crude soybean oil, New York, weekly (Friday high), 1951-52.

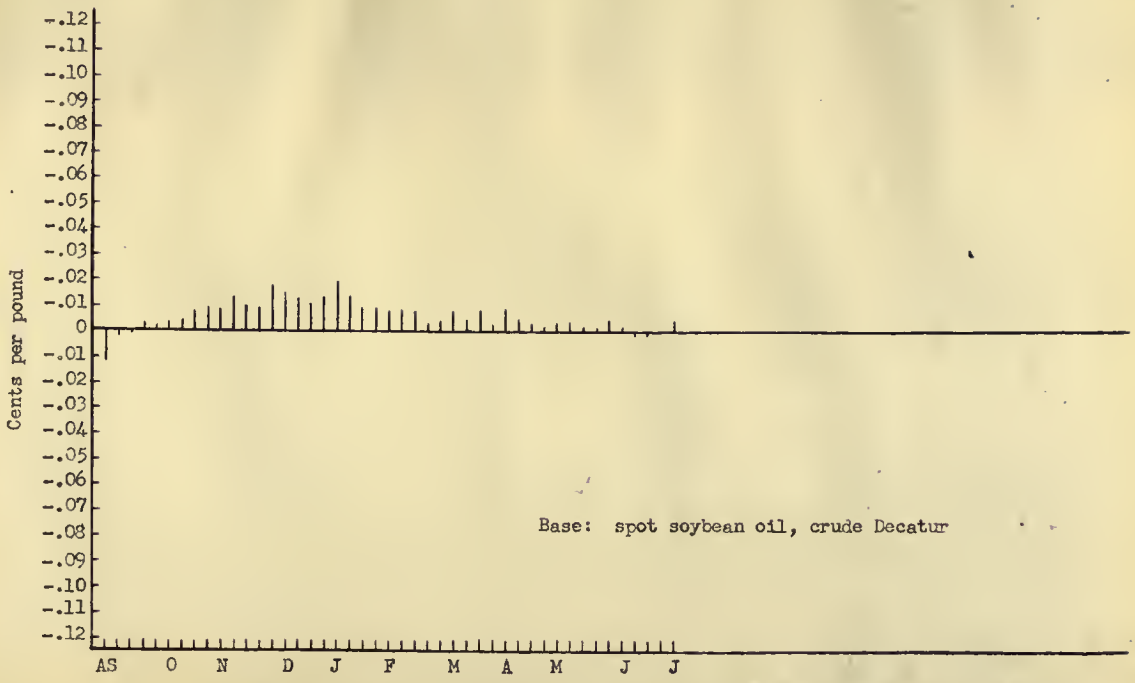

Fig. 53. Actual price spread per pound (plus or minus) between soybean oil, crude Decatur, weekly (Saturday high) and July future, crude soybean oil, New York, weekly (Friday high), 1951-52.

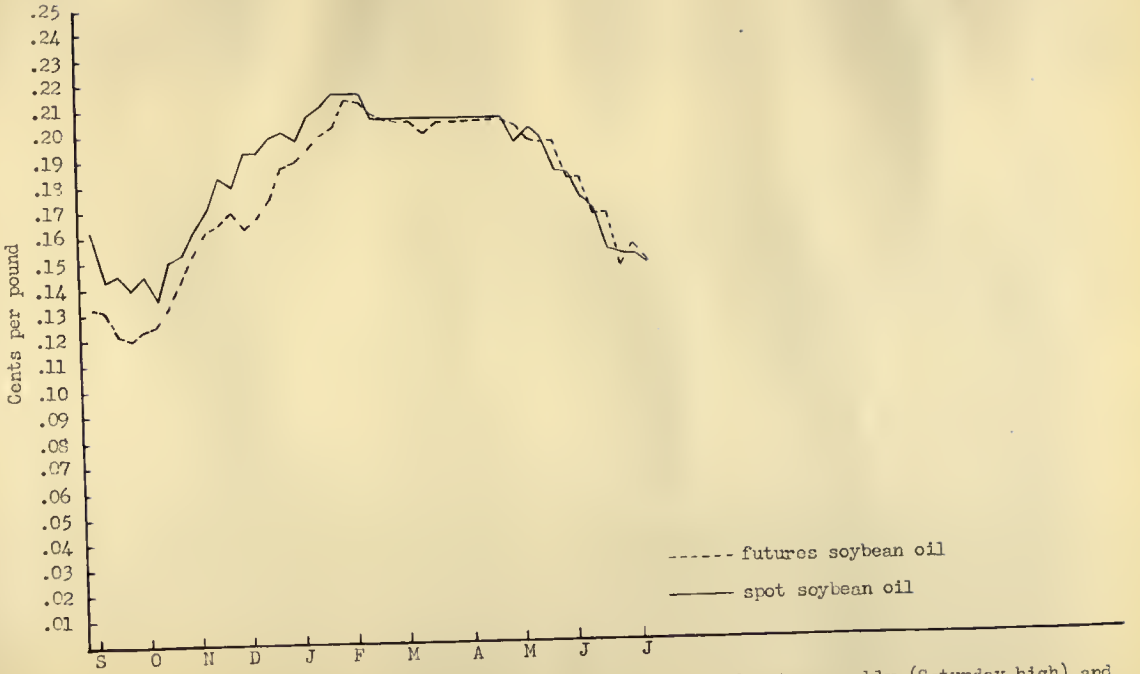

Fig. 54. Price spread per pound between soybean oil, crude Decatur, weekly (Saturday high) and July futures, crude soybean oil, New York, weekly (Friday high), 1950-51.

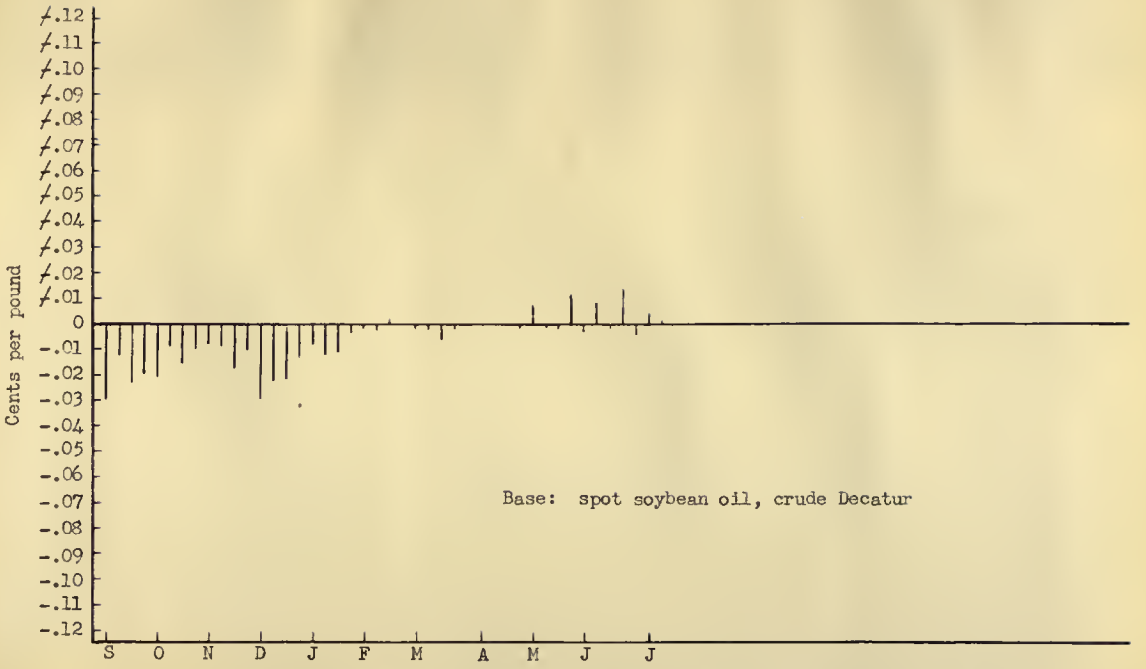

Fig. 55. Actual price spread per pound (plus or minus) between soybean oil, crude Decatur, weekly (Saturday high) and July future, crude soybean oil, New York, weekly (Friday high), 1950-51.

RELATIONSHIP BETWEEN IMMEDIATE SOYBEAN MEAL AND MEMPHIS FUTURES SOYBEAN MEAL

Soybean meal, a joint product of the soybean, represents about 80 percent of the production from a bushel of soybeans. On a per pound basis the oil is worth more than the meal; however, from a bushel of soybeans, 50 pounds of meal and 9 pounds of oil are the end produot. With meal selling at $60 per ton, the 50 pounds of meal is valued at $1.50 and oil at 10 cents per pound for 9 pounds is valued at 90 cents. The soybean processor is vitally interested in the relstionship of cash and futures soybean meal. The processor needs a market that is fluid enough that it will follow the value of oil and meal produced from the soybeans.

In the examination of this relationship, the cash prices of soybean oil meal were obtained from the "Wall Street Journal". The futures prices were tabulsted from the market quotations of the Memphis Merchants Exchange Clearing Association. The tabulation of both price series was obtained weekly and the Saturday high quotation was used.

The same criteria was used for judging the data assembled. The price spread, movement of the two series, and the actual price spread or net differences between the two series were used in ascertaining the stability and predictability of the basis. The May and July soybean oil meal futures for the years of 1950-51 and 1951-52 were plotted.

Price ceilings were encountered during 1951-52, however, some judgment can be passed on this series.

The price movement and spread outside the price ceiling period did not exhibit any stability as to the basis movement (Fig. 56). The price series opened with a very narrow spread and gradually widened until the imposition

of price ceilings (Fig. 57).

In examining the price spread and series movement of the May futures of 1950-51, it was evident that there was very little stability as to the basis movement (Fig. 58). The two series opened with a very wide spread and crossed during the month of August. After the crossing of the two series the basis was more stable, however, nothing can be said about the predictability. The actual price spread or net differences between the two series varied from a - $22 to + $14 per ton (Fig. 59).

In inspecting the July futures-cash soybean meal plots for 1951-52 and 1950-51 it will be noted that they were very similar to the May futures plots. The July futures-cash relationship for 1951-52 is of very little value because of imposition of ceilings (Fig. 60). The movement of the two price series outside of the imposition of ceilings reveal a very irregular movement (Fig. 61).

The July futures-cash relationship for 1950-51 exhibits a very irregular basis movement throughout the period (Fig. 62). By close inspection there is a noticeable association between the two series; however, the stability as measured by net differences indicates that the futures meal market is of little value for hedging purposes (Fig. 63). The actual price spreads vary from - $2 to $14 per ton.

The inspection of these several plots on the relationship between cash and future soybean meal does not meet the criteria which has been set up for judging the usefulness of this commodity for hedging purposes. The two price series do not move along together with any indication of regularity. The net differences between the two series are too varied to be of use for the hedging of meal production in the soybean meal future.

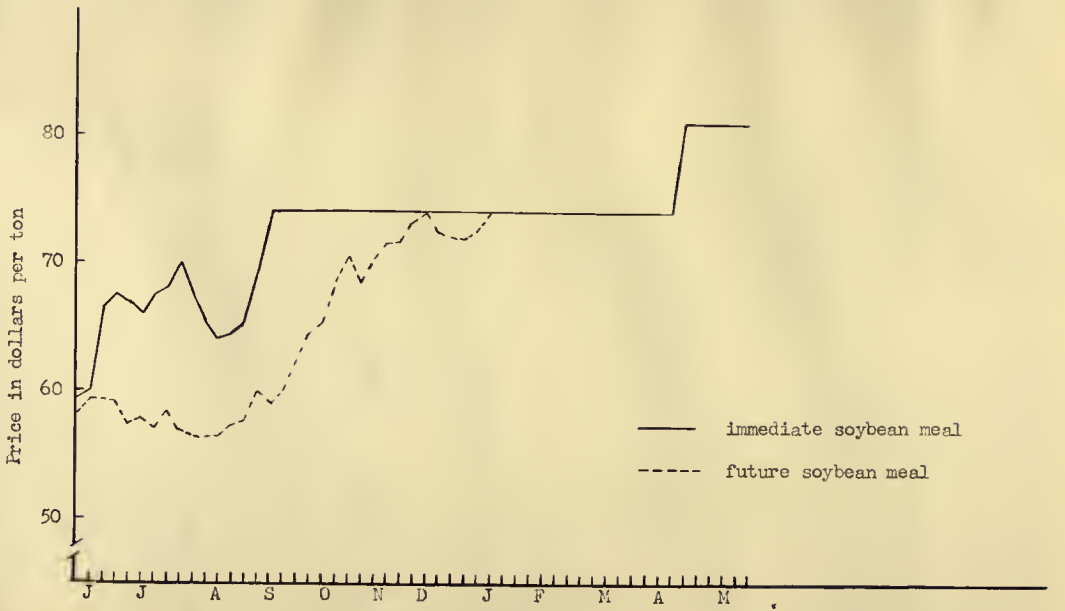

Fig. 56. Price spread per ton between soybean oil meal, bulk Decatur, restricted (western), immediate, 41 percent protein and May futures soybean meal (Decatur basis), Memphis, weekly (Saturday high), 1951-52.

