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# EFFECTS OF THE USDA CORN STORAGE PROGRAM ON CORN CARRYOVER STOCKS AND CORN UTILIZATION

BY GEOFFREY SHEPHERD AND ALLEN RICHARDS

Agricultural Experiment Stations of  
Illinois                    Minnesota  
Indiana                    Missouri  
Iowa                        Nebraska  
Kansas                     North Dakota  
Kentucky                  Ohio  
Michigan                   South Dakota  
                                Wisconsin  
and United States Department of  
Agriculture cooperating



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IOWA AGRICULTURAL EXPERIMENT STATION

IOWA STATE COLLEGE

AMES, IOWA



## FOREWORD

Agricultural policies affecting farm prices and incomes as well as programs to implement these policies are subjects of great concern to farmers and also to the general public. The issues involved are controversial and subject to lively debate. Many statements, papers and publications have dealt with these issues. All too often these have been based on subjective opinions, prejudices and emotions, with little regard for basic facts and relationships.

Agricultural policy, as a subject-matter area, is amenable to research. Policy research is related to, and depends in part on, research in such areas as price analysis, farm management and agricultural adjustments. However, the purposes and orientation of policy research are different.

In 1952 the directors of the agricultural experiment stations in the North Central Region took action to initiate regional research in this important subject-matter area. A technical committee consisting of a representative from each agricultural experiment station in the North Central Region was organized. A program of research was developed which, in its initial phases, was to investigate policies and programs affecting commodities important to the region. These included wheat, dairy products, corn, hogs, beef cattle and poultry products.

This publication is the first regional bulletin to be published from this project. It has been de-

veloped through a subcommittee in charge of the corn policy subproject consisting of the representatives from the states of Iowa, Illinois, Indiana and Missouri. Additional regional bulletins are expected to be published as the work of the technical committee progresses.

The following persons have served on the technical committee:

E. J. Working, Illinois  
\*Vincent I. West, Illinois  
\*J. C. Bottum, Indiana  
\*Geoffrey S. Shepherd, Iowa  
George Montgomery, Kansas  
James O. Bray, Kansas  
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Willard W. Cochrane, Minnesota  
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## PREFACE

This is the first report from the corn subcommittee of the North Central Regional Research Committee on Agricultural Price Policy, under project NCM-11.

Research men are naturally inclined to work their data over with meticulous care and delay publication until all their results can be shown in relation to each other in a comprehensive report. The subcommittee believes, however, that this is not the best way to proceed with the corn study and get the results of the research out into public use. The corn program is so big and diverse that it has to be broken down into manageable parts for analysis. The results of these analyses can then be published in a series of studies, each one dealing with a limited part of the field and published as soon as it is ready.

Accordingly, we are planning to conduct the study a step at a time and to publish the results of the research on the effects of the USDA corn program on producers, marketing agencies and consumers, in a series of separate reports, each report dealing with one part of the whole study. Each one of these reports will be published when it is ready, while the work on the later topics is still proceeding. Each report, therefore, will be

a progress report, subject to revision if subsequent work shows that this is necessary.

The preliminary titles of this prospective series of reports are listed below. The present report is the first of the series.

1. Effects of the corn storage program on corn carryover stocks and corn utilization.
2. Effects of the corn storage program on corn prices and livestock production.
3. Effects of the corn acreage control program on corn and other feeds production.
4. Effects of the corn program on producer's and distributor's incomes and consumers' satisfaction.
5. Effects of the corn program on grain distributors and processors.

A final report will be published eventually, revising and summarizing these progress reports and pulling them together in a comprehensive report covering the corn program as a whole, including a discussion of the estimated effects of alternative programs.

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## SUMMARY

This report analyzes the effects of the USDA stabilization program on corn year-end carryover stocks and corn utilization. It also presents data on the cost of the program to the USDA.

The objectives of the program were to stabilize corn and other feed grain utilization and prices and to raise the long-run level of those prices. In pursuit of these objectives, a program of non-recourse loans to farmers on corn sealed in cribs on their farms was undertaken, supplemented later by provisions for purchase agreements and loans stored in commercial warehouses. This stabilization program was backed up in some years by acreage control programs designed to reduce corn production.

The "total realized cost" of the corn price and production programs to the USDA from 1932 to 1955 was \$1.3 billion. Most of this consisted of payments under the acreage control program; the cost of the CCC price-support storage operations was only \$227 million. Most of this cost was incurred in fiscal 1954 and 1955, when storage stocks were larger than in earlier years. On the basis of the 1955-56 program, it is likely that the cost of CCC corn storage operations in the future will run at about \$100 million per year. If the soil bank program is effective in reducing corn production, that may reduce the size of the stocks and thus reduce the cost of the storage operations.

### EFFECTS ON CORN STOCKS

The size of the total year-end (Oct. 1) carryover stocks of corn has increased over the past 30 years, reaching a peak of 1.2 billion bushels in 1956.

From 80 to 85 percent of these total stocks in 1954 and 1955 were owned or under loan by the CCC. The quantity of corn in private hands in recent years has been declining slightly. The large CCC holdings in the main are in addition to private holdings; only to a minor extent are they a displacement of private holdings.

The year-end storage stocks of corn on farms have been somewhat more concentrated in Iowa and, to a lesser extent, in the adjacent states. From the first, the CCC stocks were more heavily concentrated in Iowa and adjacent states than the farm stocks; the concentration of CCC stocks in Iowa has increased somewhat with the passage of time.

The chief factor determining the quantity of corn put under loan is the relation between the market price of corn and the corn loan rate and the size of the corn crop. The lower the market price compared with the loan rate, the more corn goes under loan. The correlation between the total supply of corn Oct. 1 and the quantity of corn put under loan is positive, but it is rather

low. The size of the corn crop is another factor that has some positive influence. The percentage of compliance may be another.

### EFFECTS ON CORN UTILIZATION

The CCC year-end carryover stocks are large at the end of a large crop year and small at the end of a small crop year. They thus absorb part of the variations in production; the year-to-year variations in corn utilization (consumption) are about half as great as the year-to-year variations in production. The CCC storage program appears to have stabilized corn supplies (corn utilization) about 50 percent.

### SIZE OF STORAGE STOCKS NEEDED FOR STABILIZATION PURPOSES

On a purely physical basis, stabilization (year-end carryover) stocks of about 1.1 billion bushels would be needed to stabilize the market supplies of corn completely against year-to-year variations in corn utilization.

Variations in the demand for corn are more difficult to cope with, since they usually vary over longer and less predictable periods of time than year-to-year variations in production. But if it is deemed desirable to use storage operations to meet variations in demand for corn with corresponding variations in market supplies, during the first year before corn production has time to respond to an increase in demand, additional stocks of perhaps 400 million bushels might be sufficient for this purpose. The total stocks then would be 1.5 billion bushels.

Under the existing loan program, complete stabilization of corn consumption is not likely to be attained, because there is some flexibility in the loan rates and because corn prices decline some distance below the loan rates before farmers put much corn under loan and let the CCC take it over. In actual practice, storage stocks are not likely to reach the 1.5 billion figure needed for complete stabilization. The size of stocks actually attained is more likely to be about 1 billion bushels.

The Agricultural Act of 1949 set up a table of loan rates that varied inversely but less than proportionally with total corn supplies (production plus stocks). This provided some automatic safeguard against storage stocks becoming larger than needed for stabilization purposes. A still more effective safeguard against stocks becoming too small as well as too large might be provided if the loan rates were constant when total supplies ranged from 3.6 to 4.2 billion bushels, but varied inversely and proportionately with total supplies above and below that range.



# Effects of the USDA Corn Storage Program on Corn Carryover Stocks and Corn Utilization

BY GEOFFREY SHEPHERD AND ALLEN RICHARDS

Free market prices for farm products were the regulators of agricultural production and consumption in the United States until about the end of the 1920's. They did their work impersonally and, in the main, effectively. The prices of farm products fluctuated widely from season to season, from year to year and from peak to trough of industrial activity, but they generally cleared the market. Through thick and thin—large crops and small crops, strong demand and weak demand—farm products kept moving through from producer to consumer under the guiding influence of varying free market prices.

But this performed only one part of the function of prices. Variations in prices were wide and rapid enough to keep farm products moving into consumption in quantities that were in line with production, but they were too wide and rapid and erratic to perform their second function well—to serve as reliable guides to producers. In addition, prices exercised another one of their functions—allocation of income to producers—with undue harshness because of the inelasticity of the supply responses of agricultural producers.

In a period of strong demand, for example, high prices would stimulate increased seeding, breeding and feeding; yet, in many cases, by the time the product arrived at the market, demand had weakened and prices had fallen. Variations in supply were similarly erratic. Sometimes the weather would be good, and crops would be large; at other times, bad weather might cut the size of the crop in half. Sometimes a period of bumper crops would coincide with a period of weak demand, and vice versa.

These variations in prices regulated the flow of farm products to consumers, but they were confusing to producers. Farmers could not plan their production programs accurately, nor tell beforehand how they were going to come out on their operations by the end of the year. Some livestock producers tried to maintain the same livestock program year in and year out, leaving a margin of safety for protection against unpredictable fluctuations in prices. Others—"inner and outer's"—tried to guess what changes were coming and often guessed wrong. Sometimes large crops were produced when small crops were

wanted, and vice versa. Free market prices were unable to keep the production of agricultural products constant from year to year when the demand was constant, nor changing in the right direction and the right amounts when the demand changed.

The variations in prices that result chiefly from variations in general demand are well reflected in fig. 1, which shows the prices received and prices paid by farmers from 1910 to date.

## VARIATIONS IN CORN AND OTHER FEEDS PRODUCTION

The variations in prices that result from variations in supply differ from crop to crop. This report deals primarily with corn and the other feed crops.

The nature and extent of the variations in the production of corn and the other feed crops is shown in table 1 and fig. 2.

This table and chart clearly show the overwhelming importance of corn in total feed grain production.

The greatest change in corn production from one year to the next took place from 1947 to 1948, when production increased more than 1.3 billion

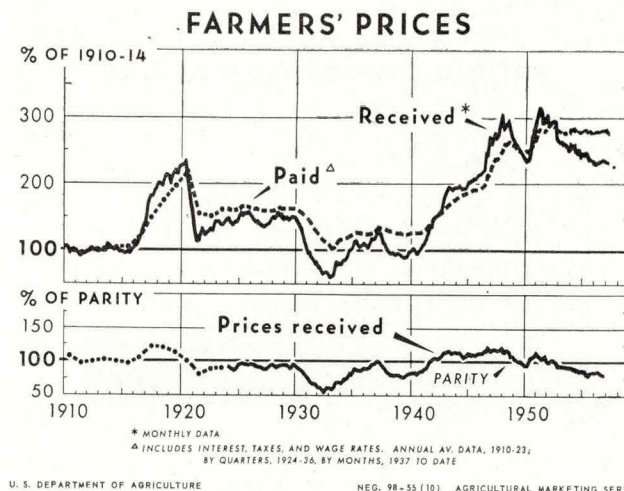


Fig. 1. Prices received and prices paid by farmers in the United States 1910-56. The lower section of the chart shows the percentages that prices received were of parity prices.



