MARKETS AND PRICES FOR OKLAHOMA BROOMCORN

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Oklahoma farmers receive an average annual income of four to five million dollars from broomcorn. It is a high risk farm enterprise arising mainly from the high degree of variability in year-to-year and within-year prices received for the crop.

The high variation in production and prices of broomcorn from year to year also creates risk to the marketing and manufacturing concerns. The marketing and manufacturing facilities have to be geared to handle variable sizes of crops at different prices.

Why Variation in Production and Prices?

Thus arise the questions: Is the variability in production and prices paid farmers for broomcorn due to the organization of the industry and operating practices of the participants, to the nature of the demand for brooms, or to the way farmers respond to price change? Or, are there other reasons for the instability in production and prices? Previous research on the broomcorn industry has not provided answers to these questions.

The major purposes of this study were: (1) To assemble facts relevant in understanding the organization of the broomcorn industry, the operating practices of the principal participants, and the process of price determination; and, (2) to explain the variability in average annual prices paid farmers for broomcorn brush.

A third objective, to appraise the alternatives of farmers in adjusting production to price variation and demand, is the subject of another publication.[1]

How the Study Was Conducted

Three surveys were made in 1956 and 1957 to obtain information from farmers, broomcorn dealers, and broom manufacturers for use in this study. Thirty-eight broomcorn growers in Garvin, Grady, and McClain counties were interviewed during the summer of 1956. Their farms were selected by random sampling methods.

Fifteen broomcorn dealers in Lindsay, Oklahoma, and Wichita, Kansas, were interviewed during the spring of 1957. Six broom manufacturers in Oklahoma and three in Texas were interviewed early in 1957, with most of the study being limited to the firms in Oklahoma.

Information relating to production and marketing practices, storage, grades, and prices was obtained in all these surveys. Data on production and prices published by the United States Department of Agriculture and by other public agencies were used in a statistical analysis of prices and production since 1929.

Production and Price Situation in Oklahoma

Production in Oklahoma

Oklahoma's share of the national production of broomcorn brush has varied widely from year to year since 1925 (Figure 1). However, the trends indicate that Oklahoma produced above 30 percent of the nation's supply of brush from 1925 through 1935. During the decade 1936-45, the average fell below 30 percent.

[1] Luther Tweeten, W. B. Back, and Kenneth Tefertiller, *Costs and Returns in Broomcorn and Alternative Crop Production, Southcentral Oklahoma*, Oklahoma Agricultural Experiment Station Publication P-308, November, 1958.

Since 1945, the state's share of the national production has increased. Further increases may be expected if current trends continue. Oklahoma was the leading producer during 1950 to 1956.

Ninety-five percent of Oklahoma's production of broomcorn is in 17 of the state's 77 counties. The counties divide geographically into two broomcorn growing areas. The southcentral area comprises Garvin, Grady, McClain, Caddo, and Stephens counties. The northwestern area includes 12 counties: Cimarron, Texas, Beaver, Harper, Woods, Ellis, Woodward, Major, Dewey, Custer, Roger Mills, and Beckham.

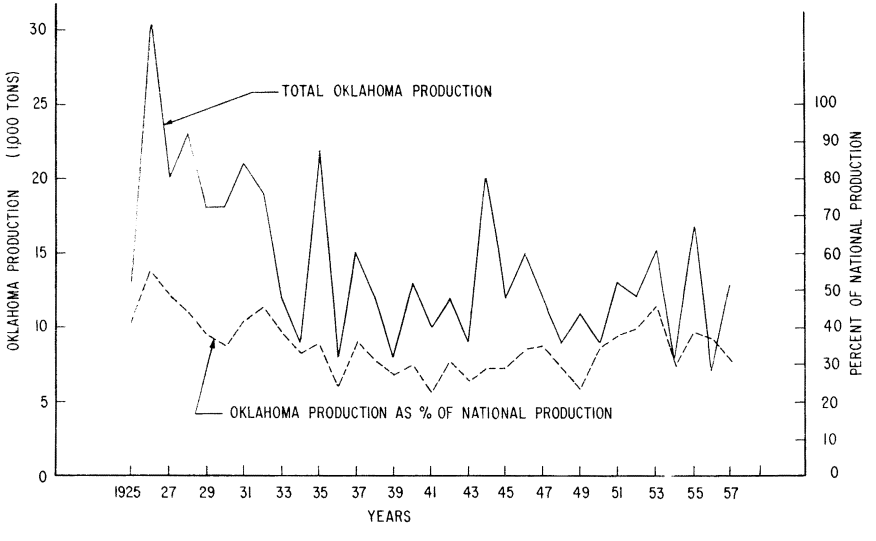

Figure 1.—Trends in Oklahoma's broomcorn production and share of the national production, 1925-1957.