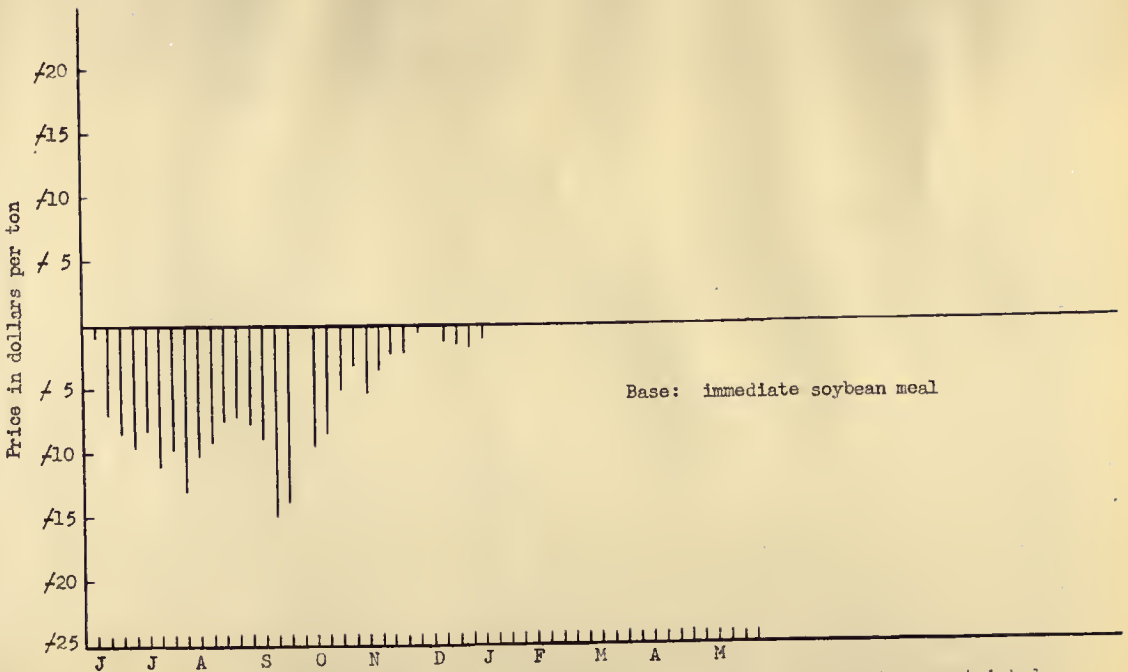

Fig. 57. Actual price spread per ton between soybean oil meal, bulk Decatur, restricted (western) immediate, 41 percent protein and May futures soybean meal (Decatur basis), Memphis, weekly (Saturday high), 1951-52.

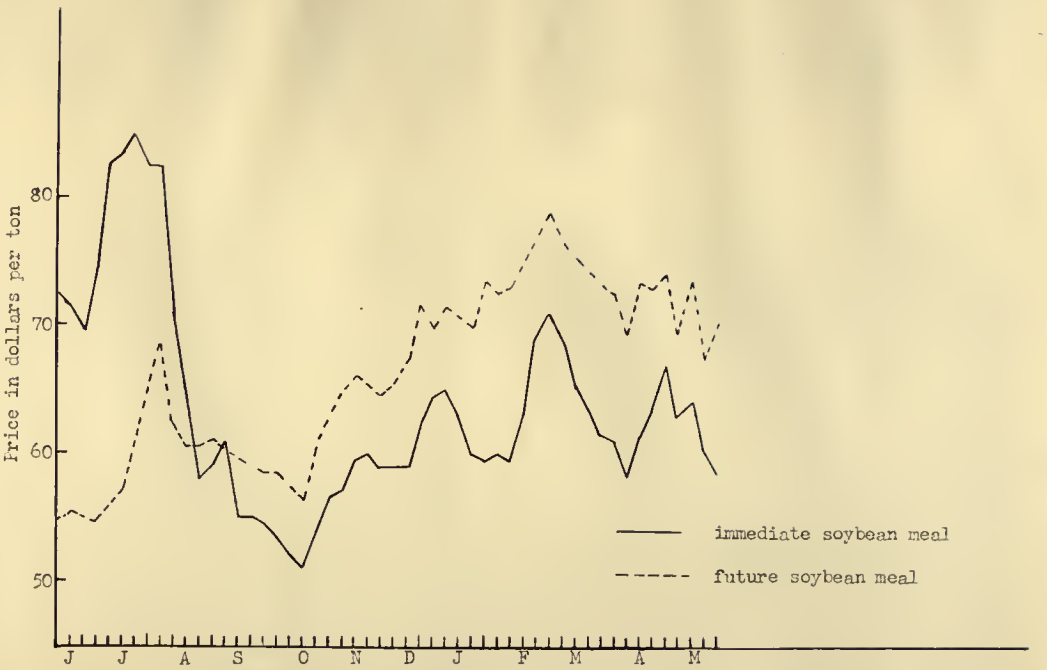

Fig. 58. Price spread per ton between soybean oil meal, bulk Decatur, restricted (western) immediate, 41 percent protein and May futures soybean meal (Decatur basis), Memphis, weekly (Saturday high), 1950-51.

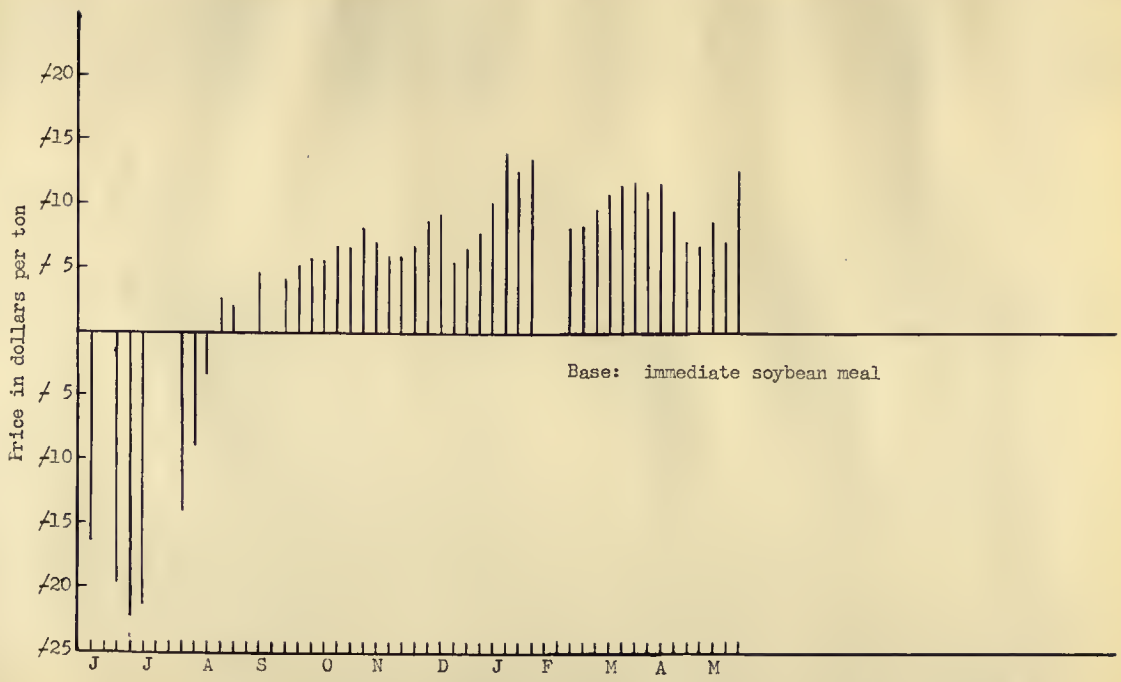

Fig. 59. Actual price spread per ton between soybean oil meal, bulk Decatur, restricted (western), immediate, 41 percent protein and May futures soybean meal (Decatur basis), Memphis, weekly (Saturday high), 1950-51.

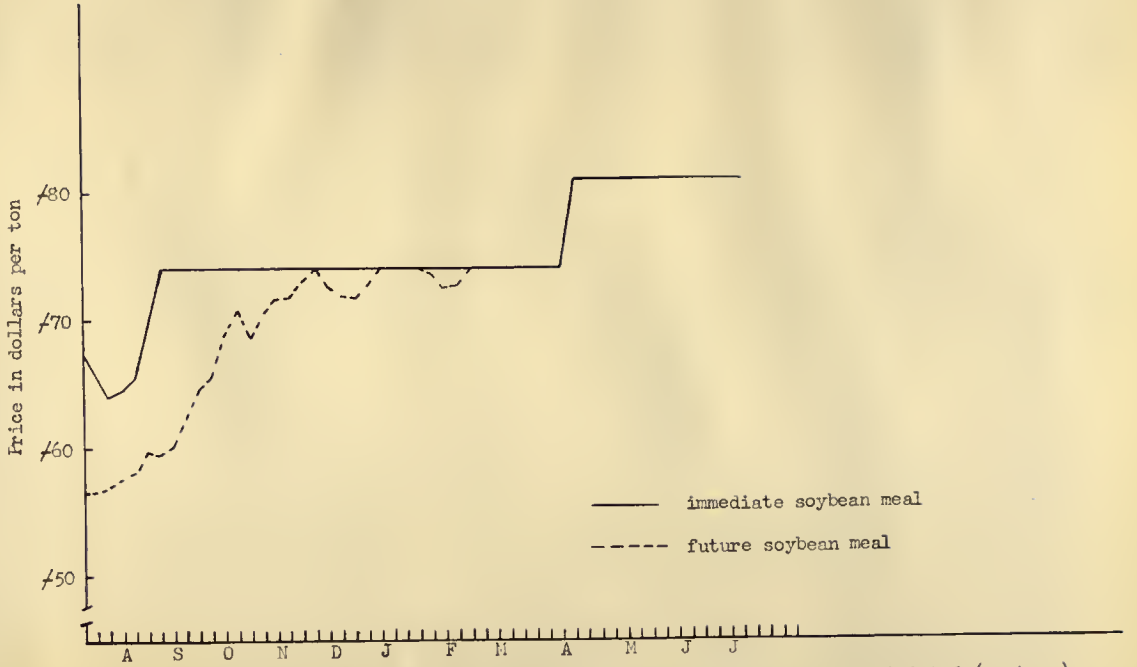

Fig. 60. Price spread per ton between soybean oil meal, bulk Decatur, restricted (western) immediate, 41 percent protein and July futures soybean meal (Decatur basis), Memphis, weekly (Saturday high), 1951-52.

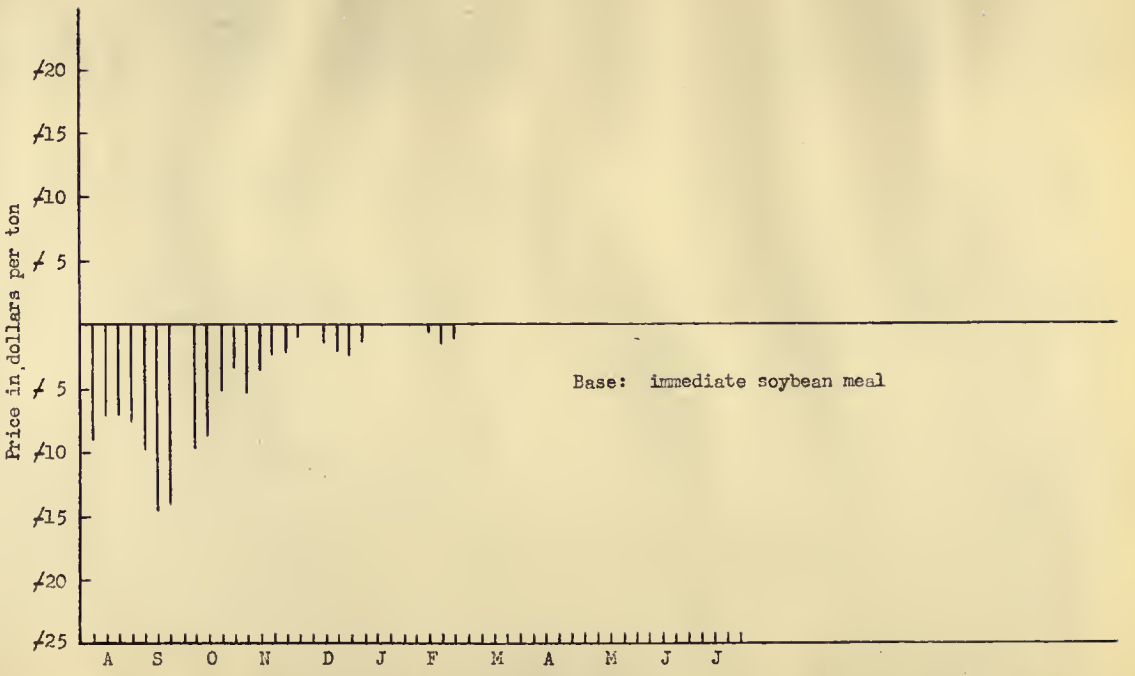

Fig. 61. Actual price spread per ton between soybean oil meal, bulk Decatur, restricted (western) immediate, 41 percent protein and July future soybean meal (Decatur basis), Memphis, weekly (Saturday high), 1951-52.