TABLE 1. FEED GRAINS: PRODUCTION, UNITED STATES, 1920-55. (million tons)

Year	Corn*	Oats	Barley	All sorghum for grain
1920	85.9	23.1	4.1	2.5
1921	81.9	16.7	3.1	2.0
1922	75.8	18.3	3.6	1.4
1923	80.5	19.6	3.8	1.7
1924	62.2	22.5	3.9	1.7
1925	78.3	22.4	4.6	1.6
1926	71.3	18.4	4.0	2.0
1927	73.3	17.5	5.7	2.3
1928	74.6	21.0	7.9	2.2
1929	70.5	17.8	6.7	1.4
1930	58.2	20.4	7.2	1.1
1931	72.1	18.0	4.8	2.0
1932	82.0	20.1	7.2	1.9
1933	67.1	11.8	3.7	1.5
1934	40.6	8.7	2.8	0.5
1935	64.4	19.4	6.9	1.6
1936	42.2	12.7	3.5	0.8
1937	74.0	18.8	5.3	2.0
1938	71.4	17.4	6.1	1.9
1939	72.3	15.3	6.7	1.5
1940	68.8	19.9	7.5	2.4
1941	74.3	18.9	8.7	3.2
1942	85.9	21.5	10.3	3.1
1943	83.0	18.2	7.8	3.1
1944	86.5	18.4	6.4	5.2
1945	80.3	24.4	6.4	2.7
1946	90.1	25.6	6.3	3.0
1947	65.9	18.8	6.8	2.6
1948	100.9	23.2	7.6	3.7
1949	90.7	19.5	5.7	4.2
1950	86.1	21.9	7.3	6.5
1951	81.9	20.4	6.2	4.6
1952	92.2	19.5	5.5	2.5
1953	89.4	18.5	5.9	3.2
1954	85.6	22.5	9.1	6.6
1955	90.8	24.0	9.6	6.8
1956†	91.5	18.3	8.3	6.0

\* Production for all purposes.  
 † Preliminary. July 1956 estimate.

Source: U. S. Dept. Agr. Grain and feed statistics through 1954. U. S. Dept. Agr. Stat. Bul. 159, March 1955, p. 3; and U. S. Dept. Agr., Agricultural Marketing Service. The feed situation. July 1956, p. 5.

bushels. The variations resulting from the drouth years of the 1930's were almost as great. "Year-to-year changes in United States corn production during the past 30 years (1919-1948) averaged 408 million bushels, or about 15 percent of the average production for the period (2,635 million bushels)."<sup>1</sup>

1 U. S. Dept. Agr., Bureau of Agricultural Economics. The feed situation. December 1948. p. 11

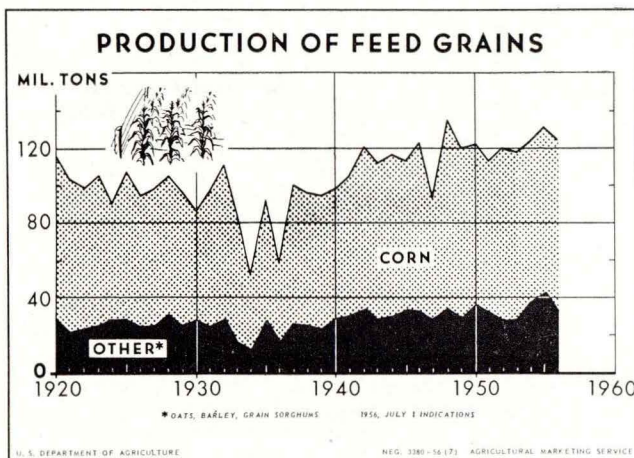


Fig. 2. Production of corn and other feed grains in the United States, annually, 1920-55.

This quotation understates the variation from a storage point of view. It deals only with differences in corn production from one year to the next. A corn storage program needs to take into account more than the changes from one year to the next, since corn production occasionally changes in the same direction, or remains high or low, for 2 or 3 consecutive years. A run of two or three crops, each 10 percent above average, would show no change from year to year but would build up storage stocks.

The coefficient of variation is a standard measure that more accurately reflects the size of the storage problem. This coefficient of variation of corn production over the 30-year period from 1919 to 1948 was 14.1 percent. This means that, in a normal distribution of sizes of crops, a band ranging from 14.1 percent above average production to 14.1 percent below average production—a total range of 28.2 percent—would include 68 percent of the series of corn crops. Also, a range from  $14.1 \times 0.67 = 9.5$  percent above and below average production—a total range of 19 percent—would include 50 percent of the series of corn crops.

The production of other feed crops (principally oats) appears in fig. 2 to be less variable than corn. But this appearance is deceptive, resulting from the smaller average size of the crop. Proportionally, the coefficient of variation for oats—16.1 percent—is greater than for corn.

The variations in production cause still greater variations in prices. The demand for corn is relatively inelastic; the coefficient of elasticity is about  $-0.65$ . A change of 10 percent in production causes an opposite change of  $\frac{10}{0.65} = 15$  percent in prices. The price of corn is still more responsive to variations in production of total feed grains. The elasticity in this case is  $-0.5$ .<sup>2</sup>

Figure 3 (from Foote et al.<sup>3</sup>) shows that "the great bulk of year-to-year variation in corn production is due to variations in yield. Corn acreage is quite stable, rarely changing by more than 3 or 4 percent from one year to the next. Even acreage allotments have not caused sharp reductions in total corn acreage.

"The maximum year-to-year change in corn production due to an acreage shift has been about 200 million bushels. But yield effects exceeded 1,000 million bushels on two occasions (1936 to 1937, and 1947 to 1948) and exceeded 500 million bushels on nine occasions during the 1901-50 period.

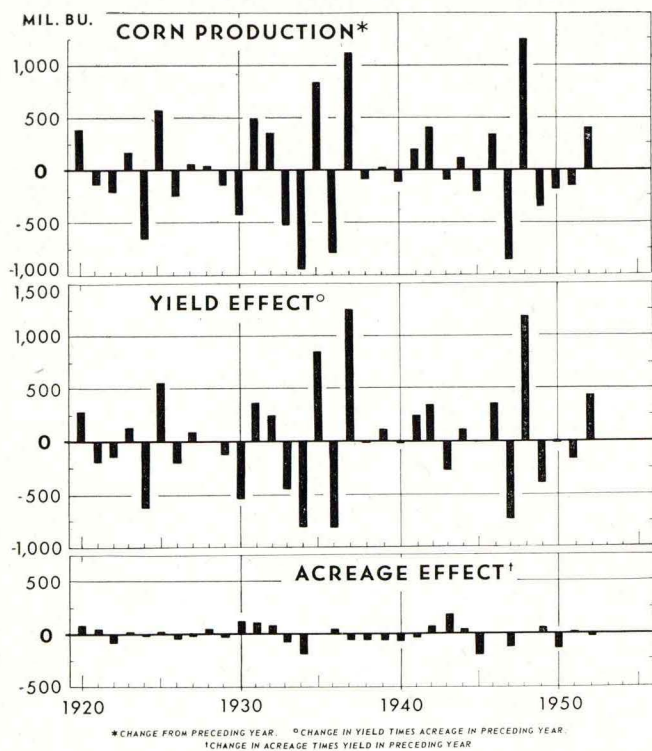
"Variations in corn yields around their normal or trend level are shown in the central section of figure 3. On three occasions during 1901-50, corn yields dropped more than 10 bushels per acre below trend. At present acreage levels, this would mean a production deficit of 800 to 900 million

2 Richard J. Foote, John W. Klein and Malcolm Clough. The demand and price structure for corn and total feed concentrates. U. S. Dept. Agr. Bul. 1061. October 1952. pp. 39-40.

3 Ibid. pp. 42 and 43.



## ACREAGE AND YIELD EFFECTS ON CORN PRODUCTION



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Fig. 3. Effects of changes in corn acreage and corn yield on corn production, United States, annually, 1920-52.

bushels. On four other occasions, yields were at least 4 bushels below trend, involving production deficits of about 350 to 600 million bushels. There were also five occasions on which corn yields exceeded their trend by at least 4 bushels, involving production excesses (above average) of about 350 to 650 million bushels. In 36 years out of 50, corn yields were within less than 4 bushels of the trend, and corn production was within less than 10 percent (about 300 million bushels) of its trend level.”<sup>4</sup>

### OBJECTIVES OF THE STABILIZATION PROGRAM

The demand that something be done about the instability of the prices of farm products became insistent during the 1920's, when violent variations in demand due to economic causes were added to the violent variations in corn and other feed production due to physical causes. Farmers became very much concerned about the drastic effects on their incomes of the decline in prices that resulted from the decline in demand after World War I. The income-allocating function of prices was more prominent in their minds than the production-guiding function.

After a sharp postwar decline in 1920, agri-

cultural prices continued to vary erratically below their prewar relation to other prices. Farmers urged that the USDA go beyond merely reporting supply, demand and the prices; they urged that it take hold of prices, smooth them out (or at least reduce their variability) and raise their level. Farm price legislation to this end was passed twice during the 1920's, but both times it was vetoed by Coolidge. In 1929 under Hoover, the Federal Farm Board was organized with a revolving fund of half a billion dollars—a large sum of money for those times.

The Board immediately proceeded to “take hold of prices.” It began stabilization operations in wheat in September 1929, and in cotton in October. At first it made loans in an attempt to keep prices at the loan levels; then it began making direct purchases at the loan levels. Thus it proceeded further than taking hold of prices; it took hold of part of the supply as well.

It could hardly have chosen a worse time. The stock market crashed in October 1929, and the deep and long industrial depression of the 1930's began. During the next 2 years, agricultural prices fell nearly 50 percent. The Federal Farm Board soon committed all of its half-billion-dollar revolving fund and lost its ability to support prices. It was terminated in May 1933.<sup>5</sup>

The Federal Farm Board not only was born at a bad time but, in addition, it had tried to stabilize the prices of cotton and wheat, two of the most difficult crops to support. Cotton and wheat are both international commodities, and their prices are set by world forces in world markets. Operations in any one country could not be expected to succeed, any more than an Iowa corn program could be expected to succeed alone in the United States.

### THE COMMODITY CREDIT CORPORATION

The Commodity Credit Corporation was organized in October 1933 to stabilize prices by storage operations. The Agricultural Adjustment Administration was set up in the same year to control production.

The CCC proceeded to do much as the Federal Farm Board had done before it. The CCC immediately made loans on cotton and corn, well above open-market levels, and began to accumulate storage stocks as the Farm Board had done.

The objective of the CCC (or “ever-normal granary,” in literary terms) was clearly stated by Henry Wallace, Secretary of Agriculture, in 1937.

“By the ever-normal granary I mean a definite system whereby supplies following years of drouth or other great calamity would be large enough to take care of the consumer, but under which the farmers would not be unduly penalized in years of favorable weather. During the past

<sup>4</sup> U. S. Dept. Agr. Long range farm program. Technical studies by the U. S. Department of Agriculture relating to selected farm price support proposals. U. S. Govt. Print. Off., Washington, D. C. 1954. p. 41.

<sup>5</sup> For a more extended account and appraisal of the Federal Farm Board operations, see: M. R. Benedict. Farm policies of the United States, 1790-1950. Twentieth Century Fund. 1953. Chs. 12ff; and G. Shepherd. Agricultural price control. Iowa State College Press, Ames, Iowa. 1945. Ch. 3.



7 years, weather, prices, and supplies have swung so violently from one extreme to the other that it is time for all thoughtful men and women, whether living on the farm or in town, to consider what action may be taken to promote greater stability.”<sup>6</sup>

The objectives of AAA were somewhat less clearly stated in the next paragraph:

“To keep the government from committing a ‘farm board’ it will be necessary after supplies under the loan program have reached a certain point to keep the granary from running over by some practical program of production adjustment. I call this part of the ever-normal granary program ‘storing the grain in the soil’ instead of ‘storing it in the bin.’ After the consumer is adequately taken care of by the building up of certain supplies, it is cheaper for the farmer, consumer, and government alike to store additional quantities in the soil rather than in the bin. If the weather is going to be unusually violent in its swings, it is necessary for man to be unusually intelligent in meeting the problem. I believe the ever-normal granary is a start.”<sup>7</sup>

This paragraph calls for “production adjustment” to keep the granary from running over. On this basis, the objective of the AAA was similar to the stabilization objective of the CCC. It merely went further and called for “storing the grain in the soil” instead of in the bin, when swings in the weather were unusually violent.