Trends in Production

In 1929, the acreage in the northwest was more than double the acreage in the southcentral area (Figure 2). A large decline in acreage occurred in the northwestern area from 1929 to 1939. The expansion of wheat and grain sorghum production contributed to the decline.

A gradual increase followed. Production increase after 1949 in western Oklahoma was due mainly to the development of some diverted wheat land back to broomcorn production.

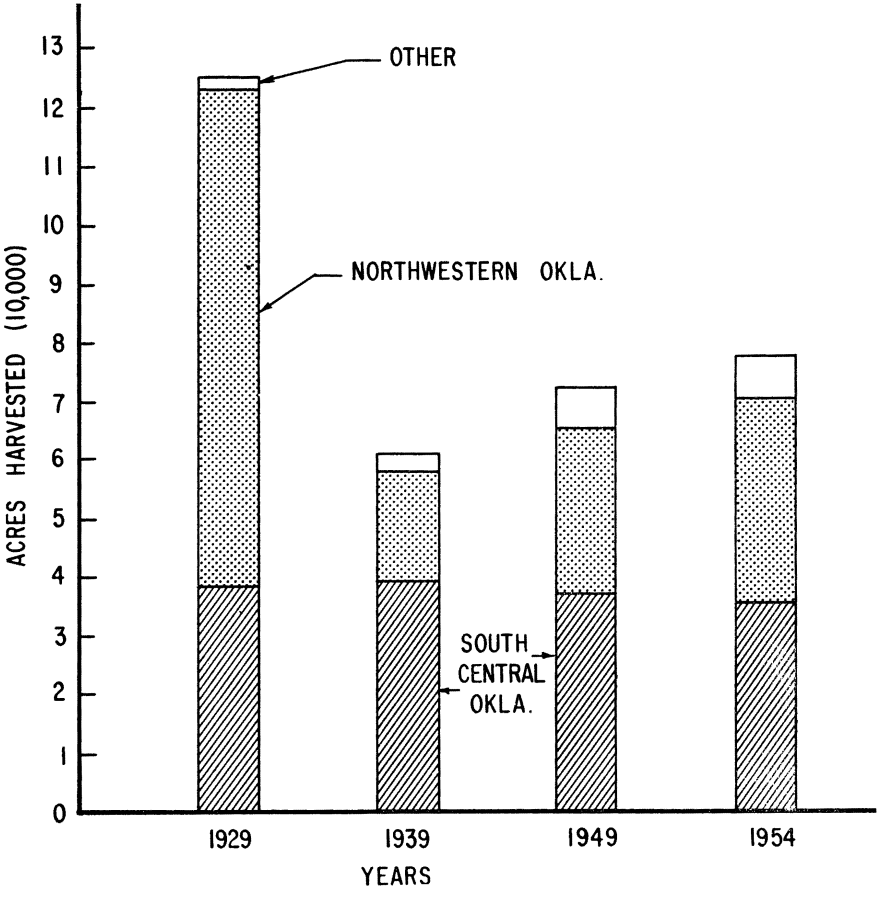

Figure 2.—Trends in harvested acres of broomcorn in major producing areas of Oklahoma, 1939-1954.

Production in the southcentral area remained nearly stable throughout the period, varying slightly from year to year. By 1954, acreages in the two major production areas were about equal.

A slight upward trend in acreage outside the major producing areas of the state occurred after 1940, though it still remained small. The trend in broomcorn production in the state depicts mainly the influence of variability in acreage in the northwestern counties (Figure 3).