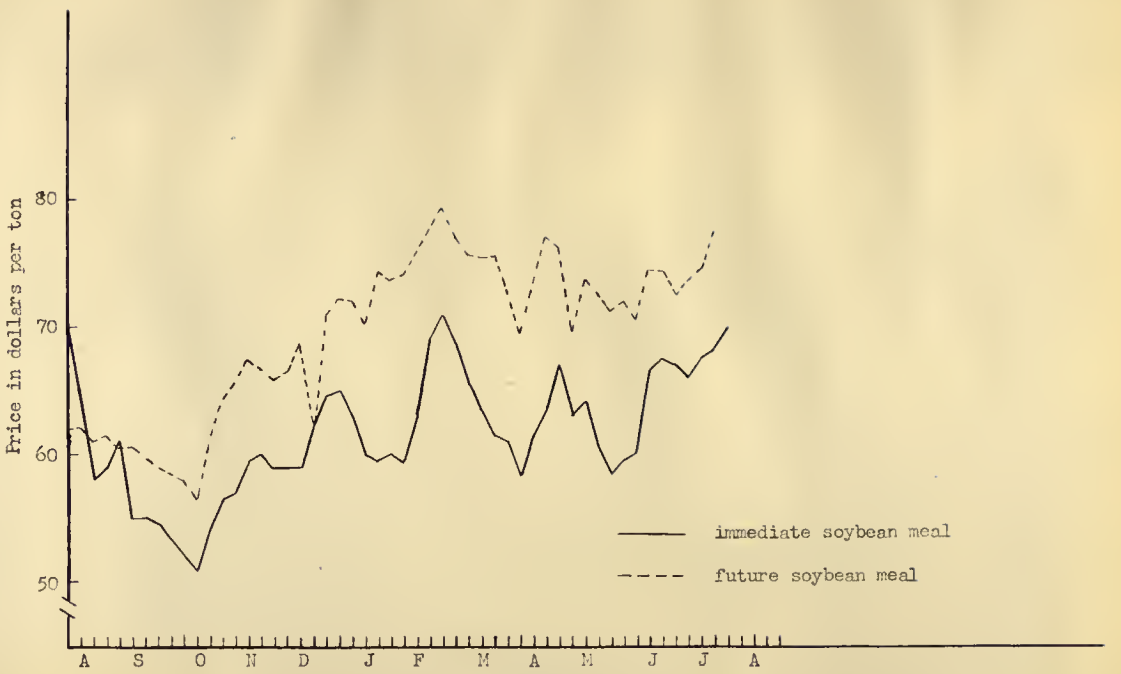

Fig. 62. Price spread per ton between soybean oil meal, bulk Decatur, restricted (western), immediate, 41 percent protein and July future soybean meal (Decatur basis), Memphis, weekly (Saturday high), 1950-51.

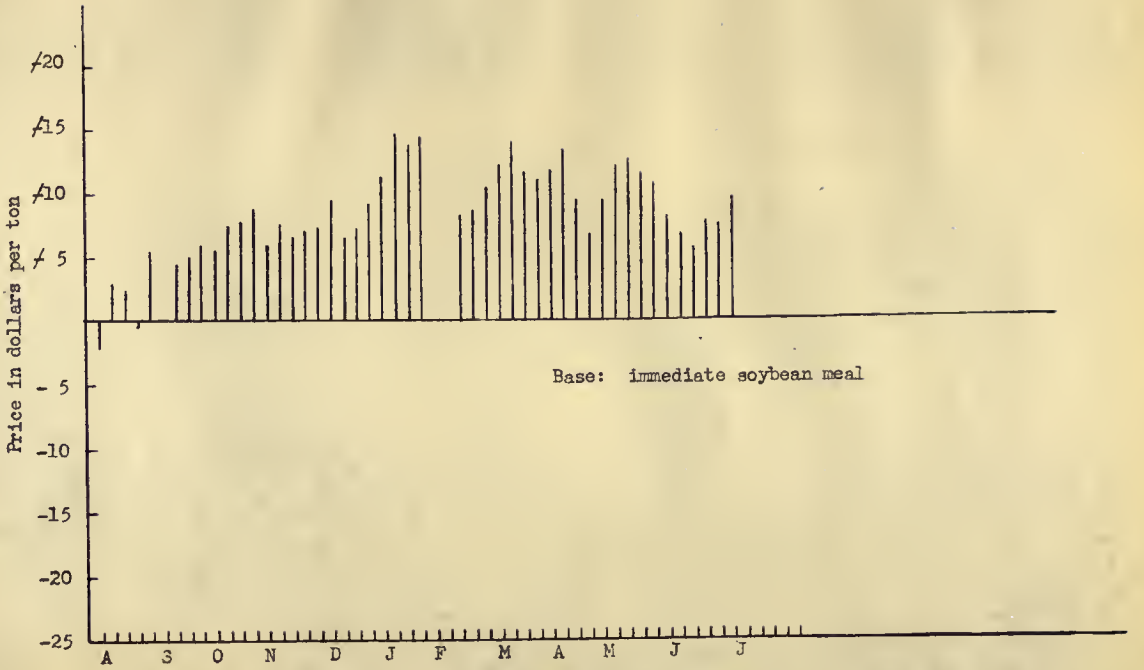

Fig. 63. Actual price spread per ton between soybean oil meal, bulk Decatur, restricted (western) immediate, 41 percent protein, and July futures soybean meal (Decatur basis), Memphis, weekly (Saturday high), 1950-51.

RELATIONSHIP BETWEEN CASH SOYBEANS AND FUTURE OIL-MEAL EQUIVALENT

Another logical relationship is the association of the cash soybean and future oil-meal equivalent price series. /1 Soybean processors could hedge their inventory of cash purchases in the equivalent future oil and meal market in hopes of insuring against risks of price decline in their inventories. This is not an attempt to associate the cash oil-meal equivalent—cash soybean price series—this relationship will be inspected at the end of this section.

The futures soybean oil-meal equivalent price was calculated weekly from the futures quotations of the New York and Memphis Boards of Trade. The cash tabulation was compiled from the "Kansas City Grain Market Review". This relationship study was made for the years of 1952-53, 1951-52 and 1950-51.

The futures oil-meal equivalent was calculated for the contract months of May and July.

In all plots the futures oil-meal equivalent moved above the cash soybean series by varying amounts. It was the assumption that those two price series would move along together, however, the actual plots proved this series to be of little value. The May futures oil-meal equivalent and cash soybeans were plotted and from inspection appeared to move along together (Figs. 64, 66, and 68). After a closer inspection it will be noted that the price movements were violent in nature with the futures equivalent exhibiting the greatest irregularity. The actual price spread or net differences (using

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/1 The future soybean oil-meal equivalent price is a combination price. This combination price is calculated weekly by multiplying the production of 8.8 pounds of oil times the oil future quotation, plus the sum of the production of 50 pounds of meal, times the future meal price from a bushel of beans.

No. 2 yellow soybeans as a base) reveals a wide range of variation (Figs. 65, 67, and 69). The net differences vary from a ∕ .56 to ∕ $2.45 per bushel.

The July futures oil-meal equivalent and cash soybean relationship were also studied. The price spread between the two series exhibited irregular movements and basis changes (Figs. 70, 72, and 74). The irregularity and instability of the price movements or basis changes prove to be of very little value for hedging purposes. The actual price spread or net differences varied from ∕ $1.08 to $2.40 per bushel (Fig. 71, 73, and 75).

This relationship between futures oil-meal equivalent and cash soybean price series is too inconsistent to be of value to the processor for hedging purposes. This relationship also indicates very little relationship between the prices of soybeans, soybean oil, and soybean meal. The criteria for a near perfect hedge does not indicate stability or predictability.

In a previous section it was pointed out that the processor needed a market which was fluid enough that it would follow closely the value of oil and meal produced by the crusher. A net difference or basis change was calculated for the cash oil-meal equivalent and the futures soybean price series as an indication of its usefulness for price insurance. After examining several price series relationships of this nature it was observed that the net differences were much greater in variation than the future oil-meal equivalent—cash soybean price series. Due to the wide range of variation of this relationship it was felt that it was not necessary to plot the price spread or net differences.

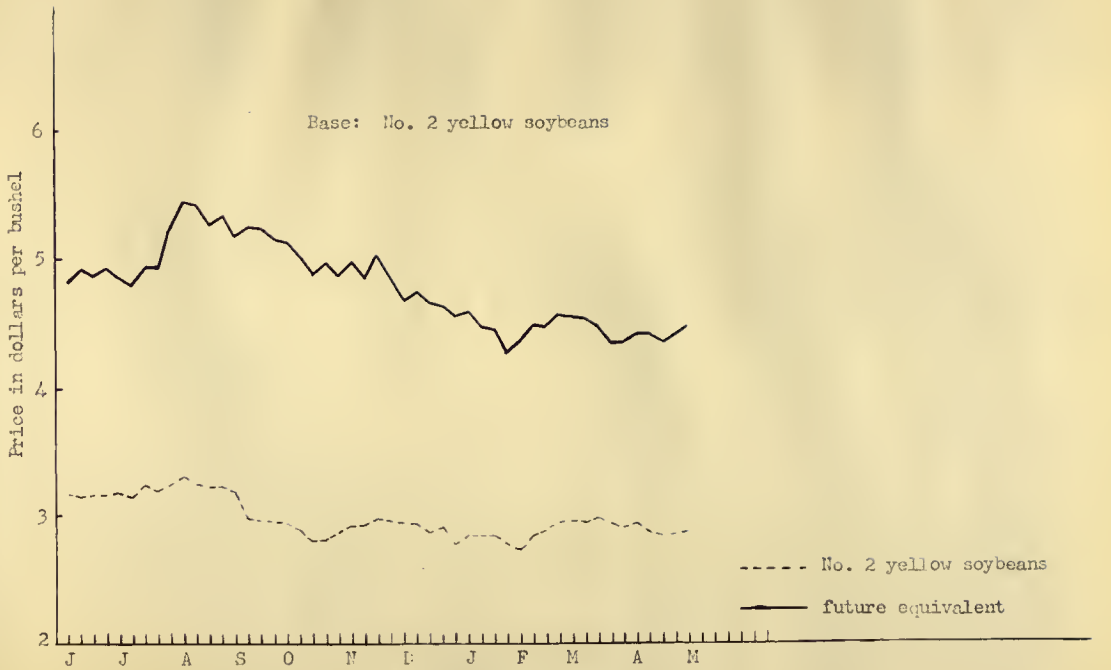

Fig. 64. Price spread between No. 2 yellow soybeans, Kansas City and equivalent per bushel price of May future crude soybean oil, New York (8.8 pounds) and May future soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1952-53.

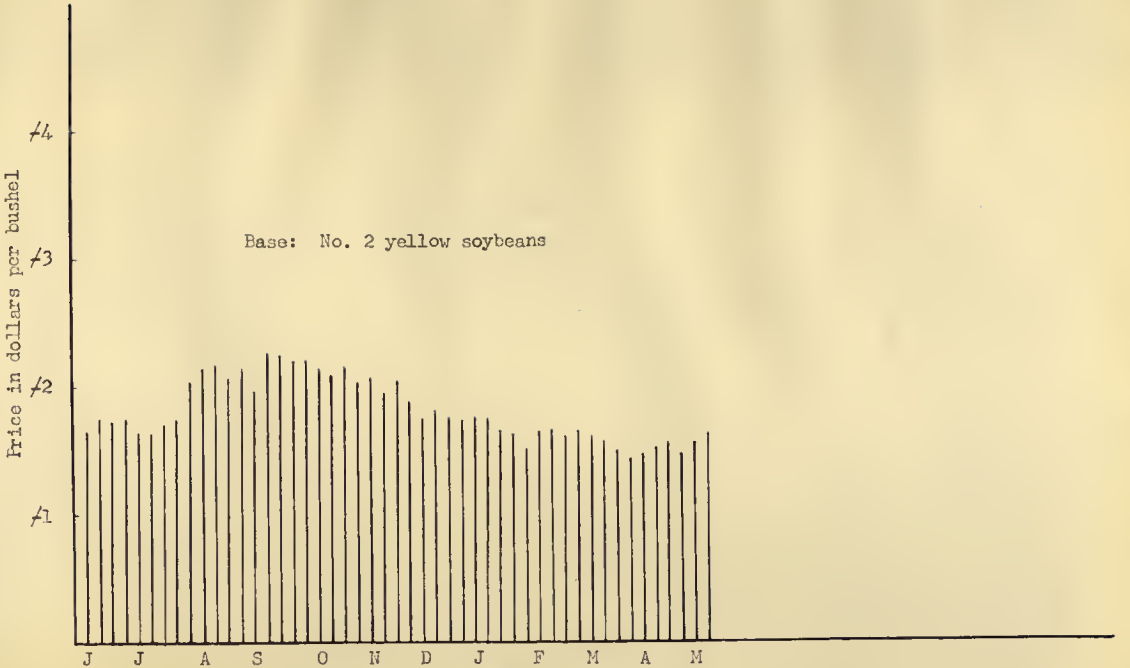

Fig. 65. Actual price spread between No. 2 yellow soybeans, Kansas City, and equivalent per bushel price of May future crude soybean oil, New York (3.8 pounds), and May futures soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1952-53.