A more recent statement concurs with Wallace’s original statement of the objective of the CCC. It is more specific and names storage as a means for attaining greater stability in market supplies and prices.

“A major objective of storage policy in recent years has been to reduce fluctuations in farm prices and smooth out the flow of the main storable crops into domestic use and the foreign market. One of the basic causes of such fluctuations is the variability of crop yields and acreage. Variations in crop yields from year to year are mainly due to factors beyond human control.

“If we do not want such pronounced changes in consumption and exports as occur in crop yields or if we want greater stability in the price structure, a part of the fluctuations in production must be absorbed by storage operations.”<sup>8</sup>

It is evident from these quotations that the chief stated objective of the CCC storage program was to reduce the unpredictable year-to-year variations in the market supplies of “the main storable crops” that result from variations in production caused by year-to-year variations in the weather. In the case of corn, the smoothing out of the year-to-year variations in corn supplies was expected to have the further effect of reducing the year-to-year variations in hog production

and prices that result from year-to-year variations in corn supplies and prices.

The CCC, however, went further than “mere stabilization.” It was impressed with the importance of the income-allocating function of prices too. It, therefore, embarked on a policy of raising the level of prices over a period of years, as well as stabilizing them. The Farm Board had said in its last annual report in 1933: “Many people have thought ‘stabilization’ means to hold the price permanently higher than it would be otherwise. This cannot be done without control of production.” The CCC believed that it could profit by the Farm Board’s experience; it proceeded to set loan rates “permanently higher than they otherwise would be,” but it believed that it would be protected against the fate that had overtaken the Board, because the AAA would control production.

The importance of this second objective, raising prices over a period of years, is indicated in the 1940 annual report of the president of the CCC—the first such report to be published. In this report, the raising of prices was listed as the first of “the three fundamental functions of the (Commodity Credit) Corporation’s loan programs: Namely, to protect and increase farm prices, to stabilize farm prices, and to assure adequate supplies of farm products” (i.e., to stabilize supplies).<sup>9</sup> Thus the CCC relied on the AAA to reduce crop production below average, not merely as an emergency measure to be used as a last resort if stocks grew too large, but as a continuing feature of the program for raising prices over a period of years.

The second objective of the CCC, therefore, went beyond stabilizing prices. The second objective was to “stabilize them upward” in a whimsical phrase current at the time. This second objective, in simpler language, was to raise the long-run level of prices as well as to stabilize them. This raising of the long-run level was to be accomplished by AAA acreage controls designed to reduce acreage and production and thus support prices above long-run competitive levels.

#### OPERATIONS OF THE CCC

From October 1933, when the CCC was created, to June 30, 1948, the CCC operated under a Delaware charter. Its status as an agency of the United States was granted by statutes expiring at intervals of one or more years. Effective July 1, 1948, the Corporation was granted a Federal charter, making it a permanent agency of the United States. Public Law 344, 84th Congress, approved August 11, 1955, increased the authorized borrowing power of the Corporation (i.e., the amount outstanding at any one time) to \$12 billion.<sup>10</sup> The CCC thus was able to operate on a scale about 10 times greater than the Farm

<sup>6</sup> Henry A. Wallace, *The agricultural situation*. U. S. Dept. Agr., Bur. Agr. Econ. March 1, 1937. p. 9.

<sup>7</sup> *Ibid.*

<sup>8</sup> Reserve levels for storable farm products, a study of factors, relating to the determination of reserve levels for storable farm products. Senate Document No. 130. 1952. p. 1.

<sup>9</sup> U. S. Dept. Agr. Report of the President of the Commodity Credit Corporation. 1940. p. 4.

<sup>10</sup> On July 2, 1956, Congress raised this figure to \$14.5 billion.



Board, taking the lower purchasing power of the dollar into account.

The Farm Board, in its stabilization operations for wheat and cotton, had relied mainly on loans to cooperatives and direct purchases in the markets. The CCC operated differently. It made some commodity loans (loans on basic commodities produced by farmers) directly to farmers, but in most cases it simply underwrote commodity loans made to farmers by ordinary commercial banks who had entered into agreements with CCC. The loans were nonrecourse loans. If the market price of the crop rose above the loan rate plus interest after the loan was made, the farmer could redeem his loan and sell the crop at the higher price. But if the market price remained below the loan rate, the farmer could default on the loan and let the CCC take over the collateral, without recourse on the farmer for the difference between the loan rate and the price. The collateral then became the property of the CCC.<sup>11</sup>

<sup>11</sup> "Loans made to eligible growers on farm-stored corn are evidenced by a promissory note secured by chattel lien on the corn. Loans on warehouse-stored corn are evidenced by a promissory note secured by the warehouse receipt. These loans may be made by the Corporation direct or by private lending agencies operating under a form of lending agency agreement with the Corporation. The grower may pay off his loan at any time up to the maturity date at its face value plus accrued interest. Loans have been extended beyond their maturity dates on several crops, the grower having been given the option of resealing his corn, redeeming it, or delivering it to the Corporation in satisfaction of the loan." (U. S. Dept. Agr., Commodity Credit Corporation. Corn price-support loan operations 1933-1952. Mimeo report. p. 2.)

## LEVEL OF LOAN RATES

Up to this point, the present report has dealt with the development of the agricultural stabilization program as a whole. From this point on, the rest of the report concentrates primarily on the corn program.

Under the CCC program, loans were made on varying quantities of corn every year from 1933 on. In general, the CCC carried over from one crop year to the next quantities of corn which varied directly with the size of the crop.

Table 2 and fig. 4 show the loan rates and prices by years from 1933 to date. They also show the quantities placed under price support. Data for oats, barley and grain sorghums are given in table 3.

At first, the loans were made at moderate rates, and the severe drouths of 1934 and 1936 along with general recovery from the depression raised corn prices. Accordingly, from 1933 to 1937 the CCC had no problem of supplies accumulating on its hands. Farmers were well pleased with its operation; there was a natural and pleasant association in their minds between the CCC's operations and the rise in prices that took place during the first few years of the CCC's life.

By the latter part of 1937, however, the picture suddenly changed. In spite of acreage reductions, high yields of cotton, corn and wheat in 1937

TABLE 2. CORN: AVERAGE PRICE, SUPPORT PRICE AND QUANTITY PLACED UNDER SUPPORT 1933-55.

Year beginning October	National average loan rate		Average price November-May*	Difference†	Placed under price support			
					Loans‡	Purchase agreements	Total	Percentage of production
	(dollars per bushel)	(percentage of parity)	(dollars per bushel)	(dollars per bushel)	(million bushels)	(million bushels)	(million bushels)	(percent)
1933.....	0.45	55	0.45	0.00	268	.....	268	11.2
1934.....	0.55	65	0.83	0.28	20	.....	20	1.4
1935.....	0.45	55	0.56	0.11	31	.....	31	1.3
1936.....	0.55	66	1.06	0.51	.....	.....	.....	§
1937.....	0.50	59	0.51	0.01	61**	.....	61**	2.3
1938.....	0.57	70	0.44	-0.13	.....	.....	230	9.0
1939.....	0.57	70	0.55	-0.02	302	.....	302	11.7
1940.....	0.61	75	0.58	-0.03	103	.....	103	4.2
1941.....	0.75	85	0.74	-0.01	111	.....	111	4.2
1942.....	0.83	85	0.90	0.07	56	.....	56	1.8
1943.....	0.90	85	1.12	0.22	8	.....	8	0.3
1944.....	0.98	90	1.07	0.09	21	.....	21	0.7
1945.....	1.01	90	1.15	0.14	3	.....	3	0.1
1946.....	1.15	90	1.38	0.23	26	.....	26	0.8
1947.....	1.37	90	2.20	0.83	1	.....	1	§
1948.....	1.44	90	1.20	-0.24	355	196	551	15.3
1949.....	1.40	90	1.18	-0.22	329	58	387	11.9
1950.....	1.47	90	1.55	0.08	51	2	54	1.8
1951.....	1.57	90	1.66	0.09	25	1	26	0.9
1952.....	1.60	90	1.47	-0.13	309	108	417	12.7
1953.....	1.60	90	1.42	-0.18	369	102	471	14.8
1954.....	1.62	90	1.38	-0.24	199	59	258	8.6
1955.....	1.58	90	1.21‡‡	-0.37	338§§	27§§	366§§§	11.5§§§
1956.....	1.50	82	.....	.....	.....	.....	.....	.....

\* Average price received by farmers in period when most of the corn is placed under price support. In recent years, loans have been available from time of harvest through May.

† Average price above or below national average loan rate.

‡ Excludes purchase agreement corn placed under loan in the following year during the period 1948 to date.

§ Less than 0.05 percent.

\*\* Includes 14 million bushels of 1937 corn placed under loan for first time in 1938 under short term loan program.

†† Purchase agreements not available before 1947.

‡‡ Preliminary.

§§ Through April 15, 1956; loan period ends May 31 in most areas.

Compiled from reports of Commodity Stabilization Service.

Source of table: U. S. Dept. Agr. Agricultural outlook charts 1956. November 1955. Table 5, p. 68; U. S. Dept. Agr. Grain and feed statistics through 1954. U. S. Dept. Agr. Stat. Bul. 159. March 1955. Table 48 p. 46; and U. S. Dept. Agr., Agricultural Marketing Service. The feed situation. May 1956. p. 21.



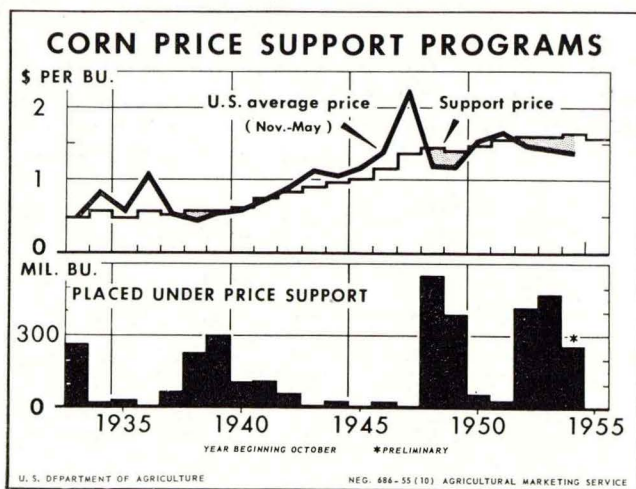


Fig. 4. United States average price of corn, loan rate (support price) and quantity of corn placed under loan (price support), annually, 1933-55.

carried the production of those products well above the average. Supplies increased and the industrial "recession" in the latter part of 1937 reduced the general demand.

The Agricultural Adjustment Act of 1938 included a formula or schedule under which the loan rate for corn was to vary inversely with the estimated total production of corn, below the basic rate of 75 percent of parity. The bottom of the range of loan rates, reached if the total production exceeded normal by more than 25 percent, was 52 percent of parity. During the next 3 years, from 1938 to 1940, the loan rates for corn were set close to the top of the range provided by this schedule. They were set at 70, 69 and 75 percent of parity, respectively.

These loan rates were high enough to cause a rapid increase in the quantities of corn put under price support. Figure 4 shows that the quantities

rose to a record 300 million bushels in 1939. By 1940, the total year-end stocks of corn Oct. 1 rose to a record high at that time of 687 million bushels.