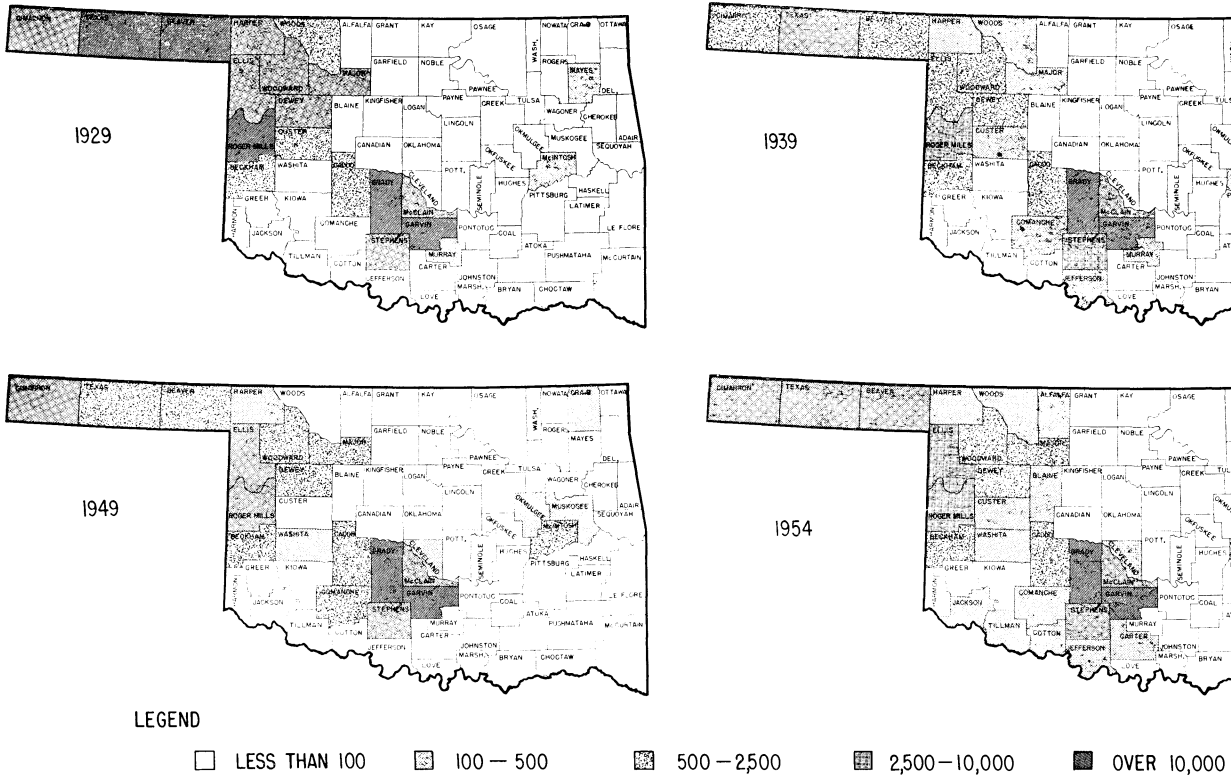

Figure 3.—Harvested acres of broomcorn by counties in Oklahoma, 1929-1954.

In the southcentral area, 8 to 12 percent of the farmers grew broomcorn in the census years, 1929-54. The range was 3 to 10 percent in the northwestern counties. Although the acreage of broomcorn per grower increased after 1939 in both areas, production did not increase in the southcentral area because of the decrease in number of farmers growing the crop (Figures 4 and 5). A small increase in production was noted in the northwestern area due to a gradual increase of the number of growers.

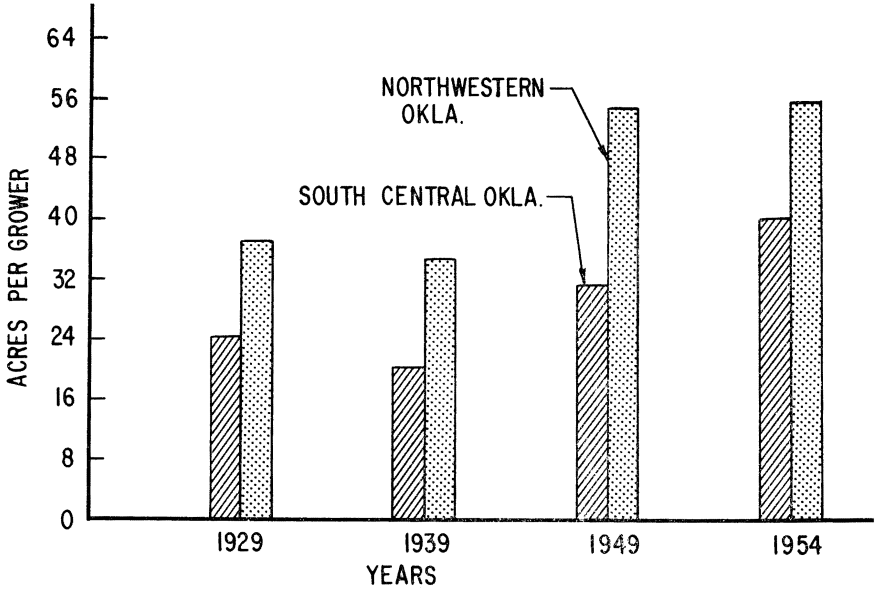

Figure 4.—Trends in number of acres of broomcorn per grower in Southcentral and Northwestern Oklahoma, 1929-1954.