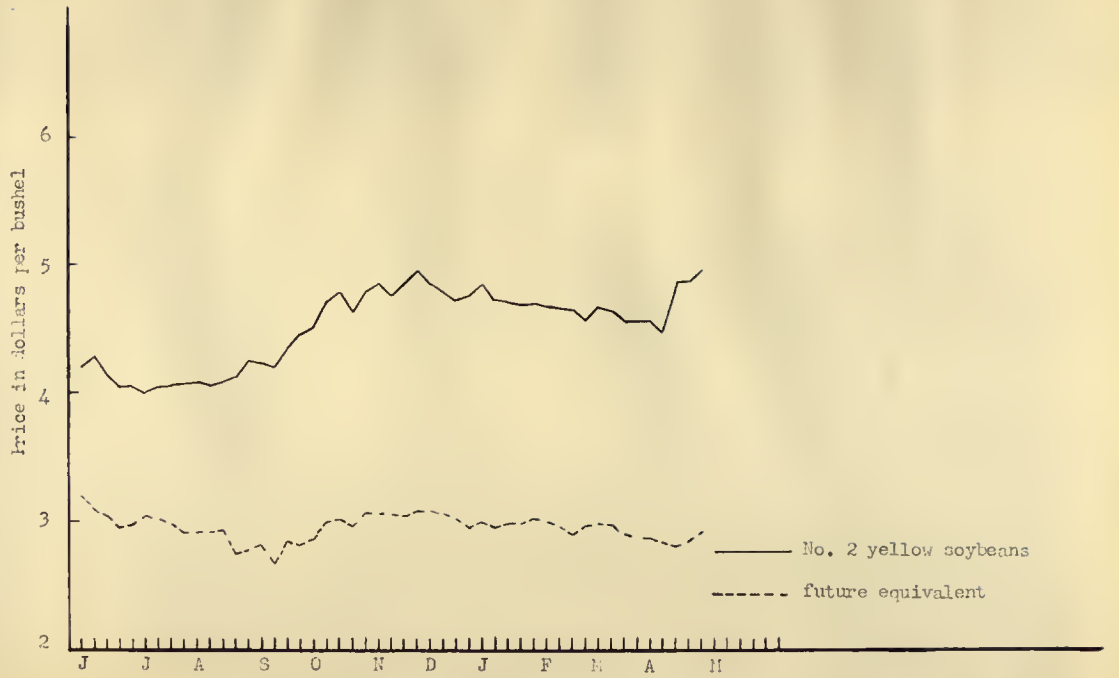

Fig. 66. Price spread between No. 2 yellow soybeans, Kansas City and equivalent per bushel price of May future crude soybean oil, New York (1.8 pounds) and May future soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1951-52.

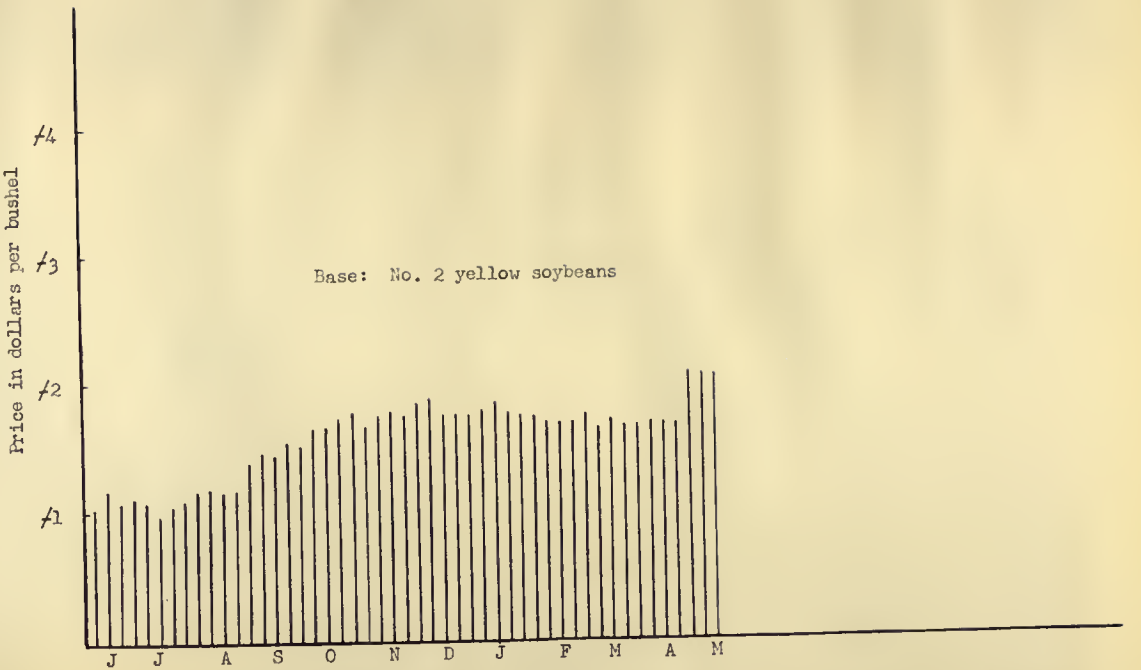

Fig. 67. Actual price spread between No. 2 yellow soybeans, Kansas City, and equivalent per bushel price of May future crude soybean oil, New York (8.8 pounds), and May futures soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1951-52.

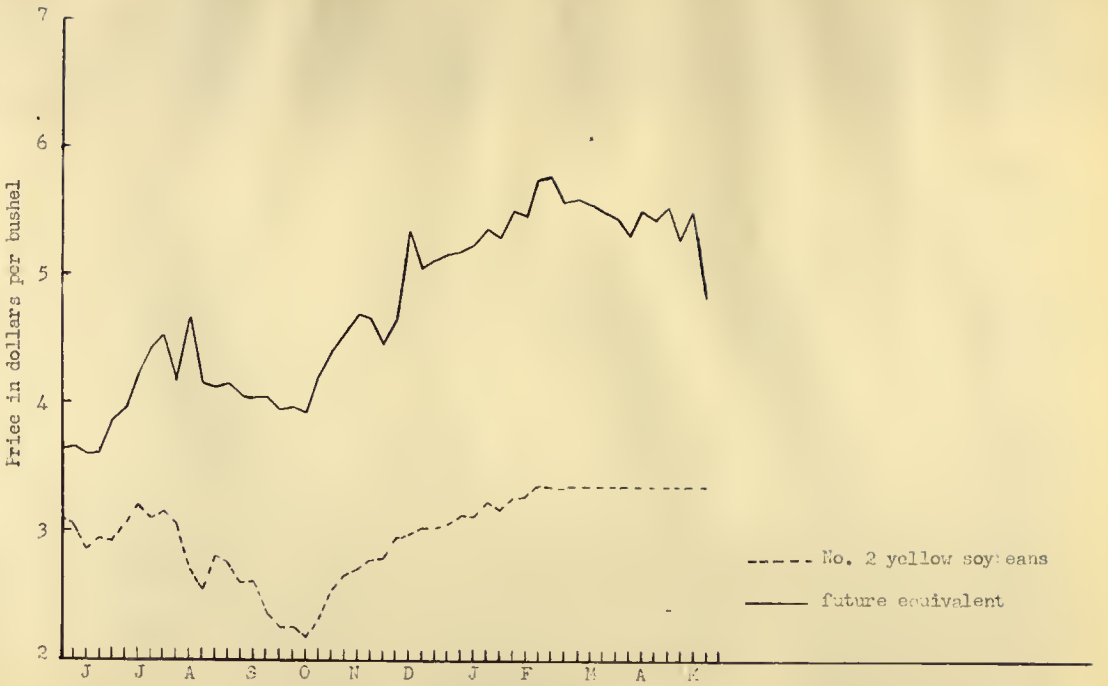

Fig. 6?. Price spread between No. 2 yellow soybeans, Kansas City and equivalent per bushel price of May future crude soybean oil, New York (?.? pounds) and May future soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1950-51.

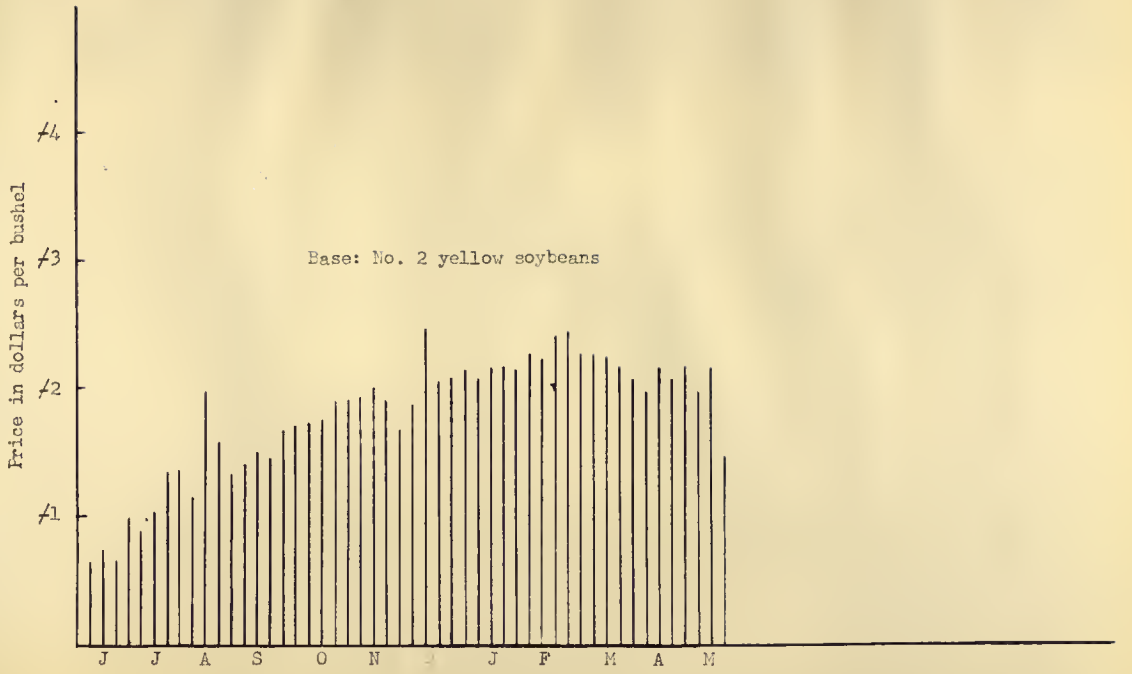

Fig. 60. Actual price spread between No. 2 yellow soy eans, Kansas City, and equivalent per bushel price of May future crude soybean oil, New York (3.3 pounds), and May futures soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1950-51.

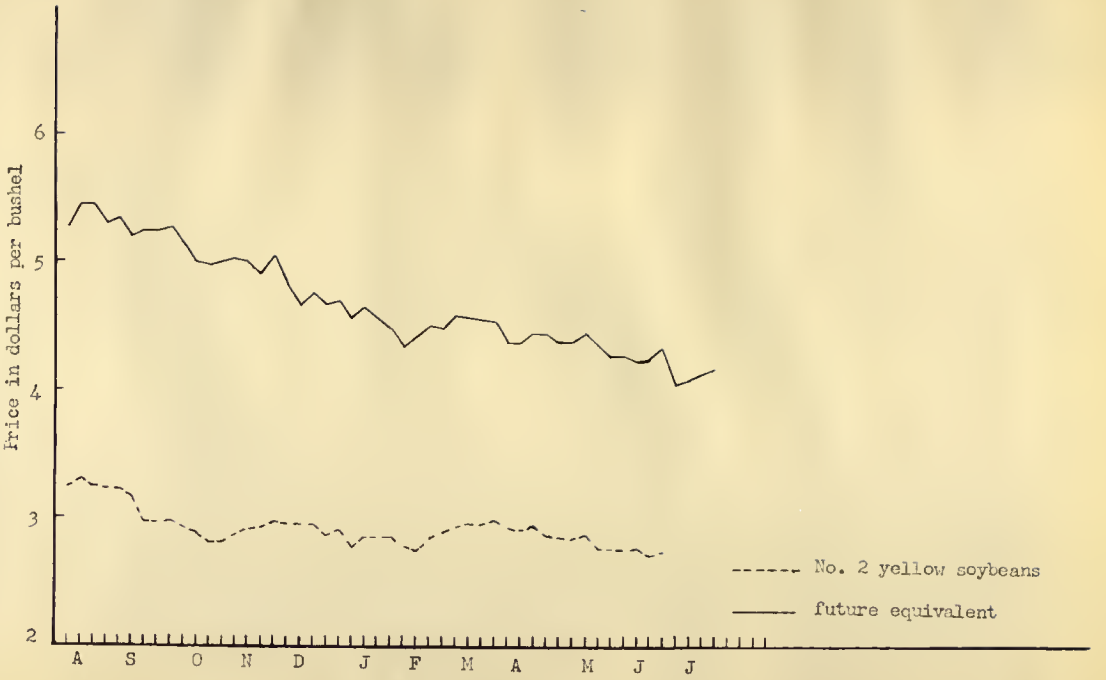

Fig. 70. Price spread between No. 2 yellow soybeans, Kansas City, and equivalent per bushel price of July future crude soybean oil, New York (8.8 pounds) and July future soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1952-53.