By 1941, the CCC was heading into the same sort of trouble that had killed the Farm Board. Supplies of corn, cotton and wheat were accumulating rapidly. By the fall of 1941, the equivalent of a full crop of cotton, half a crop of wheat and a quarter of a crop of corn had accumulated in storage. Some of the cotton stocks were 7 years old. Grain storage elevators were over-burdened, and embargoes had to be applied at several terminal markets. One CCC official envisioned a complete breakdown of the corn acreage reduction and loan program by the end of 1941, because the loan rates had been set too high and by too arbitrary a formula, and because the AAA had not been able to reduce production enough to support the loan rates.<sup>12</sup>

#### WORLD WAR II AND AFTERWARDS

Then the United States entered World War II in December 1941. This changed the situation completely. The insatiable demands of war drew down the accumulated stocks. Surpluses were replaced by shortages, and rationing and price ceilings were instituted to hold down the demand.

The war and postwar boom was followed by a comparatively mild recession. Prices declined and stocks accumulated again, to higher levels this time than they had reached in 1941. But again war rescued the CCC; the military activity during the Korean conflict that broke out in 1950 stimulated an increase in demand that drew stocks down. The high level of preparedness that seemed essential in the cold war after Korea kept demand at a high level.

12 C. F. Sarle, then Director, Research Division, CCC. Private communication.

TABLE 3. OATS, BARLEY AND GRAIN SORGHUMS: PRICE SUPPORTS AND QUANTITY PLACED UNDER PRICE SUPPORT, UNITED STATES, 1940-55.\*

Crop of	Oats		Barley		Grain sorghums	
	National average price support per bushel	Placed under price support†	National average price support per bushel	Placed under price support†	National average price support per cwt.	Placed under price support†
	(dollars)	(million bushels)	(dollars)	(million bushels)	(dollars)	(million cwt.)
1940			0.35	7	0.54	
1941			0.45	16	0.71	
1942			0.55	15	0.98	
1943			0.75		1.52	
1944			0.85	3	1.70	5
1945	0.48	3	0.80	1	1.65	
1946	0.53		0.83		1.72	
1947	0.63		1.03		2.12	
1948	0.70	23	1.15	49	2.31	40
1949	0.69	41	1.09	33	2.09	84
1950	0.71	15	1.10	31	1.87	60
1951	0.72	13	1.11	17	2.17	15
1952	0.78	21	1.22	10	2.38	4
1953	0.80	56	1.24	45	2.43	45
1954	0.75	75	1.15	115	2.28	114
1955	0.61	68	0.94	96	1.78	106
1956	0.59		0.93		1.80	

\* Loan program for oats started in 1945. Loan rates on all three grains varied by counties from 1945 to date.

† Total quantity placed under loan, 1940-47, and under loan and purchase agreement, 1948 to date.

Compiled from reports of the Commodity Stabilization Service; and U. S. Dept. Agr., Agricultural Marketing Service. The feed situation. May 1956. p. 21.



After fighting ceased in Korea, corn storage stocks grew large. Corn acreage allotments were used again in 1954, 1955 and 1956, but total corn acreage was not reduced much. Production continued high, and stocks continued to accumulate. By Oct. 1, 1956, corn stocks in all positions amounted to 1.2 billion bushels, the largest in history. The average farm price of corn in December 1955 was \$1.15 per bushel, 43 cents below the loan rate. Farmers complained that the corn program was not working well; a series of House hearings held in the Corn Belt in October 1955 revealed considerable concern about the whole farm price support program. Congress passed a new agricultural act in April 1956, raising loan rates to 90 percent of parity. This bill was vetoed by President Eisenhower, and the corn loan rate for the 1956 corn crop to cooperators in the commercial corn area was set at \$1.50 per bushel but not less than 82.5 percent of the parity price at the beginning of the marketing season. This \$1.50 was 86 percent of the March 15 parity price; however, the announcement did not commit the Department of Agriculture to a support price of 86 percent of parity.

#### COSTS OF THE CORN PROGRAM

A program like the corn program involves several kinds of costs. It involves direct money costs and indirect money costs, and some costs that are difficult to measure in monetary terms—the costs of alternatives foregone, the costs in terms of utility or satisfaction borne by other producers and by consumers, etc.

A full analysis of these costs would constitute a report in itself. For the purposes of the present introduction, it is sufficient to report merely the simplest, most important and most clear-cut item of cost—the direct money cost to the USDA. Even this item involves some important matters of judgment, as we shall see.

“The direct money costs to the USDA” sounds like a clear-cut concept. But what is the direct money cost of half a billion bushels of corn under loan, which may or may not be taken over later by the CCC? And for that matter, what is the cost of half a billion bushels of corn that has been taken over? Most of it will be sold back to the market within a few years; some of it may go out of condition and have to be sold at a loss.

The solution which the USDA has come up with is the concept of “realized cost.”

“Realized cost means the net cost which has actually been incurred to date. It was adopted as the basis for the statement because (1) it is a realistic measure of the actual financial results of program operations and (2) it is a common denominator which can be applied to all programs regardless of how they are financed. It is realistic because it takes into account only those transactions which actually have an ultimate financial impact. For example, the advancing of a loan to a borrower under one of the Department’s lend-

ing programs is not considered a cost. It is regarded as an investment which will be repaid. However, the interest paid by the government on funds provided for lending purposes is considered a realized cost of the year in which it accrues. Similarly, interest collected from the borrower is included as income, or a reduction of cost. The principal amount of a loan becomes a cost only in the event the borrower defaults and the loan is written off by the Department. This example is illustrative of how the realized cost approach comprises elements of cost as distinguished from cash outlays, and how it also takes into account income or negative cost items. The realized cost basis can be applied to all programs regardless of how they are financed since, regardless of how funds are made available for carrying out a program, there is in each instance a measurable net cost of operations to date. Many of the Department’s programs are financed directly from appropriations, some activities are carried out by corporations using their corporate funds, and others are operated from revolving funds. Funds available, therefore, is not a practicable common denominator for all programs, and it likewise does not take into account income or offsetting receipts arising from operations. Realized cost does not include any element of anticipated gains or losses and, accordingly, it is not synonymous with accrued cost or accrued income and expense.”<sup>13</sup>

Keeping this definition of cost in mind, let us see what the realized cost of the CCC program has been.

#### REALIZED COST OF THE CORN PROGRAM

The official data published by the USDA show that the “realized cost of agricultural programs primarily for stabilization of prices and farm incomes,” over the fiscal years 1932-55, was \$9,819 million.<sup>14</sup> This cost is shown by commodities in table 4.

This table shows that the wheat program has cost the most of any commodity—\$2.4 billion. Cotton comes second with \$1.6 billion. Corn comes third with \$1.3 billion.

The costs of the corn program are broken down into separate items by years in table 5.<sup>15</sup> This table shows that the largest item of cost in the corn program was the acreage control program. Parity payments came second. The cost of the storage program was comparatively small; the “CCC loan, purchase and payment costs” were only \$227 million. This is only 17 percent of the total cost of the corn program.

Figure 5 shows, however, more clearly than table 5, that the small size of the storage costs in relation to the total costs resulted from the situation in the early years of the program, not in the later years. In the last 3 years shown on the

<sup>13</sup> Statement by the USDA, mimeo, undated, prepared by Office of Budget and Finance.

<sup>14</sup> F. D. Stocker. Governmental cost in agriculture. U. S. Dept. Agr., Agricultural Research Service. (Mimeo.) May 1956. p. 39.

<sup>15</sup> Ibid. p. 41.



TABLE 4. REALIZED COST OF AGRICULTURAL PROGRAMS PRIMARILY FOR STABILIZATION OF PRICES AND FARM INCOME, 1932-55, SHOWING DISTRIBUTION OF COST BY COMMODITY GROUPS.

	(millions of dollars)
<i>Basic commodities</i>	
Corn.....	\$1,319.3
Cotton.....	1,602.9
Peanuts.....	166.5
Rice.....	29.3
Tobacco.....	101.8
Wheat.....	2,412.9
Total basic.....	\$5,632.7
<i>Designated non-basic commodities</i>	
Butter.....	\$ 481.3
Cheese.....	142.4
Milk.....	351.0
Potatoes.....	638.4
Wool.....	105.7
Other.....	14.5
Total designated non-basic.....	\$1,733.3
<i>Other non-basic commodities</i>	
Eggs.....	\$ 331.5
Linseed oil.....	146.1
Sugar.....	310.8 (gain)
Program expense.....	1,863.3
Total other non-basic.....	\$2,011.5
Interest cost, etc.....	442.0
Grand total.....	\$9,819.3

Source: U. S. Dept. Agr., Office of Budget and Finance.

chart, the storage costs make up the bulk of the total costs of the whole corn program.

Since the present report is concerned primarily with the CCC storage program, we will deal with the "CCC loan, purchase and payments costs" of \$227 million first. The costs of the acreage control and parity payment programs will be considered in a later report.

#### COST OF THE CORN STORAGE PROGRAM

There are three reasons for the relatively low cost of the CCC storage operations shown in table 5. One is that the storage operations were not conducted on a very large scale until quite recent years. The second is that the general price level rose markedly after 1933; this helped the CCC keep its inventory losses low and, in fact, enabled it to make some inventory gains. The third reason is that the CCC has not sold much of its stocks

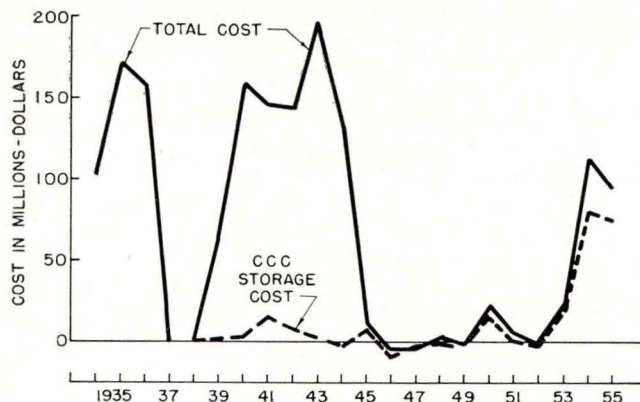


Fig. 5. Total cost of the corn program, and CCC corn storage cost, annually, 1933-55.

during the past few years when the loan rates for corn have been declining.

If all commodities acquired by the CCC could be disposed of without any losses, the "realized cost" figure would be a reasonably accurate measure of the total cost of the storage program. But it is likely that some of the commodities in storage will have to be sold for less than they cost, either because they are going out of condition, because they will be sold for export at reduced prices, or because the prices for the products have declined. In the latter case, substantial additional storage costs are likely to be incurred.

Study of the cost data by years shows, in fact, that more than two-thirds of the total CCC storage program costs (\$156 million out of a total of \$227 million) was incurred in the two most recent fiscal years, 1954 and 1955 (fiscal year 1954 means July 1, 1953 to June 30, 1954, and similarly for other years). The storage stocks were built up to a record large size by then, and the general price level ceased to rise. The level of loan rates for corn was reduced in 1955 from \$1.62 to \$1.58, and a further reduction to \$1.50 was made in 1956. The transition to modernized parity could further lower the level of loan rates in 1958 and 1959 (the 5-percent drop scheduled for 1957 was postponed for 1 year under the Agricultural Act of 1956).