Trends in Prices

Average annual prices paid farmers for broomcorn tend to vary inversely with production (Figures 6 and 7). There has been a tendency for years of high price and low production to be followed by years of low price and high production. Some of the variability in production arises from variability in yields per acre, but the major changes occur from changes in acres planted.

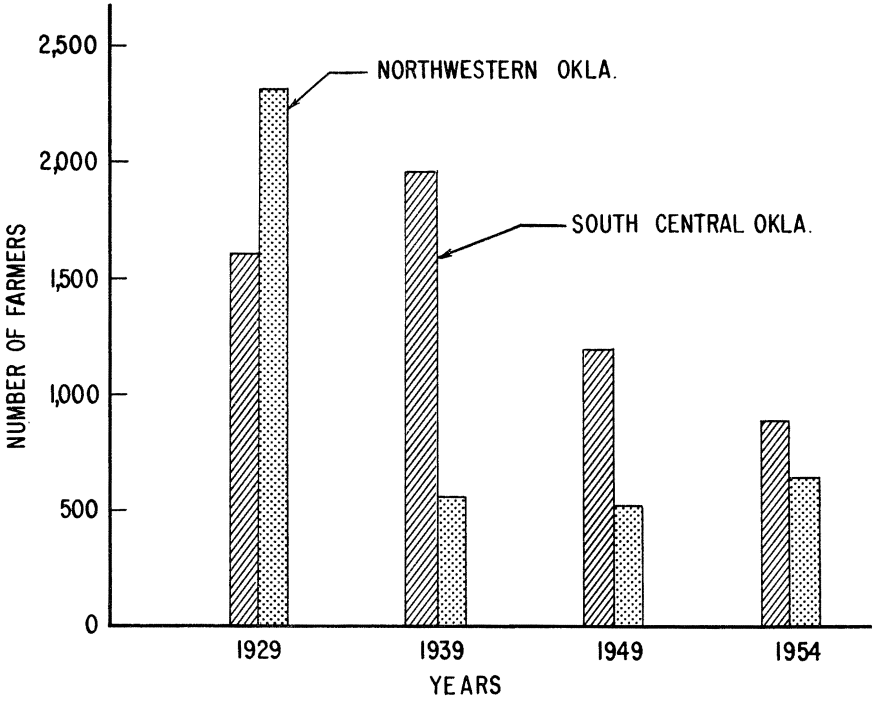

Figure 5.—Trends in number of farmers growing broomcorn in South-central and Northwestern Oklahoma, 1929-1954.

There has been an upward trend in "real" prices paid farmers for broomcorn brush since 1940. This correlated with a slight upward trend in acreage planted since that date. "Real" prices were actual prices adjusted for changes in the purchasing power of the dollar to farmers.

Average annual prices received by Oklahoma farmers for broomcorn brush varied more than did the price of many other field crops produced in the state from 1929 to 1955. For example, in this period, the annual variation in prices according to one measure was as follows: Broomcorn, 38 percent; corn, 30 percent; grain sorghum, 30 percent; cotton, 28 percent; oats, 27 percent; wheat, 24 percent; and alfalfa, 21 percent.[2]

[2] The percentage variation is the computed coefficient of variation.