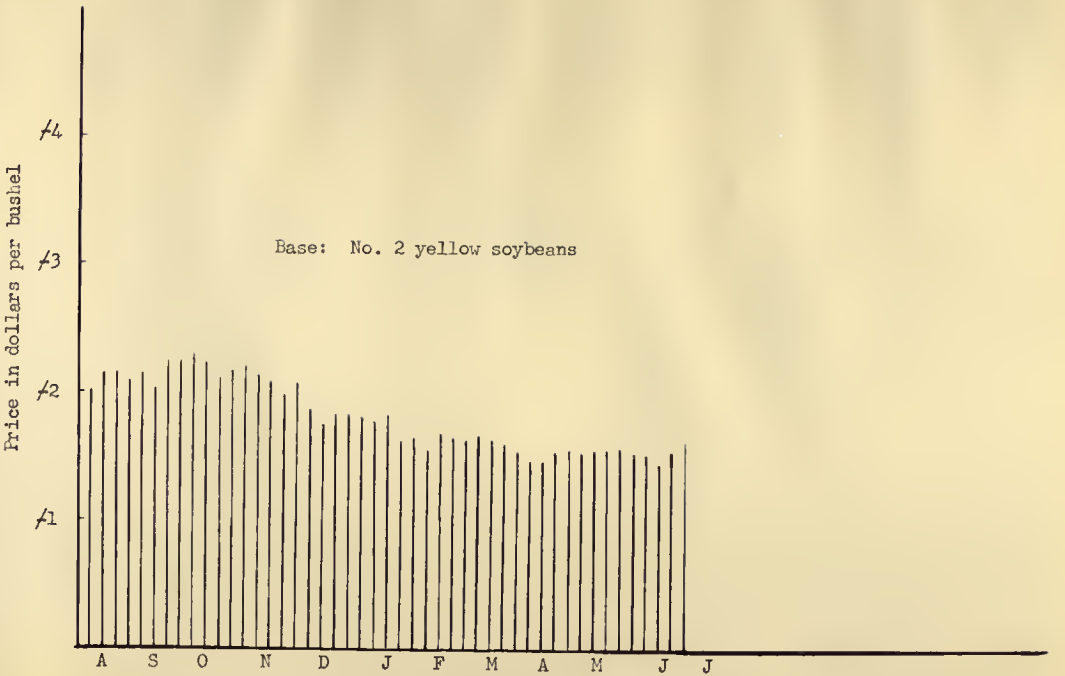

Fig. 71. Actual price spread between No. 2 yellow soybeans, Kansas City and equivalent per bushel price of July future crude soybean oil, New York (8.3 pounds), and July futures soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1952-53.

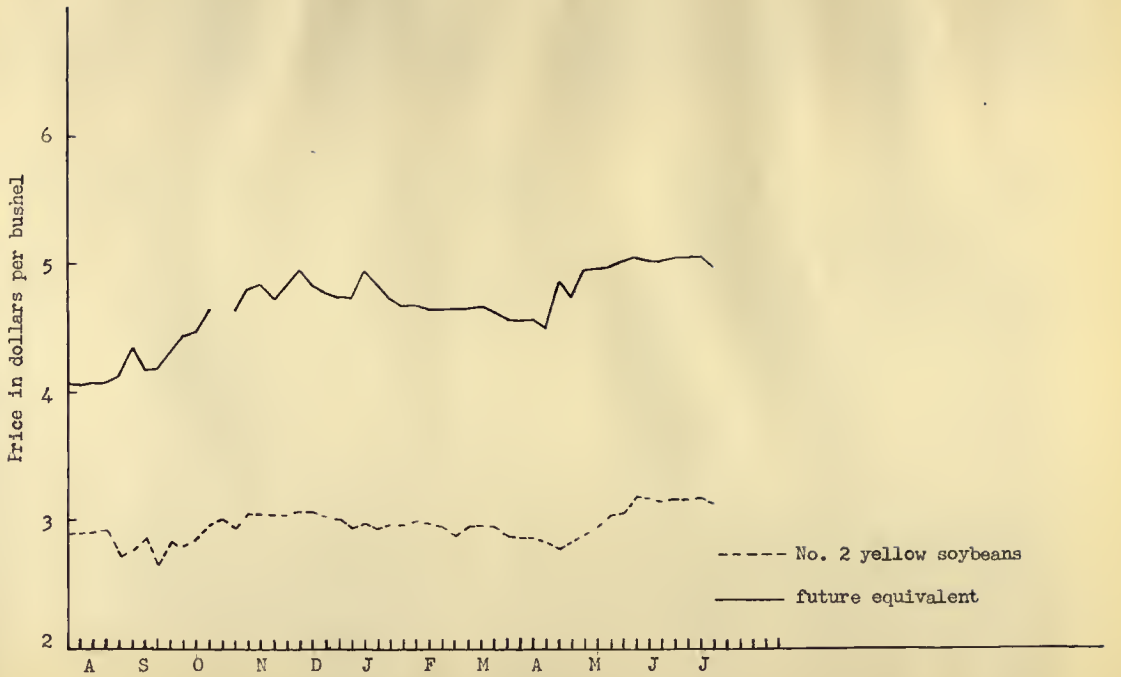

Fig. 72. Price spread between No. 2 yellow soybeans, Kansas City, and equivalent per bushel price of July future crude soybean oil, New York (8.8 pounds) and July future soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1951-52.

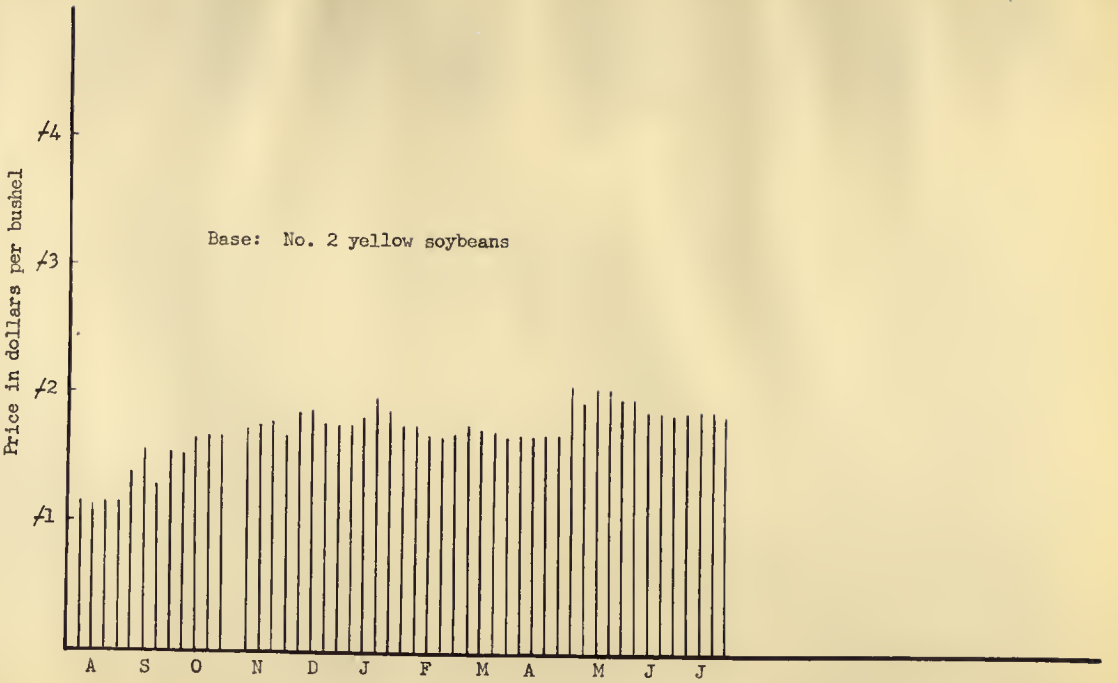

Fig. 73. Actual price spread between No. 2 yellow soybeans, Kansas City and equivalent per bushel price of July future crude soybean oil, New York (8.8 pounds), and July futures soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1951-52.

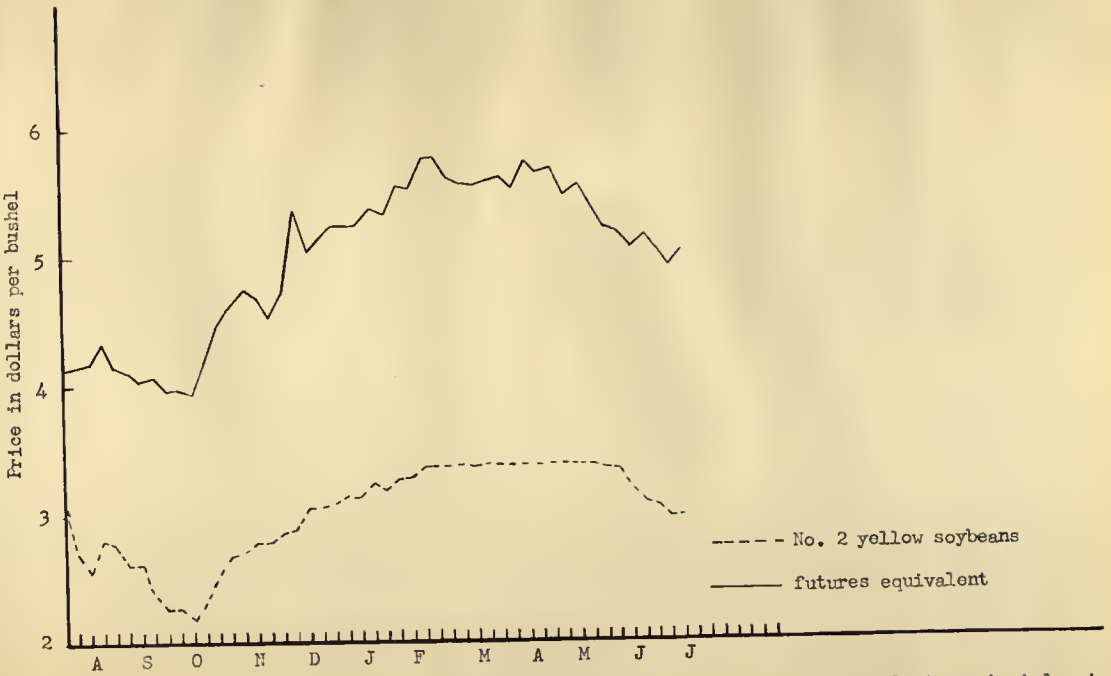

Fig. 74. Price spread between No. 2 yellow soybeans Kansas City, and equivalent per bushel price of July future crude soybean oil, New York (3.8 pounds) and July future soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1950-51.