It seems likely, then, that even if corn loan rates were constant, the cost of CCC operations would be more like the \$75-80 million per year registered in 1954 and 1955 than the small figures of earlier years. If corn loan rates continue to decline, the figure is likely to be larger than \$80 million.<sup>16</sup> In the latter part of 1955, the costs of storage of the CCC corn inventory of 696 million bushels were running at about \$50 million a year. The value (cost) of this inventory was \$1,186 million. The reserve for losses set up on the advice of the Grain Division of the CCC was \$507 million—nearly half the total value.<sup>17</sup>

The losses from deterioration so far have been small. The large size of the reserve for losses reflects mostly the expectations of losses from prices below the costs of acquisition.

How large these losses will be depends upon several things—the size of the corn crops in 1956 and later years, the level of loan rates, the rapidity of disposition of the present inventory, the effects of the soil bank, etc. If corn crops over the next few years are average in size, and CCC inventories continue to run at about present levels, it seems likely that the direct cost to the CCC of its corn stabilization operations in the near future will run somewhat higher than the figure was in 1955 (\$76 million) as the level of loan rates declines over the next few years. On the basis of the 1955-56 program, a reasonable estimate for the near future would be a round figure of about \$100

16 For the first 9 months of 1955-56, the loss was \$80 million.

17 Commodity Credit Corporation. Commodity inventories and commodities under contract purchase as of October 31, 1955. (Unpublished report.)



TABLE 5. REALIZED COST OF CORN PROGRAM BY ITEMS AND BY FISCAL YEARS, 1933-55.  
(millions of dollars)

	1933-55 Total	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
<i>Basic commodities:</i>																								
<i>Corn (including cornmeal and AAA corn-hog program):</i>																								
CCC nonrecourse loan, purchase and payment programs...	227.1							1.1	3.4	15.6	9.5	4.5	0.3*	8.1	7.4*	0.3*		0.1*	17.2	0.8	1.8*	20.5	80.5	75.7
CCC losses on emergency feed.....	17.0																						16.5	0.5
Donations of commodities to other nations.....	8.1																							8.1
Removal of surplus agricultural commodities:																								
Corn.....	2.4																							
Cornmeal.....	17.5							2.8	0.8	2.2	4.1	3.1											1.5	
<b>Total.....</b>	<b>19.9</b>							<b>2.8</b>	<b>6.1</b>	<b>2.2</b>	<b>4.1</b>	<b>3.1</b>											<b>1.5</b>	
Federal crop insurance.....	1.6*														0.3	0.1*	0.5	0.4*	0.5*	0.2	1.5	1.0*	1.4*	0.6
Acreage allotment payments under the Agricultural Conservation Program.....	441.0							61.0	89.9	86.0	86.3	66.7	51.2											
Agricultural adjustment programs (acreage allotments and marketing quotas).....	22.4																							
Parity payments.....	347.5								60.1	43.8	43.9	121.4	78.3						5.0	3.9			6.8	6.7
Agricultural Adjustment Act of 1933 and related acts:																								
Corn-hog program:																								
Program expenses.....	488.7			311.9*	176.9*																			
Miscellaneous receipts.....	0.6*				0.6*																			
Processing taxes (net).....	261.4*		105.4*	137.7*	18.3*																			
<b>Total.....</b>	<b>226.7</b>		<b>105.4*</b>	<b>174.2</b>	<b>158.0</b>																			
Transportation and handling of emergency feed.....	11.2																						10.5	0.7
<b>Total, Corn.....</b>	<b>1,319.3</b>		<b>105.4*</b>	<b>174.2</b>	<b>158.0</b>			<b>64.9</b>	<b>159.4</b>	<b>147.6</b>	<b>143.8</b>	<b>195.7</b>	<b>129.2</b>	<b>8.1</b>	<b>7.1*</b>	<b>0.4*</b>	<b>0.5</b>	<b>0.3*</b>	<b>21.7</b>	<b>4.9</b>	<b>0.3*</b>	<b>19.5</b>	<b>114.4</b>	<b>91.1</b>

\* Gain.



million per year. If the soil bank program proves effective in reducing corn production, this estimate could be reduced.

### EFFECTS OF THE CORN PROGRAM ON YEAR-END STOCKS

Has the corn loan and storage program attained its objective of stabilizing market supplies and prices? What effects has it had on other things—on the prices and production of hogs and other livestock, etc.?

The effects of the corn storage program ramify out in various directions, in some cases reinforcing the effects of other concurrent events, in some cases conflicting with them. It is not always easy, therefore, to determine how much of an effect should be ascribed to one cause and how much to another. We shall need to be on our guard constantly to be sure that we do not attribute an effect to the corn loan program when in fact it resulted from something else.

It is not easy to determine how much of the various changes that took place in corn and livestock supplies and prices after 1933 was due to the CCC loan and storage program and the acreage program, and how much was due to other forces—drouth, war, inflation, etc. But the attempt is made below, with appropriate reservations expressed where they are in order.

One of the most obvious things a corn storage program could be expected to do would be to affect the quantity of corn held in storage from year to year. This effect is registered in the size of the year-end carryover stocks—the carryover of corn from preceding crops into the new crop year.

The USDA publishes quarterly estimates of the stocks of the various grains. The Oct. 1 estimate coincides closely with end of the corn marketing year, just preceding the new harvest. The July 1 estimates similarly serve for oats and barley; they serve somewhat less well for wheat that is fed.

The data for corn are given in table 6. This table shows the Oct. 1 stocks of corn from 1926 (the earliest date when the data were compiled) to 1956 (old crop grain only).

These data go back farther than any other storage series. They are widely used. They show, however, only the CCC inventory in bins or other storage owned or controlled by CCC, or in transit to ports. They do not include CCC-owned corn in interior mills, elevators and warehouses, or in terminal markets, nor do they include corn in process of being taken over from loans being liquidated, nor corn under loan (resealed) most of which will be taken over by the CCC later. Accordingly, the situation for our purposes is better shown in table 7, where the quantities of corn under loan or owned by CCC, and "other" corn (in private hands) are listed separately for the years since 1933.<sup>18</sup> These data, plus the data from

TABLE 6. CORN: STOCKS, UNITED STATES, OCT. 1 (OLD CROP GRAIN ONLY). (million bushels)

Year	Farm	Terminal market	Commodity Credit Corporation *	Interior mill, elevator and warehouse	Total
1926.....	262	18			280
1927.....	192	25			217
1928.....	87	7			94
1929.....	142	4			147
1930.....	134	5			139
1931.....	162	5			168
1932.....	252	19			270
1933.....	327	60			386
1934.....	274	64			338
1935.....	61	3			65
1936.....	171	4			176
1937.....	60	6			66
1938.....	351	10			361
1939.....	554	15	15		584
1940.....	541	41	105		688
1941.....	473	39	132		645
1942.....	422	39	30		491
1943.....	355	7		21	384
1944.....	203	7		20	231
1945.....	293	5		17	315
1946.....	152	5		15	172
1947.....	252	8		23	283
1948.....	112	1		10	123
1949.....	696	10	68	70	813
1950.....	471	40	253	81	845
1951.....	313	33	315	79	739
1952.....	171	18	245	52	486
1953.....	330	9	384	45	769
1954.....	359	18	468	74	920
1955.....	314	32	560	129	1,035
1956†.....	300	64	600	201	1,166

\* Owned by CCC and stored in bins or other storage owned or controlled by CCC, in transit to ports, or in Canadian elevators. Other CCC-owned grain is included in the estimates by positions.

† Preliminary.

Source: U. S. Dept. Agr., Agricultural Marketing Service. Grain and feed statistics through 1954. U. S. Dept. Agr. Stat. Bul. 159. March 1955. p. 18.; 1955 and 1956 data from: U. S. Dept. Agr. Stocks of grains, Oct. 23, 1956. (Mimeo rept.)

TABLE 7. CORN: STOCKS AT CLOSE OF THE MARKETING YEAR, UNITED STATES, 1933-54. (million bushels)

Year beginning October	Stocks of corn at the close of the marketing year		
	Under loan or owned	Other	Total*
1933.....	82†	256	338
1934.....		65	65
1935.....	†	175	176
1936.....		66	66
1937.....	45	316	361
1938.....	258	326	584
1939.....	471	216	688
1940.....	403	242	645
1941.....	197	294	491
1942.....	8†	376	384
1943.....	6†	225	231
1944.....	9†	306	315
1945.....	0†	172	172
1946.....	9†	274	283
1947.....	0†	123	123
1948.....	493‡	320	813
1949.....	650§	195	845
1950.....	487§	252	740
1951.....	306§	180	486
1952.....	580‡	190	769
1953.....	736‡	184	920
1954.....	870	165	1,035
1955**.....	1,025	141	1,166

\* Includes stocks at interior mills, elevators and warehouses for the years 1943 to date.

† Loans were in the process of being repaid. Practically all of the corn under seal on Sept. 30 was redeemed by farmers early in the next marketing year.

‡ Includes corn under purchase agreement delivered to CCC or placed under loan after Oct. 1.

§ Includes corn on which loans were in the process of being repaid by farmers.

\*\* Preliminary estimate.

Source: U. S. Dept. Agr., Agricultural Marketing Service. Grain and feed statistics through 1954. U. S. Dept. Agr. Stat. Bul. 159. 1955. p. 46.; and U. S. Dept. Agr., Agricultural Marketing Service. The feed situation. May 1956. p. 22.

18 U. S. Dept. Agr., Agricultural Marketing Service. Grain and feed statistics through 1954. U. S. Dept. Agr. Stat. Bul. 159. March 1955. p. 46.



1926 to 1932 in the preceding table, are reproduced in graphic form in fig. 6.

This figure shows that while the total stocks of corn have been increasing, the quantities owned privately have been slightly decreasing. This is particularly evident during the past few years while total stocks have been large. The CCC has been taking over part of the year-to-year storage function from private hands.

The CCC stores most of the corn it owns, and some of its other grains, in its own bins—at “bin-sites” in the vernacular of the trade. In June 1949, CCC owned only 45 million bushels of bin-type storage capacity for use in storing CCC-owned grain. By September 1955, this capacity had been increased to 886 million bushels, 334 million of which were purchased since the end of the fiscal year 1952.

CCC purchases bins for storing CCC-owned commodities only for areas where commercial storage facilities are inadequate. This policy is in accord with the Commodity Credit Corporation Charter Act which provides that CCC’s authority to acquire real property for storage purposes shall not be utilized by CCC unless CCC “determines that existing privately owned storage facilities . . . in the area concerned are not adequate.”

Private storage capacity has also been increasing. From 1951 through 1954, off-farm commercial-type grain storage capacity rose on a nationwide basis, from 2,176 million bushels to 2,820 million—an increase of 644 million bushels within the space of 3 years.

On Oct. 1, 1955, the CCC owned outright 681 million bushels of corn. (The difference between this figure and the 850 million bushels shown in table 7 represents corn under loan, mostly in process of being taken over or resealed.) The CCC held most of this corn in its own storage structures. It held 551 million bushels in bin-sites, 84 million bushels in country warehouses and elevators, 32 million in subterminal and terminal elevators, and 15 million in transit.<sup>19</sup>

Figure 7 shows the year-end government stocks (under loan or owned) and “other” stocks of feed grains (corn, oats, barley and sorghum grains)

19 U. S. Dept. Agr., Commodity Stabilization Service, Grain Division. Oct. 20, 1955. (Mimeo rept.)

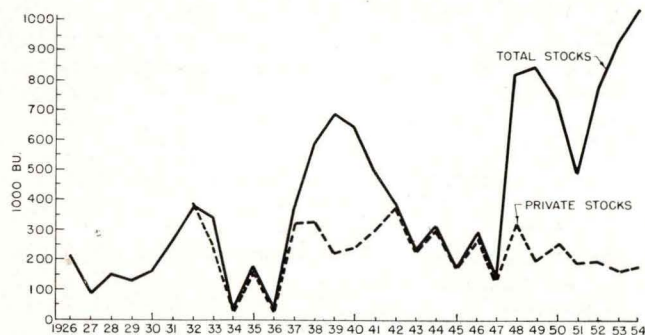


Fig. 6. Total stocks of corn, Oct. 1, and private stocks, annually, 1926-54. The difference between the two represents the CCC stocks.