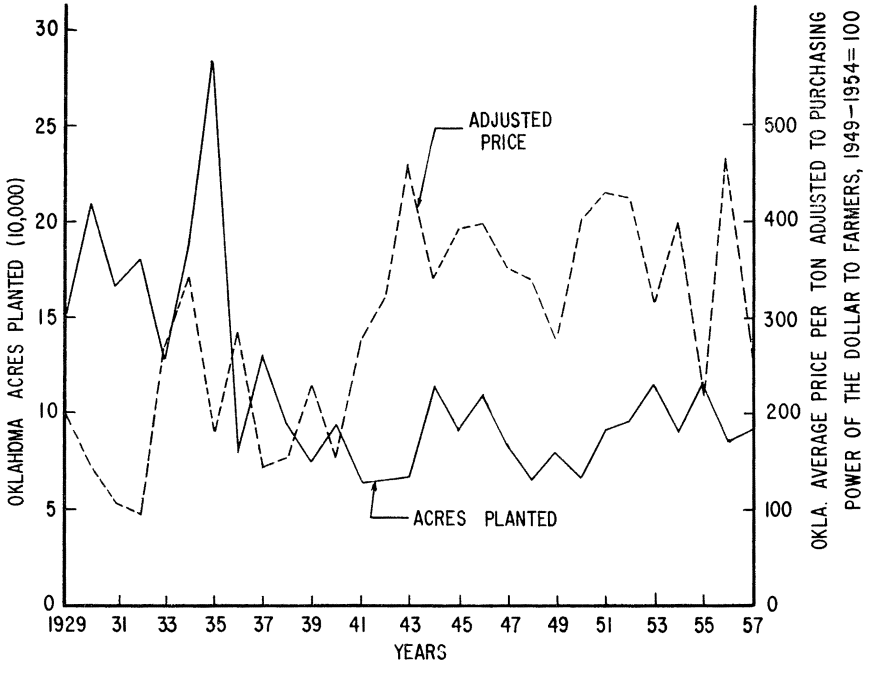

Figure 6.—Trends in prices and acres planted of broomcorn in Oklahoma, 1929-1957.

Consequences of Price Variability

The high degree of instability in year-to-year price for broomcorn has several unfavorable consequences to growers. First, if a low price is received for the crop, returns may be less than costs, and net losses may occur.

Second, in a low-price year, loss of income will occur through the use of acreage for broomcorn production instead of more profitable alternative crops. Similarly, in a high-price year, loss of income will

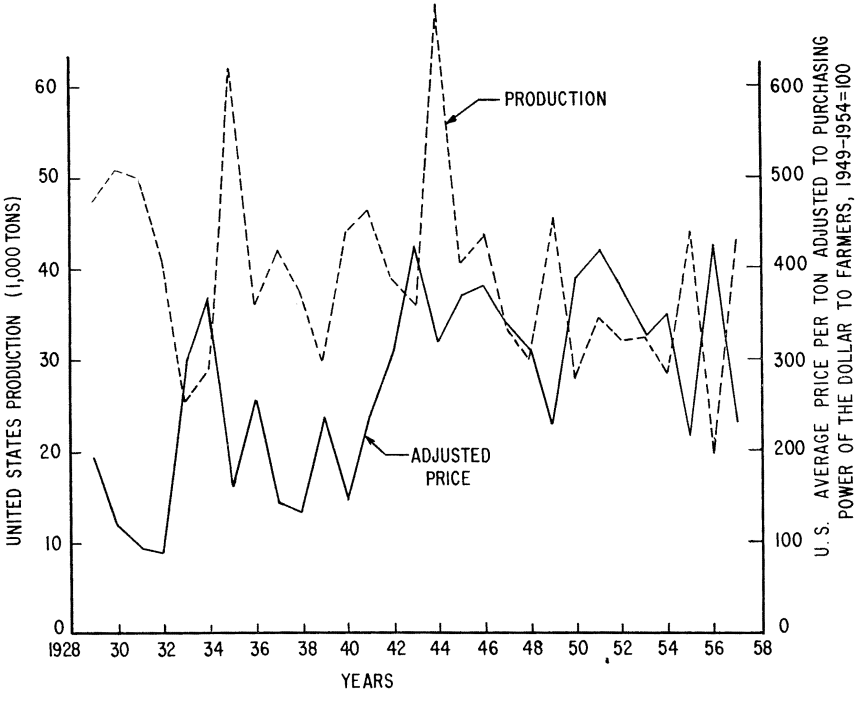

Figure 7.—Trends in production and prices of broomcorn in the United States, 1929-1957.*

be felt in acreage devoted to other crops that could have been used more profitably in broomcorn production.

A third consequence is the accompanying reluctance of farmers to make investments in machinery and facilities which would reduce production costs. Little change in methods of producing broomcorn have occurred in the last 25 years.

* 1957 estimates are preliminary.

Characteristics of the Industry

Broomcorn Dealers

About 15 to 20 dealers handle most of the nation's supply of brush. Wichita, Kansas, is the major center of operation for dealers in the United States, with dealers in that city handling more than 60 percent of the brush produced domestically.

Lindsay is the major marketing center in Oklahoma. Dealer warehouses for storing Oklahoma produced brush are located both in Lindsay and Wichita. The 15 dealers interviewed had a total storage capacity of 1,450 carloads or approximately 18,000 tons. The dealers use their storage facilities mainly as centers for accumulating brush purchased from farmers, and in general, they have large stocks on hand only during short periods following the marketing season.

Manufacturing Firms

Employment and investment per broom factory in the nation are larger on the average than those in Oklahoma. The 13 Oklahoma manufacturers interviewed employ an average of 16 men while operating at full capacity. They have an average investment of $15,000 in buildings and machinery.

These 13 factories turn out an average of 58 dozen brooms per day, with the output of individual factories ranging from 25 to 125 dozen brooms.