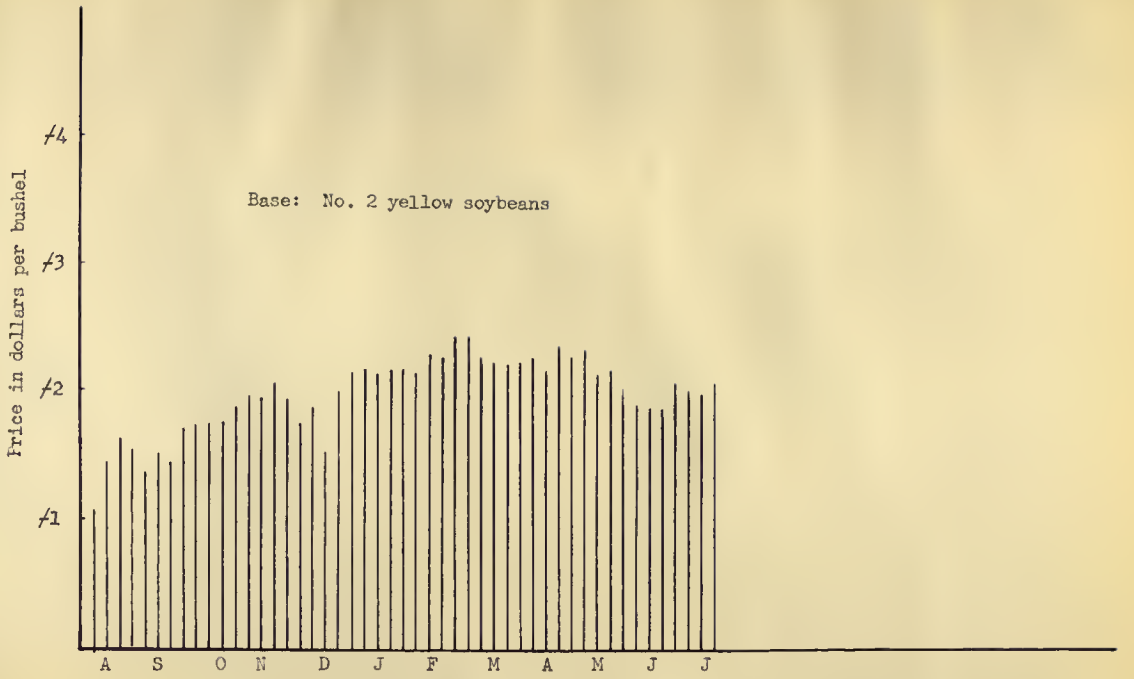

Fig. 75. Actual price spread between No. 2 yellow soybeans, Kansas City and equivalent per bushel price of July crude soybean oil, New York (8.8 pounds), and July futures soybean meal (Decatur basis), Memphis (50.0 pounds), weekly (Friday high), 1950-51.

RELATIONSHIP BETWEEN SOYBEANS AND SOYBEAN OIL PRICES

A very necessary part of this study should be to investigate the relationship betwsen the prices of soybeans and its joint product's prices. The soybean processor visws a bushel of soybsans from its value as oil and msal. It is important for further investigations that the correlation bs determinted in order to furnish some information on relationship.

The relationship bstween ths prices of oash soybeans and spot soybean oil was calculated weekly for the period 1947-51. Ths price relationship was not deflated for the rise in ths general prios lsvsl beoause by this operation both series would have been deflated by the same amount. A scatter diagrsm was plotted to give an indioation of ths relationship (Fig. 76). The scatter diagram revsaled that there was vsry little indication of a closs association between the two prics series. Random correlations were made, calculated on a weekly basis, for a relationship study of wsekly soybean and soybean oil prices. Random correlations were caloulated for the years 1952, 1951, and 1950 and ths respeotive correlations were .19, .56, and .37.

The coeffioient of correlation for the monthly price revealed a relationship of $\pm$ .04. The conclusion can be made that thers is practically nc correlation between the two ssries.

RELATIONSHIP BETWEEN SOYBEANS AND SOYBEAN MEAL PRICES

A oalculation was made of the relationship between ths price of soybeans and the price of soybean meal. An indioation of the assooiation of thess two series was obtained from a scatter diagram (Fig. 77). An examination of the plot indicates vsry little relationship between the two series. A coefficient

of correlation was calculated for this series which revealed a relationship of $\pm$ .05. A correlation of this amount definitely indicates very little correlation between the two price series.

RELATIONSHIP BETWEEN SOYBEAN MEAL AND SOYBEAN OIL PRICES

An examination of the relationship between soybean meal and oil as plotted in a scatter diagram indicates very little correlation between the two price series (Fig. 78). An actual coefficient of correlation of $\pm$ .10 was obtained. This again indicates that the two price series are not closely associated. It would seem logical that there should be some correlation between the value of soybeans and soybean oil and meal; however, after examining the monthly and weekly scatter diagrams and coefficient of correlation it appears quite conclusive that there is very little association or similarity between the series.

RELATIONSHIP BETWEEN SOYBEAN OIL AND COTTONSEED OIL PRICES

Soybean oil and cottonseed oil have similar uses in the food and non-food industries. These two commodities are interchangeable for these uses. Since these two oils have similar uses, a very close relationship between the two price series existed for the period studied, 1947-52, (Fig. 79).

The scatter diagram reveals a correlation between the two series so that it is unquestionable that the two series are very closely associated. The coefficient of correlation between the two price series was calculated for 72 consecutive months. The coefficient of correlation between the two series

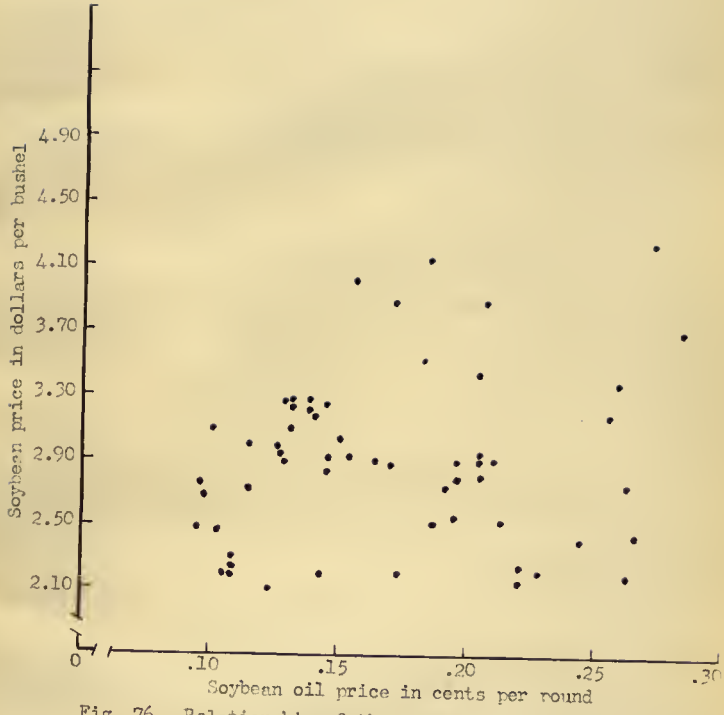

Fig. 76. Relationship of the monthly average price of soybeans per bushel at Illinois country shipping points and soybean oil, per pound, crude Decatur, 1947-51.

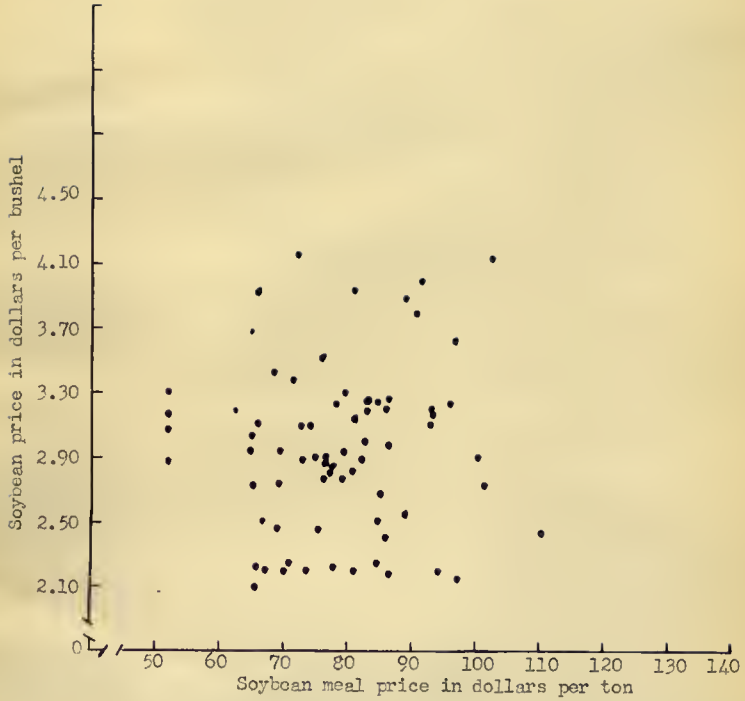

Fig. 77. Relationship of the monthly average prices of soybean meal, per ton, wholesale, bagged, Chicago and soybeans per bushel at Illinois countr shipping points, 1946-51.

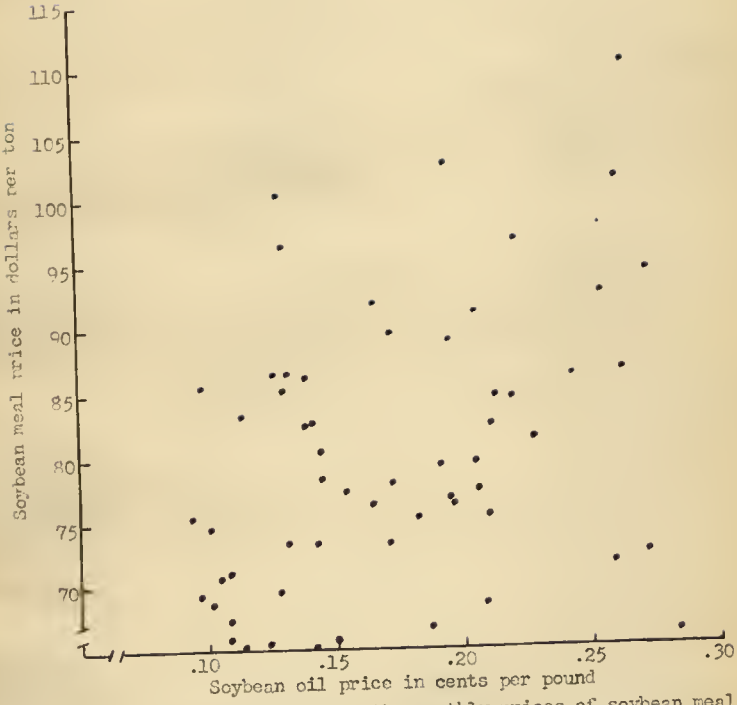

Fig. 7[illegible]. Relationship of the monthly prices of soybean meal per ton, wholesale, bagged, Chicago and soybean oil per pound, crude Decatur, 194[illegible]-51.

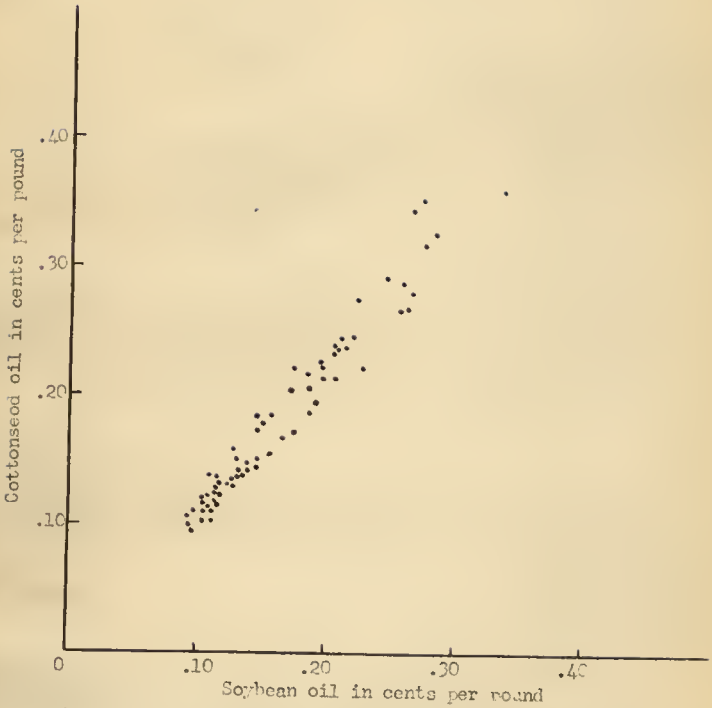

Fig. 79. Relationship of the monthly wholesale price per pound of soybean oil, crude, midwestern mills and cottonseed oil, crude, southeastern mills, 1947-52.

was ± .97. With 70 degrees of freedom this coefficient was highly significant. /1 A coefficient of 30 is significant at the one percent level.

Expressed as a coefficient of determination the statement can be made that 94 percent of the variations in soybean oil prices for the period studied were associated with the variations in cottonseed oil prices.

RELATIONSHIP BETWEEN SOYBEAN OIL AND LARD PRICES

The uses made of soybean oil and lard are very similar. Since very little can be said about the association of soybeans and soybean oil perhaps a better understanding of soybean oil prices can be obtained by this relationship study.

The two price series; namely, soybean oil and lard were correlated on a monthly basis for the period 1947-52. An inspection of the scatter diagram gives an indication that these two series are very closely related (Fig. 80). The coefficient of correlation obtained was ± .94 indicating a very high degree of association between the two price series. This coefficient of correlation is highly significant with 70 degrees of freedom--a correlation coefficient of ± .30 would be significant. Expressed in terms of a coefficient of determination it can be said that 88 percent of the variation in price of lard can be expressed in the variation of soybean oil prices. The relationship between soybean oil and lard are very closely associated.