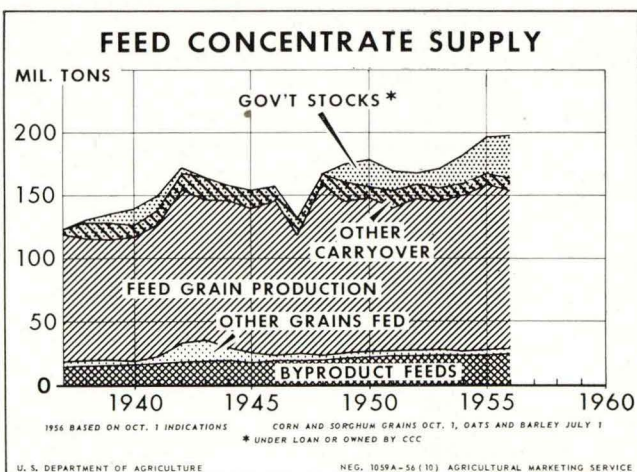


Fig. 7. Feed concentrate supply; feed concentrate production plus private and CCC (government) stocks, annually, 1937-56.

in total. The chart also provides some perspective on the size of these stocks; it shows them in relation to total feed grain production, other grains fed and by-product feeds. It shows that, large as the carryover stocks have grown, they are still relatively small compared with total feeds production.

To take a specific case: The carryover of corn is the same size (a billion bushels) as the carryover of wheat. But the carryover of wheat is about equal to an average crop of wheat, while the carryover of corn is only equal to a third of an average crop of corn; and the carryover of total feeds is only about a quarter of an average total feeds crop. The question whether these carryover stocks are larger, or smaller, than needed for stabilization purposes is discussed in a later section of this report.

#### WHAT DETERMINES HOW MUCH CORN GOES UNDER LOAN?<sup>20</sup>

Figure 4 in a preceding section of this report shows that when the open-market price of corn declines below the loan rate, large quantities of corn generally go under loan.

The nature of this relationship is shown more accurately in fig. 8. In the upper section of this chart, the quantity of corn put under loan each year is plotted against the difference between the average November-May United States farm price of corn and the corn loan rate for the same year.

A general negative relationship is shown in fig. 8, although there is a good deal of scatter among the dots for the recent years. This shows that some other factor was also at work determining the quantity of corn put under loan.

A likely factor of this sort would be the size of the corn crop. To test whether this factor did affect the quantity of corn put under loan, we plotted the corn put under loan each year against the size of the corn crop that year. The correla-

20 This section summarizes work done by Allen Richards.



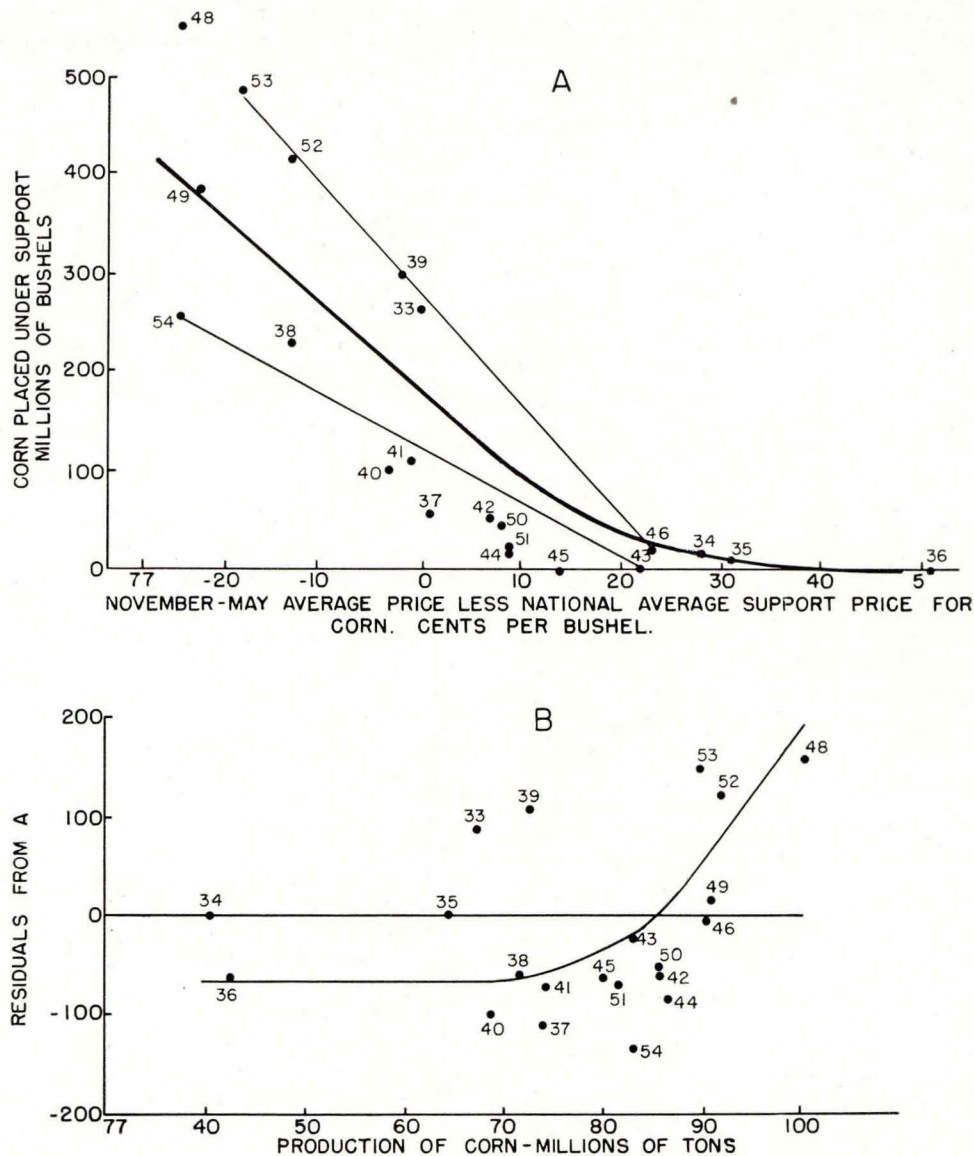


Fig. 8. Relation of corn placed under loan (support) to two factors (1) November-May average price minus loan rate and (2) corn production.

tion between the two series was quite low, indicating that the size of the corn crop was not as influential a factor as the price-loan rate differential shown in fig. 8.

We next investigated whether the two factors, price-loan differential and size of corn crop, might determine the quantity of corn put under loan in combination. In the upper part of fig. 8, we connected pairs of dots for those years when the size of the corn crop was similar, by light straight lines as shown in the chart. These light lines provided clues to the slope of the line of net influence of price-loan differential when the size of the crop is held constant. The heavy curved line was then drawn to represent this net influence, and the vertical residuals of the dots from this line were then plotted against the size of the corn crop in the lower part of the chart.

There is still some scatter of the dots about the

line. The dots for the years 1933 and 1939, particularly, remain far off the line. Evidently, the two factors, price-loan rate differential and size of corn crop, explain most of the variation in the quantity of corn put under loan, but not all of it. The rest of the variation is caused by other factors as yet undetermined. One of them may be the extent of compliance with the acreage control program.

#### WHAT DETERMINES THE SIZE OF THE OCT. 1 CCC CORN INVENTORY?

What determines the size of the CCC year-end carryover stocks?

One likely factor to test is the size of the corn crop. This factor, however, would not be the size of the current corn crop, because the *current* crop does not come on the market until after Oct. 1.



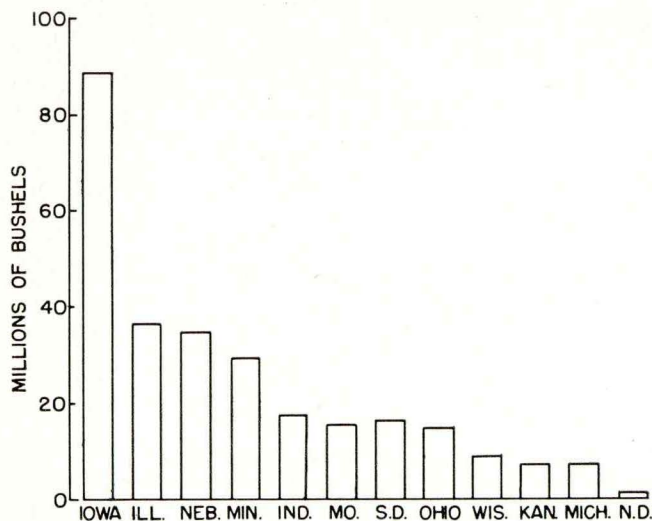


Fig. 9. Average farm stocks of corn Oct. 1, 1946-55, by states, North Central Region.

The size of the growing corn crop is fairly accurately forecast by the USDA by Oct. 1, but that forecast is not likely to have much effect on the CCC inventory that year. Accordingly, it would not be the size of the current corn crop that would affect the CCC inventory Oct. 1, but the size of the preceding corn crop.

Comparison of the inventory and corn crop data shows, in fact, that there is a higher correlation between the CCC Oct. 1 inventory and the size of the corn crop 2 years before than there is with the corn crop 1 year before.

This 2-year lag results from the way the corn loan program operates. Farmers who put corn under loan from, say, the 1954 crop do not begin

deliveries to the CCC until July 1 of the following year—1955, at the earliest. Study of the CCC inventory data by quarters shows that the highest point is reached in March of the next year (in the present example, March 1956). Apparently, the bulk of the deliveries are made after Oct. 1, 1955 and therefore do not show up in the CCC inventory until Oct. 1, 1956. This is 2 years after the crop was harvested in 1954.

By the time the 2 years have elapsed, several other factors affecting the release of corn from the CCC inventory have been at work. The simple correlation between crop size and CCC Oct. 1 inventory therefore is not high. What these other factors are has not yet been determined.

#### EFFECTS OF THE CORN PROGRAM ON THE LOCATION OF CORN STOCKS

The data showing the distribution (location by quantities by states) of the stocks of old corn on farms Oct. 1 in the 12 states of the North Central Region are available from 1926 to 1955. Most of these stocks of corn are owned by farmers; small percentages, varying from year to year, are under resale programs and loans in process of liquidation. The original annual data by states from 1926 to 1955 are too voluminous to include in this report. The average distribution for the past 10 years by states in the North Central Region is shown in fig. 9. The states are shown in order of size of stocks. The height of the bars represents the average quantity of corn in the different states for the period 1946-55.