The three principal types of brooms manufactured are whisk, parlor, and warehouse. About 80 percent of the Oklahoma production is the parlor type. The other 20 percent is mainly the warehouse type of broom.

Oklahoma manufacturers estimate their cost of production in the range of $9.00 to $12.00 per dozen brooms. From 40 to 50 percent of

this cost is for the broomcorn brush. Currently, the Oklahoma manufacturers believe the present and prospective price-cost relations do not favor expansion of broom manufacturing in the state.

Operating Practices in the Industry

Broomcorn is grown and marketed without any administrative controls or regulations by government, and without organizations within the industry to limit the decision-making freedom of the individual participants. The operating practices relating to marketing, therefore, arise from conditions broadly associated with free enterprise and from conditions associated with characteristics of the product.

Marketing Practices of Farmers

Storage of brush on farms for extended periods is not a common practice. Only 11 of the 38 farmers interviewed had experienced on-farm storage of broomcorn past the period of the regular seasonal operation of the farmer-dealer market.

One reason for the insignificance of on-farm storage is the immediate need by farmers for means of paying the cash harvesting costs ranging from $125 to $175 per ton. The risk associated with future price and lack of adequate storage facilities are other reasons why farmers do not store brush.

Some broomcorn growers sell their crops prior to completion of harvesting. Generally, this occurs most frequently during years when competition among dealers for brush in short supply brings about earlier marketing by farmers.

The transaction between the dealers and farmers usually takes place on the farm. About 82 percent of the 1955 crop was sold on the farm. The remainder of this crop was transported by farmers to Lindsay and sold there to the dealer offering the highest price.

Practices of Dealers

During the years 1954-56, about 50 percent of the dealer purchases from farmers were on "order" from manufacturers, with dealers receiving a commission of about $15 per ton for handling these purchases. Thus, in this three-year period, dealers stored in their own warehouses just half of the crops for later sales to manufacturers.

The "order" buying by manufacturers occurs most frequently in years of short supply of brush or of particular kinds of brush. This practice is related to the early selling by farmers to dealers.

The greatest volume of sales from dealers to manufacturers occurs during and soon after the market transactions with farmers. Dealers interviewed indicated that, in the period 1954-56, they had sold about 90 percent of the preceding year's crop by July 1. The size of that crop made little difference in the volume of their carryover past July 1.

Dealers estimate the total quantity to come on the market by obtaining information on seed sales and growing conditions in the production areas and by observing the crop in the pre-harvest period. Although the dealers believe they can estimate the size of the crop prior to the opening day of the market within 90-95 percent of the actual size, none indicated they could estimate the *quality* of the crop to any usable degree of accuracy until after the market season opened.

Grades and Standards

The concepts of grades vary slightly among manufacturers due to the different types of brooms they produce, and to differences among manufacturers in specifications for brooms within the same types. This variation among manufacturers in concepts of grades provides a major barrier to the development of universal standards in grade and quality of broomcorn.

This variation also accounts in part for the general practice by

manufacturers of purchasing broomcorn brush from the same dealer year after year. Continuity in purchases from the same dealer year after year provides a basis for mutual understanding between dealer and manufacturer on grades and standards.

Practices of Manufacturers

Manufacturers buy heavily during and immediately after the farmer-dealer market season and carry over brush from one crop year to the next. The Oklahoma manufacturers interviewed had an average storage capacity for 77 tons of brush. These manufacturers had completed more than 90 percent of their purchasing of the 1955 crop by January 1. They carried over an average of 33 tons per manufacturer of this crop past the opening of the 1956 marketing season.

Manufacturers indicated that the degree to which they used their storage facilities for brush depended upon the price of brush, their expectations of the new crop, and a "rule of thumb" practice of having at least 10 tons but no more than a year's supply on hand at all times.

Carryover by dealers and farmers is insufficient to provide an even year-to-year flow of brush to manufacturers. However, available information indicates the volume of brooms manufactured and sold varies little from year to year. Thus, manufacturers accept the major responsibility for storage of brush to smooth out the annual variation in supply.

Available information also indicates that the manufacturers absorbed most of the annual variation in prices for brush. This conclusion is based upon the fact that variation in prices paid for brush by Oklahoma manufacturers from year to year did not differ significantly from the degree of price variation experienced by farmers. However, prices received by manufacturers for brooms varied little from year to year. Most of the manufacturers interviewed indicated they did not vary their production greatly among years of different crop sizes.