/1 The number of degrees of freedom is the number of deviations minus the number of constants determined from the sample and used to fix the points from which these deviations are measured.
For the test of significance, reference was made to the textbook. Statistical Methods by Snedecor, G. W., p. 149.

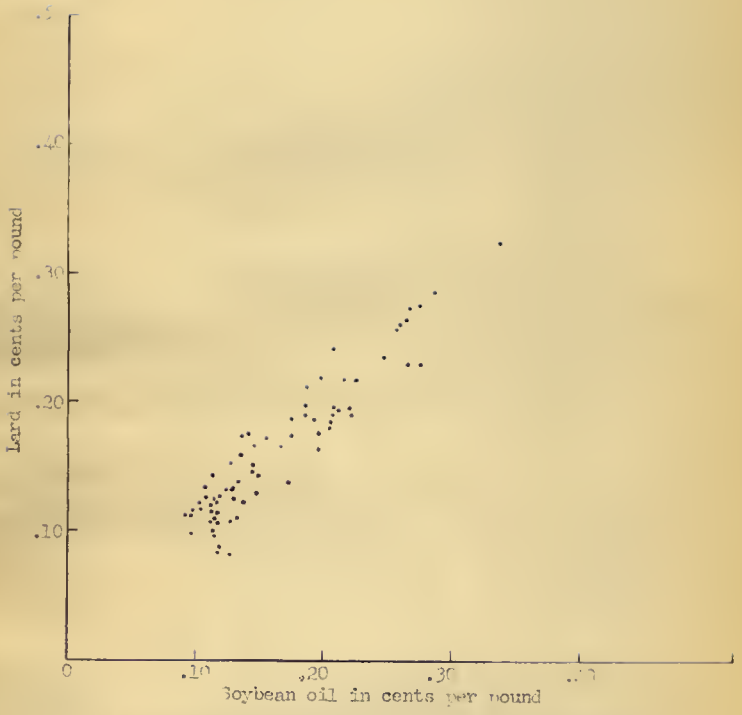

Fig. 30. Relationship of the monthly wholesale prices of soybean oil, crude, tank cars, midwestern mills and lard, prime steam, Tierces, Chicago, 1947-52.

SUMMARY AND CONCLUSIONS

The soybean harvest usually begins the latter part of September and continues thru the month of November. In 1950-51, 77 percent of the farmer sales were made during the months of September, October, November, and December. After January 1st of that year only 23 percent of the crop remained to be marketed. Out of this remainder, the seed for the following crop must be deducted.

The sale of a large percentage of the crop by producers during the harvesting season points out the necessity for soybean processors to obtain their crushing supplies during this time.

Seasonal variations in the price of soybeans are of value to the producer to better judge the optimum time of the year to market his production. This seasonal index will also be of value to the soybean processor along with future determination of prices to suggest hedging procedures.

The seasonal movement of prices received by farmers in the United States exhibited a seasonal low in October and then rose gradually (with the exception of January to February) to a high in June. The long-time seasonal movement of prices received by farmers in Kansas revealed the low month to be October and the high in June with a minor low occurring in March.

The seasonal index for soybean meal prices reveals very little indication of a pronounced seasonal. The seasonal movement indicated a high in August and a low in April. It was noted that this seasonal indicated two low months; namely, April and October. The seasonal price movement of soybean oil did not reflect a wide range of variations. Two lows were observed in the seasonal movement; namely, July and October. January and March were the high months.

Criteria for an optimum risk shifting system are six in number — the criteria used in this study tested the stability and predictability of the spread and net differences between cash and futures markets. Actual price spreads and net differences were plotted and examined for the following: cash and future soybeans, cash soybeans and futures corn, spot and futures soybean oil, immediate and futures soybean meal, cash soybeans and futures equivalent soybean oil-meal equivalent.

In inspecting the many actual price spread plots for the many price series it became quite evident that due to the great variability of these price series it can be conclusively determined that hedging of cash soybeans in any futures market with an stability and predictability is impossible. However, maybe a new era is dawning for the possibility of hedging cash purchases in the futures soybean market. In examining the two price series for the January, May, and July futures of 1952-53, a greater tendency was shown for stability.

The relationship between soybeans, soybean oil and soybean meal were examined. Scatter diagrams and coefficients of correlations provided proof to point out the fact there is no correlation between soybeans and its two products.

There is a definite correlation existing between soybean oil, cottonseed oil, and lard.

Points listed below consist of suggestions for the operation of soybean processing plants in Kansas after a limited examination of the marketing system, seasonal movement of prices, relationships existing between cash and futures markets and a relationship study of soybeans, soybean oil, soybean meal, cottonseed oil and lard. Suggestions are a result of this study and

suggestions reviewed in the writings and research of other institutions and authors. This is quite apparent from the conclusions of this study that it is impossible to set down a set of rules that will be successful every year.

The following list of suggestions become apparent after making the study:

(1) Due to over-expansion of crushing capacity and the sale of soybeans by producers during the last three months of the calendar year, it is necessary that soybean processors purchase soybeans while they move. Keep abreast of market happenings. Know and be familiar with the outlook for general business conditions, production and supplies of other oilseed products, livestock population and a knowledge of happenings in general agriculture.

(2) Know your plant costs and the necessary margins necessary to sell the crush at a profit. Forward sales by the soybean processor are suggested as a near perfect risk-shifting system. A processing plant making forward sales with a certainty of a margin after costs on soybeans purchased are not affected by future price changes of soybeans or soybean products.

(3) Soybean futures markets have not proven to be satisfactory risk-shifting systems. The stability and predictability of the price spread between soybean cash and futures has been too varied to afford optimum hedging conditions. It is further suggested that processors limit speculation to that amount that is deliberate and not just for the sake of hedging for speculative profits. (Keep in mind that the 1952-53 soybean future market revealed some possibilities for hedging). If the processing plant has been operating and is making a profit do not hedge.

(4) Before hedging in futures markets, if a must, calculate the amount of risk the company can afford and stop the losses at that point. If basis profits appear on soybean hedges, be willing to take these profits and not

try to squeeze out the last cent.

(5) Soybean processors should at all times try to maximize the transit return. Freight rates should be studied so as to give the greatest advantage of milling in transit.

(6) Forward sale of soybean meal is sometimes impossible beyond a 90 day period, however, some attempt should be made to forward sell to constituents.

(7) A survey should be made of the consuming area for soybean meal. Dairy, poultry, and hogs are big consumers of soybean meal.

(8) Some thought must be given to the type of crushing facilities employed by soybean processors. Solvent type crushers are returning approximatoly 11' pounds of oil as compared to the 8½ to 9 pounds returned by the expeller type. Some thought must be given to this matter as soybean oil is worth more per pound.

ACKNOWLEDGMENTS

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PRICING SOYBEANS IN KANSAS

by

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ABSTRACT

Purpose

It is the purpose of this study to investigate and analyze the price relationships between soybeans and related products in order to assist in solving marketing and processing problems involving inventory and risk management. Price relationships mean the relationships which exist between cash prices of the commodity (soybeans) and cash prices of its by-products; namely, oil and meal; relationships between cash and futures prices; relationships between futures prices of the commodity and futures prices of its by-products and relationships between other farm commodity prices and soybean prices.

Problem

Soybeans have become a major crop in the United States within the last 20 years, and in Kansas their importance, as measured by production, has increased twenty-fold in the last 13 years. However, processing capacity has increased more rapidly. As a result, most soybean processors, during this period of expanded production, have been forced to purchase a supply of soybeans during the harvesting season to assure operation of crushing facilities throughout the year. The general practice has been to purchase a supply of soybeans during September, October, and November and place them in storage for later processing. The accumulation of large inventories during these three months has concentrated the problem of inventory and risk management into the hands of a relatively few processors.

Soybean processors have shifted the risk of inventory ownership by forward sales and by hedging. The forward sales or forward contracts are private treaties, like cash sales, except that they are made for deferred delivery. Forward sales naturally sell for less than current delivery. Forward sales are a perfect risk shifting system if forward sales can be accomplished.

To date, the hedging of soybean purchases in the futures market has met with varied success for Kansas soybean processors. Many reasons are advanced for the inadequacy of the futures market: (1) volume of futures transactions has not been sufficient to provide adequate price change insurance, (2) relatively few buyers and sellers may influence the market unduly, (3) the many and varied products made from the soybean have different market values and outlets, and (4) similar products made from oil producing crops have an influence on soybean prices.

Risk bearing includes the cost of storage, insurance, interest on funds invested in grain ownership, and adverse price changes. Processors have attempted to shift these risks on to the futures market or by forward sales. The forward sales of soybean oil and meal to feed manufacturers and oil refiners have been used successfully in shifting risk; however, the shifting of risk by forward contracts has been met by increasing discounts from the current month delivery by users of oil and meal. The shifting of risk through the use of futures markets has met with varied success.

ACREAGE AND PRODUCTION OF SOYBEANS IN THE UNITED STATES AND KANSAS

Soybeans have become a major crop in the United States within the last 20 years, and in Kansas their importance, as measured by production, has increased twentyfold in the last 13 years. Soybeans have been grown as a grain crop for about 25 years. The many multiple uses of soybeans have lent themselves to continued increased production. Within a period of 25 years the production of soybeans in the United States has increased from five million bushels in 1925 to over 291 million bushels in 1952.

Prior to 1940 the acreage planted to soybeans in Kansas was of very little economic importance. Since that time production has increased from 312 thousand bushels in 1940 to over seven million bushels in 1952. The larger portion of the production of Kansas is in the Southeastern part of the state. Crawford, Anderson, Franklin, Lyon, Coffey, Osage, Linn, Labette, Bourbon, and Cherokee are the counties producing the greater percent of the Kansas production.

MONTHLY SALES OF SOYBEANS MARKETED IN KANSAS

The soybean harvest usually begins the latter part of September and continues through the month of November. As this production is located in an area of smaller scale farming, the fact that it is a cash grain and usually is of such small volume per farm, most of the bean production is marketed during this time. In 1950-51, 77 percent of the sales were made during the months of September, October, November, and December. After January 1 of that year only 23 percent of the crop remained to be marketed. Out of this remainder the seed for the following crop must be deducted. In Illinois, during the 1947 and 1948 crop about 80 percent of all soybeans bought by country elevators were acquired

by the end of September.

The sale of a large percentage of the crop by producers during the harvesting season points out the necessity for soybean processors to obtain their crushing supplies during this time.

SUPPLY AND UTILIZATION OF SOYBEANS IN THE UNITED STATES

The disposition of the soybean crop through the marketing channels indicates that the bulk of the soybeans are sold by producers to local elevators. In the total soybean movement, the sales by farmers directly to processors are about 4 percent of the total.

The supply of soybeans in the United States during 1924-25 crop year was five million bushels made up of a production of 49 million bushels, imports of 60 thousand bushels, and a carryover of 690 thousand bushels. In the 1950-51 crop year when production reached an all-time high of over 300 million bushels, carryover stocks of three million, and imports of one million bushels. Carryover stocks of soybeans have been very small in comparison to other grain stocks at the beginning of the crop year. The largest stocks on record to date were a carryover of 14 million bushels in 1944-45. Imports of soybeans into the United States are of little consequence; in the past 15 years, imports averaged less than two million bushels.

The utilization of soybeans has kept pace throughout soybean history. Before 1934 less than one-fourth of the soybeans grown in the United States were used for processing. As markets expanded and production increased the proportion processed became consistently larger. By 1937 about two-thirds of the crop was processed and this proportion increased to more than 80 percent during the last few years. Exports in recent years have increased to an all-time high

in 1950-51 of 27½ million bushels.

The yield from a bushel (60 pounds) of soybeans averages about 8.8 pounds of oil and 49 pounds of meal processed by screw presses, while the solvent extraction method yields 10½ pounds of oil and 45 pounds of meal. Soybean oil is used in the manufacture of more than 50 productsof human consumption. The U.S. produced 2½ billion pounds of oil in 1951-52. The use of soybean oil for food was stimulated by the great demand for it during World War II. Prior to World War II in 1933 only 30 percent of the oil produced was used for edible products and 70 percent was used for non-food products.

However, since that time a complete switch-over has occurred until in 1951 84 percent was used for food purposes and 16 percent for non-food purposes. Of the oil used for food purposes, approximately half of it has been used for shortening. Percentagewise, of the oil used for food purposes margarine has increased from less than one-half of 1 percent to 25½ percent in 1951. Although 70 to 90 percent of the annual consumption of soybean oil in the United States has been used in the food industries--there has been a rapid poundage increase in its industrial use.

From every bushel of soybeans about 80 percent of the resultant product is soybean meal and 20 percent crude soybean oil. During the 1920's and 1930's the United States was importing between 12 and 28 thousand tons of high protein feed. The production of soybean meal in the 1938-39 crop year exceeded one million tons and has increased since then to 5½ million tons in 1952. The principal use of soybean meal in the United States is as a livestock feed. Of the total oilseed cake and meal used for livestock use, the statement can be made that soybean meal has taken over as the leader in furnishing high protein feed for livestock. As a percent of the total oilseed cake and meal used,

soybean meal now comprises between 60 and 65 porcent of the total oilseed meals used for livestock. Thie percentage has gradually increased from 5 percent of the total in 1930 to a high of 66 percent in 1950.