The figure shows that the state with the largest stocks of corn is Iowa. About as much corn is held in Iowa as in the next 2 states (Illinois and Ne-

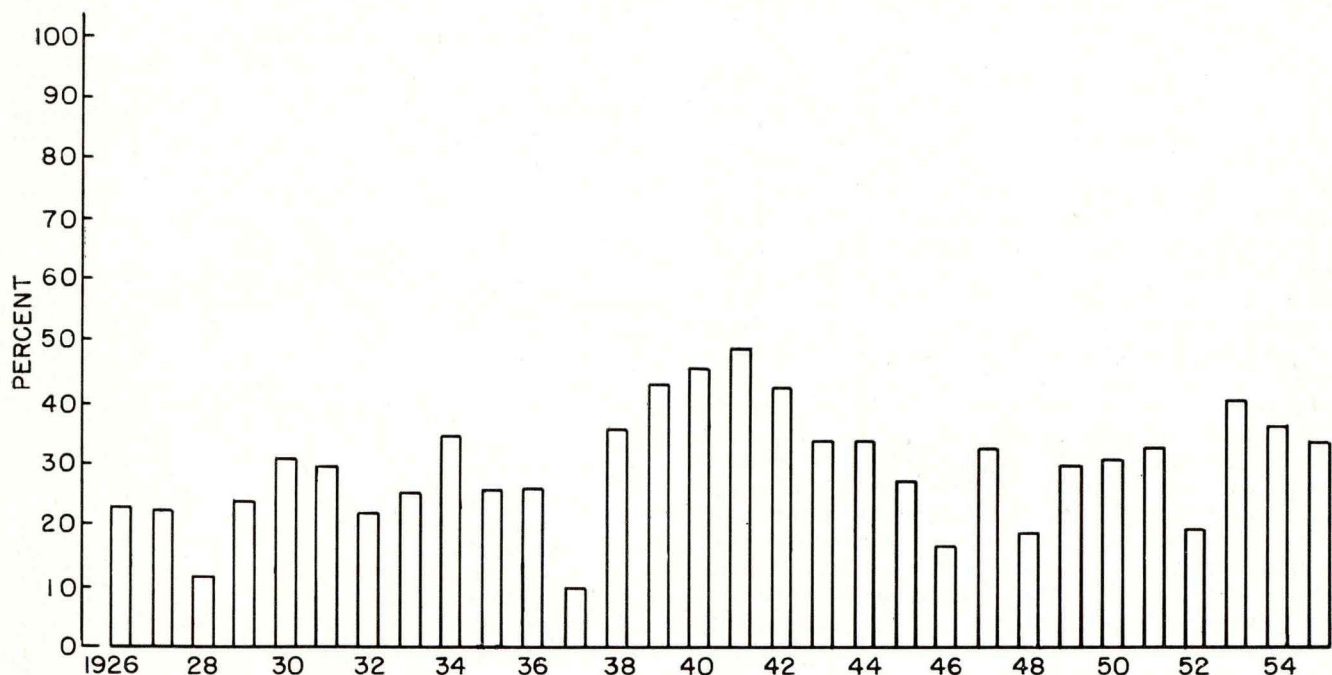


Fig. 10. Percentage of the farm stocks of corn Oct. 1 in the North Central Region that was held in Iowa, annually, 1926-55.



TABLE 8. CCC CORN BY STATES IN THE NORTH CENTRAL REGION, OCT. 1, 1942-55.  
(1,000 bushels)

State	1942	1943	1944	1945	1946	1947-1950	1951	1952	1953	1954	1955
Illinois.....	11,947	318	124	7	1,146	.....	81,053	41,602	27,531	71,361	123,873
Indiana.....	90	4	.....	.....	504	.....	8,332	5,338	2,930	16,929	28,367
Iowa.....	9,516	225	483	15	520	.....	147,479	129,316	101,286	137,433	252,047
Kansas.....	45	6	.....	.....	20	.....	9,970	2,938	2,633	3,396	7,234
Michigan.....	.....	.....	.....	.....	.....	.....	812	31	8	3,604	8,501
Minnesota.....	4,915	89	25	0	72	.....	35,796	30,153	21,958	31,242	87,704
Missouri.....	1,160	98	146	19	542	.....	9,037	1,711	3,375	8,772	14,843
Nebraska.....	5,630	16	234	66	194	.....	60,386	43,697	41,689	43,498	77,160
North Dakota.....	.....	.....	.....	.....	.....	.....	1,425	1,053	387	504	1,289
Ohio.....	74	4	.....	.....	452	.....	5,410	3,934	3,446	7,469	12,535
South Dakota.....	2,149	158	5	.....	.....	.....	31,697	27,363	25,781	17,579	42,793
Wisconsin.....	1,579	9	.....	.....	143	.....	2,345	573	383	4,069	6,659
TOTAL.....	37,104	926	1,017	107	3,593	.....	393,743	287,710	231,408	353,670	663,005
Percent Iowa/Total.....	25.6	24.3	47.5	14.0	14.5	.....	37.5	44.9	43.8	38.9	38.0

braska) combined. Iowa's stocks equal 32.2 percent of the corn on farms in the North Central Region.

Figure 10 shows that the concentration of corn stocks in Iowa varies from year to year. The trend has been rising with the passage of time. In the late 1920's the percentage of the regional stocks held in Iowa varied from 11 to 23 percent. During World War II, it rose to a peak of 49 percent in 1941. In the 1950's, it has varied from 20 to 40 percent.

It might be expected that the chief reason for the variations in the concentration of corn stocks in Iowa would be the variation in concentration of production in Iowa. The correlation between production one year and stocks the next year, however, is only 0.62. Other factors also must be at work; their nature as yet is undetermined.

THE GEOGRAPHICAL DISTRIBUTION OF CCC STOCKS OF CORN

Are the CCC stocks of corn distributed about the same as the farm stocks?

Data showing the distribution (location by quantities by states) of the CCC stocks of corn as of Oct. 1 in the 12 states of the North Central Region are available annually from 1942 to 1946 and 1951 to 1955. These data are given in table 8. Data for the years 1947-50 were not compiled by the CCC; the absence of data does not indicate that there were no stocks in those years (except for 1948).

Because of this gap in the records, the 10-year average data, 1946-55, cannot be shown for direct comparison with the 1946-55 average farm stocks chart.

Figure 11, however, shows that the CCC stocks have been concentrated in Iowa much the same as the farm stocks have been, or a little more. Iowa CCC stocks over the past 5 years averaged about 40 percent, even higher than the percentage of farm stocks (31 percent) over the same period.

The data for all the states in the North Central Region the past 5 years, 1951-55, are shown separately by states and by years in fig. 12. This figure shows that a very high percentage of the CCC stocks has been concentrated in 5 of the 12 states in the North Central Region (Iowa, Nebraska,

Illinois, Minnesota and South Dakota). This was true for all of the years, and to such an extent in 1952 that less than 2 percent of the CCC stocks were stored in the remaining 7 states of the region. For the first 3 of the past 5 years, Iowa held as much as any other three states combined, and for the other years (1954 and 1955) she held as much as any other two states. Thus the CCC stocks of corn are more concentrated geographically than the farm stocks of corn.

The heavy concentration of CCC stocks in Iowa is interesting. Back in 1941, observers noted that CCC stocks were accumulating more heavily in Iowa than in the other states. It was thought then that the flat loan rate might be partly responsible for this. Corn prices normally are lower in Iowa than in most other areas because Iowa produces more corn than it consumes, and the surplus corn depresses prices in Iowa until it pays to ship corn out to other areas. Accordingly, prices in Iowa were low relative to the flat loan rate in effect from 1933 to 1941, and this, it was believed, caused large quantities of corn to be put under loan and eventually taken over by the CCC. This belief was one of the reasons why geographical differentials in loan rates were instituted in 1941. But evidently CCC stocks in Iowa are high under differential loan rates, much as they were under flat rates.

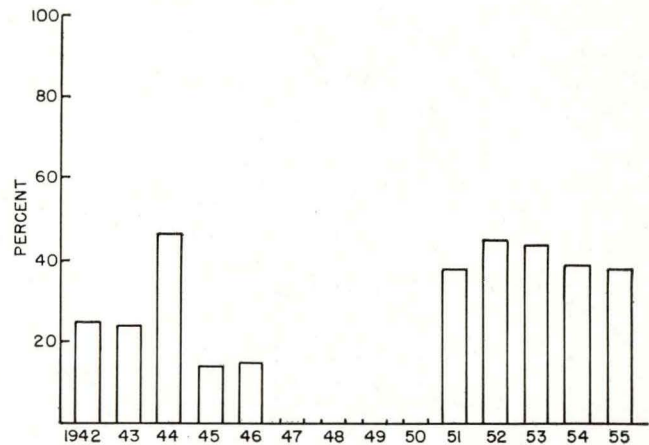


Fig. 11. Percentages of the CCC stocks of corn Oct. 1 in the North Central Region that was held in Iowa, annually, 1942-55.



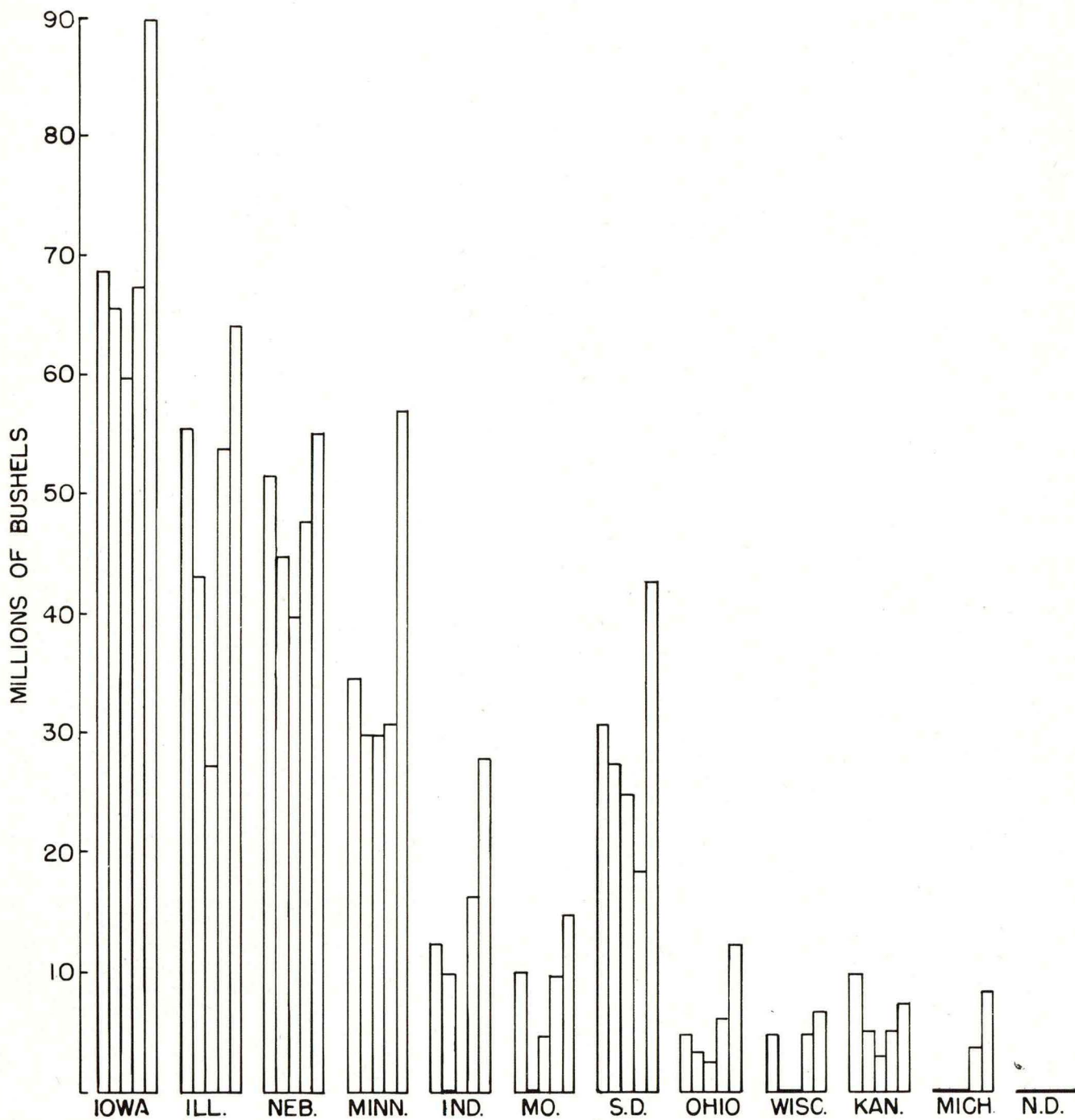


Fig. 12. CCC stocks of corn Oct. 1 by states in the North Central Region. Bars read from left to right for 1951 to 1955.