Analysis of the Variation in Annual Prices

Possible Factors Affecting Prices

Five possible sources of the unusually high degree of variation in average annual prices paid farmers for broomcorn are: (1) Variation in year-to-year production of brooms, and consequently, a year-to-year change in demand for brush; (2) inaccurate estimates of demand and supply conditions by participants in the industry; (3) a sensitive demand relation such, that changes in production induce larger percentage changes in price;[3] (4) a production response relation highly sensitive to price changes;[4] and, (5) combinations of conditions relating to practices in manufacturing brooms, characteristics of demand, inaccuracy in estimating demand and supply, or the nature of the response of farmers to price changes.

The information obtained from manufacturers and dealers indicated the first and second possible sources of price variation were not sufficiently important to account for the existing high degree of variability in prices for brush. Therefore, the analysis of the annual variation paid farmers for brush was mainly in determining the nature of demand and the production response of farmers to price changes. This analysis required the estimation of demand and supply relationships in the farmer-dealer market.

Nature of Demand

For estimating the nature of demand, annual data for the nation during the period 1929-55 were assembled on production, prices, income, population, exports and imports of broomcorn brush, and production of vacuum cleaners.[5]

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[3] In technical terminology, an enelastic demand.

[4] This possible source of price variation relates to year-to-year shifts in the supply function accompanying changing prices. In the literature of economics, this hypothesis is called the Cobweb Theorem.

[5] Only those variables contributing a significant effect on prices were used in the estimation equation. A "constructed" carryover variable and the annual net imports of brush were excluded when found to be non-significant in the explanation of prices.

Prices paid farmers for broomcorn and incomes of the people were adjusted to a purchasing power of the dollar in the 1948-54 period.[6] How this relation shifted as a result of changes in income per capita in the United States and changes in production of vacuum cleaners also was estimated.[7]

The results indicated that an increase or decrease in production from an average-sized crop changed price, in the opposite direction, by about the same percentage as the percentage change in production (Figure 8).

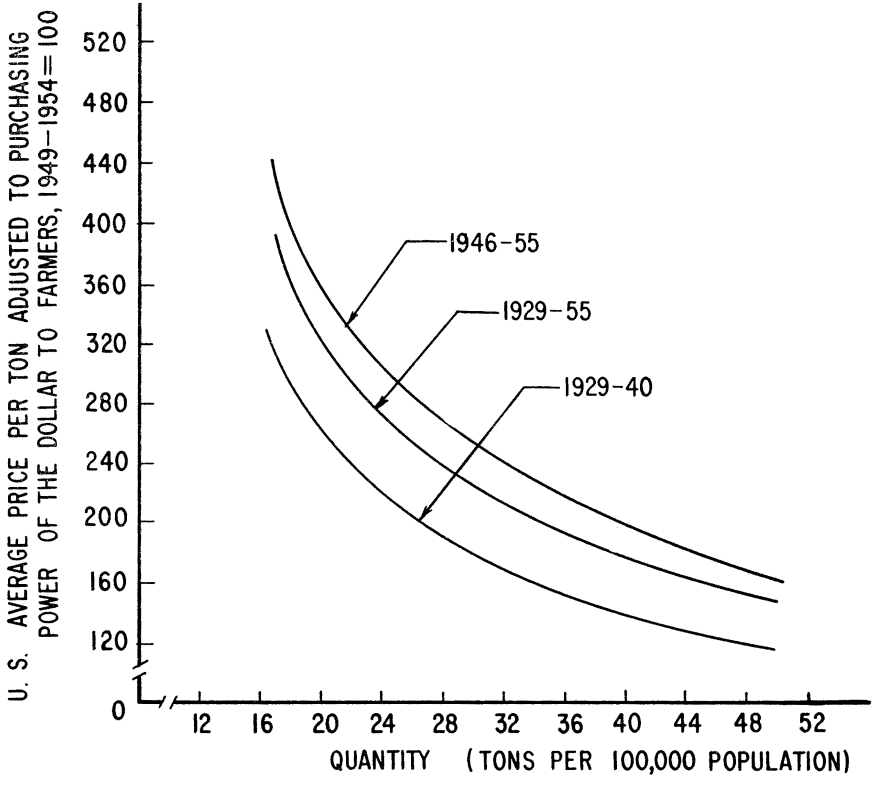

Figure 8.—Estimated demand for broomcorn in the farm market, United States, 1929-1955.

[6] A prices paid by farmers index (parity ratio) was used to adjust broomcorn prices; a consumer price index was used to adjust income per capita.

[7] The general demand function obtained was: $P_t = -9.95\ Q_t^{-.91}\ I_t^{1.96}\ V_{t-1}^{-.69}$ where P_t was price, Q_t was U. S. production per 100,000 population. It was income per 100,000 population, and V_{t-1} was units of vacuum cleaners produced per 100,000 population in the preceding year. R^2 was .74. Estimated elasticity of demand was -1.10. All coefficients were statistically significant at the one percent level of probability.