SOYBEAN CRUSHING CAPACITY

Crushing capacity has increased faster than production. The estimated crushing capacity for the 1951-52 season on a ten-month basis was 284 million bushels, proving that the crushing capacity has increased faster than production. The production during the crop year cited was 282 million out of which only 244 million were processed for oil and meal. Of the estimated industry total of 190 soybean mills, 107 of these mills are located in the states of Illinois, Iowa, Ohio, Indiana, Minnesota, Missouri, Kansas, and Nebraska. These eight states have within their boundaries 85 percent of the crushing capacity, with Illinois leading with a high of 41 percent of the total crushing capacity. Kansas has an estimated 3 percent total crushing capacity and crushed only two percent of the total soybeans crushed. It is estimated that Kansas crushee $4\frac{1}{2}$ million bushels of soybeans annually (1951-52). Actual crushing in Kansas has not exceeded the production in this state.

PRICES RECEIVED FOR SOYBEANS IN THE UNITED STATES

Tho price which producers receive for soybeans is determined by several factors including (1) the price users will pay processors for soybean oil; (2) the price users will pay processors for soybean meal; (3) the processing margin; and (4) transportation and other handling costs.

Jordan summarized what determines soybean prices in saying that bean prices depend on the prices that consumers will pay for meat and other animal products, margarine and vegetable shortening; on the size of the livestock

population; supplies of protein supplement, corn and edible fats and oil; and costs and profits of handlers.

Soybean meal can be expected to change during the year about 1.2 times as much (in percentage) as disposable personal income, and in the same direction. Meal prices can be expected to move in the oppostie direction to changes in the supplies of soybean meal, cottonseed meal, linseed meal, copra meal, peanut gluton feed and meal, tankage, meat scraps, and fish meal and about .40 to .45 as much (in percentage). An increase of one bushel per animal unit in the corn supply will reduce the price of meal about 2.5 percent.

Soybean oil prices have changed in the same direction and to about the same extent as disposable personal income changes. These oil prices will also tend to change about 1.4 to 1.5 percent in the opposite direction with every 1 percent change in supplies of soybean oil, cottonseed oil, lard and butterfat. The general trend in prices since 1934 has shown a gradual price advance geared to many inflationary pressures, large consumer buying power, increase in exports and restriction of world trade in fats and oils. The all-time record price paid for a bushel of soybeans on the Chicago market was $4.14 paid in June, 1947.

SEASONAL MOVEMENT OF SOYBEANS IN THE UNITED STATES

The production of farm products are seasonal in nature. The harvesting of soybeans is realized in a very short time. The major portion of the production is marketed by the first of January. The consumer of soybean products desires a steady supply throughout the year. The soybean processor has to purchase the beans during harvest and store, process the bean, and supply consumer needs as they are expressed. Soybean consumption must be matched with production and this is brought about by storage and by adjustments between supply

and demand which take place as a result of seasonal change in price.

Seasonal variations in the price of soybeans are of value to the producer to bettor judge the optimum time of the year to market his production. This seasonal index will also be of value to the soybean processor along with future determination of prices to sugg st hedging procedures. The seasonal movement of prices received by farmers in the United States exhibited a seasonal low in October and then rose gradually (with tho exception of January to February(to a high in June. A general state ont can bo made on tho increase in price from October to June—remembering this is an average seasonal price—it can be said that prices on the avorago advanced 15 1/3 cents from October to June. From previously cited literature it was determined that the cost of storage averaged 6½ percent of the October price or the actual amount would be 10¼ cents for seven months storage. Another generalization can be made to the effect that usually farm storage of soybeans pays. An index of average seasonal variation was calculated for the period 1947-52 to accent the current factors. The seasonal exhibited a high in June and the low in October with a minor low in February.

SEASONAL MOVEMENT OF SOYBEAN PRICES IN KANSAS

The seasonal movement of prices received by farmers in Kansas were similar to the U. S. seasonal. The long-time seasonal movement of soybean prices in Kansas revealed the low month to be October and the high in June with a minor low occurring in March. A general statement can be made as to the storing of soyboans on Kansas farms and the profitability of holding off markets until June. On the average, deducted from this seasonal, it is expected that the price increase from October to June would amount to 39 cents. Using the same storage costs as previously cited, the reward for marketing soybeans in June

rather than October would be 28½ cents on the average. The shorter period seasonal movement of prices indicated the same findings as found in the 1925-52 period.

SEASONAL MOVEMENT OF SOYBEAN MEAL PRICES IN THE UNITED STATES

The seasonal index for soybean meal prices reveals very little indication of a pronounced seasonal, such as the soybean index exhibited. The seasonal movement indicated a high in August and a low in April. It was noted that this seasonal indicated two low months; namely, April and October. The short time seasonal movement or variation was much greater than for the 17 year period. The range of deviation was from a low in January to a high in July.

SEASONAL MOVEMENT OF SOYBEAN OIL PRICES IN THE UNITED STATES

The seasonal price movement of soybean oil did not reflect a wide range of variation as did soybeans, but in a narrower range similar to soybean meal. Two lows were observed in the seasonal movement; namely, July and October with October the lower. January and March were the high months for the seasonal. The seasonal index indicates that the months of December, January, February, March, April, and May were above the base line and the remaining six months below the base.

FUTURES TRADING

The basic need for hedging arises from the necessity that someone own the various commodities while they are in progress through the marketing system. Commodities, such as soybeans are produced seasonally and the greater percentage is marketed during the harvest season. The risk element enters the marketing system because someone owns these commodities until consumers are willing and able to buy. The consumer of soybean products wants a ready supply

throughout the year and the processor of these products must stand ready to fill these demands and likewise assume the risk of ownership of large inventories.

Criteria for an optimum risk shifting system are six in number--the criteria used in this study will test the stability and predictability of the basis changes between cash and futures prices. A price spread or movement will be used to examine the irregularities in the two price series. The actual price spread or net differences will indicate the degree of variation between the two price series over time.

RELATIONSHIP BETWEEN CASH SOYBEANS AND THE CHICAGO SOYBEAN FUTURES

An examination was made of the cash soybean and future soybean price series relationship for the period 1948-53. Random coefficients of correlation were calculated and positive relationships of .27 to .97 were obtained indicating a very close association in some instances. The price spread between the two price series were plotted. These plots indicated that the prediction of the price spread is impossible. Some contracts open with a wide spread and close with a very narrow spread while other contracts are opposite in this character. From a practical standpoint where the two price series cross and recross and have a great variability of spread, it can be said these series are of very little value for hedging purposes.

The final test given to the cash-futures soybean price relationship is the actual price spread or net differences between the two series. In inspecting the many actual price spread plots it is quite evident that due to the great variability of these price series it can be conclusively determined that the hedging of cash soybeans in the futures market will more likely result in losses rather than price insurance.

However, maybe a new era is dawning for the possibilities of hedging cash purchases in the futures soybean market. In the examination of the two price series for the January, May, and July futures of 1952-53, it showed a tendency for the price spread to be more stable during the duration of the contract. In case of the January and May contracts the price spread did not cross and remained relatively stable after October. The July contract which closed out this past July indicates a fairly stable price spread, however, the net differences were too variable to constitute a successful hedge.

RELATIONSHIP BETWEEN CASH SOYBEANS AND CHICAGO FUTURE CORN

It was suggested that hedging in futures corn might prove successful since corn and soybeans compete for acreage within the soybean area. Also some association of the two price series might be expected because corn and soybean meal are livestock feeds. A relationship study was made on the association of cash soybeans and futures corn. The price spread and movement plots of this relationship indicated many price fluctuations of a violent nature in the cash soybean market while the future corn price movement was very smooth and not subject to violent movements.

Using the criteria of a stable and predictable basis or price spread between futures corn and cash soybeans, this study reveals that it will be impossible to hedge with any degree of certainty in futures corn.

RELATIONSHIP BETWEEN SPOT SOYBEAN OIL AND NEW YORK SOYBEAN OIL FUTURES

A relationship study between cash soybean oil and futures oil prices in an effort to suggest hedging the oil production of a processing plant in the soybean oil futures was made. The two price series move in the same general

direction with a spread which is very narrow. An inspection of the actual price spread or net differences exhibit a variation of one-half to five cents per pound. If the variations were multiplied by ten to place them on a bushel of soybeans basis, it becomes quite apparent that there was considerable probability of large losses by hedging in the oil market.

RELATIONSHIP BETWEEN IMMEDIATE SOYBEAN MEAL AND MEMPHIS FUTURES SOYBEAN MEAL

A similar comparison was made between cash soybean meal and futures soybean meal. The processor needs a market that is fluid enough that it will follow the value of oil and meal produced from the soybeans. By inspection of the several plots on the relationship between cash and future soybean meal we find it does not meet the criteria which has been set up for judging the usefulness of soybean meal futures for hedging purposes. The net differences between the two series are too varied to be of use for the hedging of meal production in the soybean meal future.

RELATIONSHIP BETWEEN CASH SOYBEANS AND FUTURE OIL- EAL EQUIVALENT

A new approach was made in an effort to find a futures market which would exhibit a stable price spread between it and the cash soybean. A futures soybean meal and futures soybean oil equivalent price was calculated and its relationship with cash soybeans was studied. The futures equivalent price moved above the cash soybean series by arying amounts. A close inspection indicates that the price movements are quite irregular with the futures equivalent exhibiting the greatest irregularity. The net differences were more erratic and inconsistent than any series inspected in this study.

An opposite approach was taken on this relationship by comparing the cash oil meal equivalent price and the futures soybeans price series. However,

this relationship exhibited a greater variation in net differences than the futures oil and meal equivalent and cash soybeans.

RELATIONSHIP BETWEEN SOYBEANS , OIL AND MEAL

A very necessary part of the study investigated the relationship or correlation between soybeans, soybean meal, and soybean oil. The coefficient of correlation for the monthly prices of soybeans and soybean oil revealed a relationship of $\pm$ .04 which is of very little significance. The relationship between soybeans and soybean meal revealed a coefficient of correlation of $\pm$ .05 which again indicates very little association. A similar correlation was calculated for soybean oil and meal and the two series were not closely associated.

RELATIONSHIP BETWEEN SOYBEAN OIL, COTTONSEED OIL, AND LARD

An additional correlation was calculated to determine the relationship between cash soybean oil and lard and cottonseed meal. The calculations revealed a very close relationship between these edible oils.

Points listed below consist of suggestions for the operation of soybean processing plants in Kansas after a limited examination of the marketing system, seasonal movement of prices, relationships existing between cash and futures markets and a relationship study of soybeans, soybean oil, soybean meal, cottonseed oil and lard. Suggestions are a result of this study and suggestions reviewed in the writings and research of other institutions and authors. This is quite apparent from the conclusions of this study that it is impossible to set down a set of rules that will be successful every year.

The following list of suggestions become apparent after making the study:

(1) Due to over-expansion of crushing capacity and the sale of soybeans by producers during the last three months of the calendar year, it is necessary that soybean processors purchase soybeans while they move. Keep abreast of market happenings. Know and be familiar with the outlook for general business conditions, production and supplies of other oilseed products, livestock population and a knowledge of happenings in general agriculture.

(2) Know your plant costs and the necessary margins necessary to sell the crush at a profit. Forward sales by the soybean processor are suggested as a near perfect risk-shifting system. A processing plant making forward sales with a certainty of a margin after costs on soybeans purchased are not affected by future price changes of soybeans or soybean products.

(3) Soybean futures markets have not proven to be satisfactory risk-shifting systems. The stability and predictability of the price spread between soybean cash and futures has been too varied to afford optimum hedging conditions. It is further suggested that processors limit speculation to that amount that is deliberate and not just for the sake of hedging for speculative profits. (Keep in mind that the 1952-53 soybean future market revealed some possibilities for hedging.) If the processing plant has been operating and is making a profit do not hedge.

(4) Before hedging in futures markets, if a must, calculate the amount of risk the company can afford and stop the losses at that point. If basis profits appear on soybean hedges, be willing to take these profits and not try to squeeze out the last cent.

(5) Soybean processors should at all times try to maximize the transit return. Freight rates should be studied so as to give the greatest advantage of milling in transit.

(6) Forward sale of soybean meal is sometimes impossible beyond a 90 day period, however, some attempt should be made to forward se l to constituents.

(7) A survey should be made of the consuming area for soybean meal. Dairy, poultry, and hogs are big consumers of soybean meal.

(8) Some thought must be given to the type of crushing facilities employed by soybean processors. Solvent type crushers are returning approximately 11½ pounds of oil as compared to the 8½ to 9 pounds returned by the expeller type. Some thought must be given to this matter as soybean oil is worth more per pound.