This demand relation also has shifted to reflect higher "real" prices paid for broomcorn in the post-war period as compared with the pre-war period. This shift in demand relation does not reflect the trend in consumption of brooms because adjustments in production over the 26-year period have contributed to the increased "real" prices paid farmers for brush.

Estimates made of the demand relation for many other farm products with a high degree of price variation differ from the results of the analysis of broomcorn. In general, these estimates for other farm products indicate changes in production induce larger percentage changes in price.[8]

Thus, the nature of the demand relation may be important in explaining the high degree of price variability for many crops. Other explanations are needed for the high degree of variation in broomcorn prices. An explanation of why farmers make large year-to-year changes in production could produce the answer.

Annual Variation in Production

Several trial analyses with different sets of variables were made in an effort to determine what factors were relevant in determining the variation of broomcorn production.

The set of variables providing the best explanation of production decisions by broomcorn growers in Oklahoma was composed of the following: (1) adjusted average prices of broomcorn received by farmers in the preceding crop year, (2) the average yield of broomcorn in Oklahoma in the preceding year, (3) the average of the indices of adjusted prices for cash crop alternatives to broomcorn in the preceding year, and (4) time, in years.

These variables explained 84 percent of the annual variation in

[8] Cf. Schultz, Theodore W., *The Economic Organization of Agriculture*, New York, 1953, Chapter V.

acres planted to broomcorn in Oklahoma from 1930 to 1935.[9] The time variable accounted for about 40 percent of this explanation. Time depicted the trend in acreage of broomcorn planted in Oklahoma in the period of the study.

Year-to-year variation in the acreage planted after adjusting for trend was the phenomenon of major importance to explain. This variation was associated with yield and price of broomcorn and prices of other cash crops in the preceding year.

The striking feature in the results was the high degree of variability in acres planted accounted for by price and yield conditions during the preceding year. After adjusting for trend, these variables explained about three-fourths of the remaining variation.

Broomcorn prices are inversely related to production. Cyclical fluctuations in production generate cyclical fluctuations in prices. The near regularity of the cycle indicates farmers in other major broomcorn growing areas are also influenced by preceding year yield and price conditions in making their planting decisions.

Within-Year Price Variation

Although the annual price variability is of most concern to farmers, the within-year changes in prices are also of concern. However, due to the lack of data, the within-year price variability for brush has not been studied.

In general, this variation arises mainly from two sources: (1) The imperfect knowledge of demand and supply conditions possessed by participants in the industry when the market opens, and (2) improvements in this knowledge as the marketing season progresses.

[9] The general supply relation obtained was $A_t = 4.21\ P_{t-1}^{.97}\ O_{t-1}^{-1.03}\ Y_{t-1}^{-.85}\ T_t^{.42}$ where A_t was acres planted, P_{t-1} was adjusted average price of broomcorn brush in the preceding year, O_{t-1} was average index of adjusted prices of competing cash crops in the preceding year, Y_{t-1} was average yield of broomcorn brush in the preceding year, and T_t was time in years. All the coefficients to the variables were statistically significant at the one percent level of probability.

Alternatives for Reducing Price Variability

Apparently, stability of broomcorn prices could be increased by increasing stability of production. Some possible alternatives are: (1) Price and production controls administered by government, (2) production controls administered within the industry, (3) improvement in informational services to producers in the period immediately before planting decisions are made, and (4) a storage program, administered within the industry or by a public agency, to stabilize the year-to-year flow of brush marketed by farmers.

Major changes in the organization and practices within the broomcorn industry would be necessary for establishing some of these measures. Many difficult problems would be associated with such changes.

The objective of this study was not to ascertain which of these alternatives warranted development into operating procedures and trial. However, the results of this study provide a basis for further study of the possibilities.

Summary

Oklahoma farmers receive an average income of four to five million dollars per year from broomcorn. The crop is grown commercially mainly in the southcentral and northwest counties of the state.

A major economic problem of broomcorn growers is associated with the large year-to-year variation in prices received for the brush. In some years, prices are too low for farmers to realize returns above harvesting costs for much of the acreage in the state.

The unusually high degree of variability in prices from year to year is due mainly to large year-to-year changes in production. In turn, the production decisions by farmers are based primarily upon prices received for the preceding year's crop.

Thus, a two-year production-price cycle is generated, and this cycle explains the tendency for high and low prices for brush to occur in alternating years.