Is it efficient to have the CCC stocks heavily concentrated in Iowa and adjacent states in the central part of the North Central Region like this?

It was thought at the beginning of this study that the problem of determining the most efficient (in this case, lowest cost) location of the stabilization stocks would be amenable to linear programming analysis. This would involve minimizing the sum of the several kinds of costs—(1) costs of storage, (2) costs of handling in and out, (3) costs of turning and other means of controlling insect and other deterioration, (4) costs of transportation to and from storage, and so forth.

It turned out, however, that the problem was simpler than this. The differences in costs at different geographical locations were not great, except along the southern edge of the commercial corn area where high temperatures and humidity accelerate deterioration. Preliminary study of the movement of corn from surplus to deficit areas shows that there was a great deal of variation in quantity and even in direction of movement from one year to another, resulting chiefly from year-to-year variations in relative corn production caused by weather. Thus corn might move out of storage in one direction one year, and in a different direction—even a reverse direction—the next year.

Since the corn put into storage one year will move in a direction that is unpredictable at the time, the way to incur the least transportation charges on the corn is simple: Store it as close as possible to where it was produced. And that, in essence, is what has been done.

#### EFFECTS OF THE CORN PROGRAM ON CORN CONSUMPTION

Figure 13 shows that previous to 1937, before the corn storage program got well under way, the utilization (consumption) of corn closely paralleled the production of corn each year. Table 2 showed that before 1937 the stocks of corn carried over from big-crop years to small-crop years were comparatively small.<sup>21</sup> After 1937, however, total carryover stocks more than doubled in size. They constituted more of a buffer or shock-absorber

<sup>21</sup> Data on utilization go back only as far as 1926. Data on stocks, however, go back at least to 1900. A bulletin published in 1937 included a study of production and carryover stocks from 1900 to 1930 and reached these conclusions:

"Farmers acting individually have in the past carried over a certain amount of corn from one year to the next. . .

"The carryover is only a small percentage of the total crop; over the period from 1900 to 1930, it averaged only 3.8 percent of the crop. The amount carried over varied considerably from year to year, however. . . In general, the larger the crop the larger the carryover, and conversely. The biggest carryover was 11 percent of an average crop, after the large 1920 crop and the low prices resulting from the post-war depression; the smallest carryover was 1 percent after the small crop of 1901. . .

"On the average, an increase in the size of the corn crop of 500 million bushels is followed by an increase in the amount carried over to the next crop year of 100 million bushels.

"Now 100 is one-fifth of 500. Farmers in the past, therefore, acting individually, have carried over one-fifth of the surplus after big crop years. Perhaps a more accurate way to say it is this: Farmers, by their storage actions, have reduced fluctuations in corn production by one-fifth. The fluctuations in consumption and sale were only four-fifths as great as the fluctuations in production; the other one-fifth went into storage."

(Shepherd, Geoffrey and Wilcox, Walter W. Stabilizing corn supplies by storage. Iowa Agr. Exp. Sta. Bul. 368. Dec. 1937, pp. 307-308.)

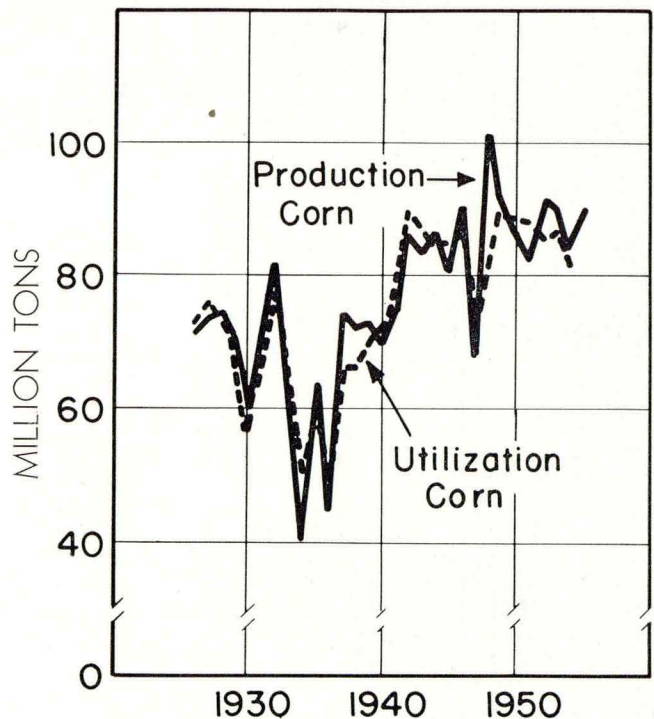


Fig. 13. United States production and utilization of corn by livestock, annually, 1926-55.

between production and consumption.<sup>22</sup> Table 9 and fig. 13 show that the large carryover stocks after 1937 reduced the variation in consumption to something like half of the variation in production.

The extent of the stabilization of feed consumption has been measured mathematically. "Storage programs for corn and other feed grains have increased the stability of feed-grain consumption in recent years. During 1926-37 approximately 30 percent of a year-to-year change in corn production was taken up by changes in the rate of accumulation of carryover stocks of corn. About 60 percent of a change in corn production was absorbed, on the average, by changes in livestock feeding. During 1938-50, on the other hand, 60 percent of a year-to-year change in corn production has been taken up by changes in the rate of stock accumulation and only 30 percent by changes in livestock feeding. The differences between these measures for the pre-program and program periods are statistically significant according to usual criteria. They suggest that the price support and storage programs in force during the past 12 to 15 years may have reduced the earlier variability of corn consumption by livestock as much as 50 percent."<sup>23</sup>

This conclusion is stated only in terms of a suggestion, not a flat assertion. Other things hap-

<sup>22</sup> The year 1947 is an exception; carryover stocks had been reduced to pre-1937 levels by the strong war and postwar demand just before 1947. The buffer was small, so the short crop of 1947 reduced corn consumption sharply.

<sup>23</sup> Source: Reserve levels for storable farm products. Senate Document No. 130. May 13, 1954. p. 41.



TABLE 9. PRODUCTION AND UTILIZATION OF CORN, UNITED STATES, 1926-55. (million tons)

Season beginning	Production of corn	Utilization of corn by livestock	Total utilization of corn
1926	71.3	67.2	73.2
1927	73.3	70.4	76.8
1928	74.6	66.0	73.2
1929	70.5	64.8	70.7
1930	58.2	52.5	57.5
1931	72.1	64.3	69.3
1932	82.0	73.5	78.8
1933	67.1	63.1	68.5
1934	40.6	44.1	49.2
1935	64.4	55.7	61.9
1936	42.2	42.5	48.1
1937	74.0	56.5	65.8
1938	71.4	58.8	65.2
1939	72.3	62.5	69.4
1940	68.8	63.2	70.0
1941	74.3	70.0	78.6
1942	85.9	81.5	89.5
1943	83.0	80.2	87.4
1944	86.5	76.1	84.3
1945	80.3	76.9	84.4
1946	90.1	74.8	87.0
1947	65.9	63.4	70.4
1948	100.9	71.5	81.7
1949	90.7	79.4	89.8
1950	85.6	77.6	88.6
1951	81.2	79.0	88.3
1952	91.8	73.0	83.9
1953	89.4	75.3	85.2
1954	84.3	70.1	81.3
1955	89.1	77.0	.....

Source: U. S. Dept. Agr., Agricultural Marketing Service. Grain and feed statistics through 1954. U. S. Dept. Agr. Stat. Bul. 159. 1955, pp. 2, 3; and U. S. Dept. Agr., Agricultural Marketing Service. The feed situation. November 1955. p. 5.

pened from 1926-37 to 1938-50, along with the coming of the corn program, and they could have been the causes of the greater absorption of variations in corn production by inverse variations in corn storage. But table 7 shows that most of the increase in the inverse variation in corn storage during the 1938-50 period was accounted for by CCC storage operations. This was true also for the years since 1950. These things support the conclusion suggested in the quotation above, that

the corn "price support and storage program" may have reduced the earlier variability of the consumption of corn by livestock as much as 50 percent.

If the stabilization operations of the CCC reduced the variation in corn consumption by livestock about 50 percent, how was the remaining variation in corn consumption absorbed?

The industrial utilization of corn takes only small and relatively constant quantities of corn.

Figure 14 shows that most of the variation in the consumption of corn by livestock is absorbed by variations in hog production. These variations in hog production result from variations in the number of hogs fed and in the rate of feeding per hog. Poultry comes next in the order of variability. The other kinds of livestock account for only a relatively small amount of the variation in corn fed.

Figure 15 shows that the situation for total concentrates is similar to the situation for corn.<sup>24</sup>

#### SIZE OF STORAGE STOCKS NEEDED FOR STABILIZATION PURPOSES

It is only since 1949 that the stocks of corn Oct. 1 have been large enough to do a good stabilization job. Under the open market, before 1933, the amount of corn carried over from big-crop to small-crop years was only about one-fifth as large as necessary to stabilize supplies. There is some evidence that it would not have paid speculators to carry much more than this. But the objective of the corn loan program is not speculative grain; it is the stabilization of corn supplies. How big should corn stocks be to do this?

We may look first at what would be required for complete stabilization of supplies, with demand remaining constant (variations in demand

<sup>24</sup> The estimates shown in figs. 14 and 15 were prepared by R. D. Jennings, Production Economics Research Branch, Agricultural Research Service, U. S. Dept. Agr.

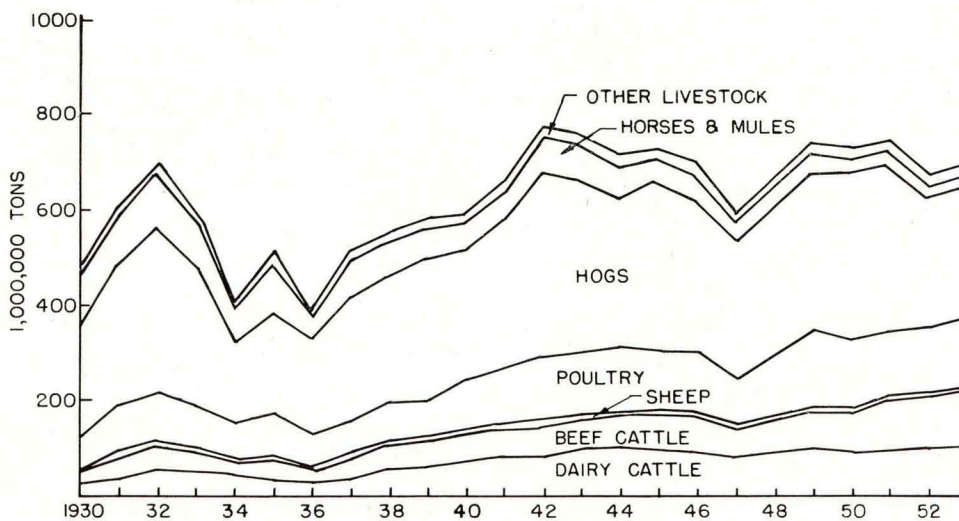


Fig. 14. Corn (excluding corn in silage) fed to different kinds of livestock, United States, annually, 1930-53.



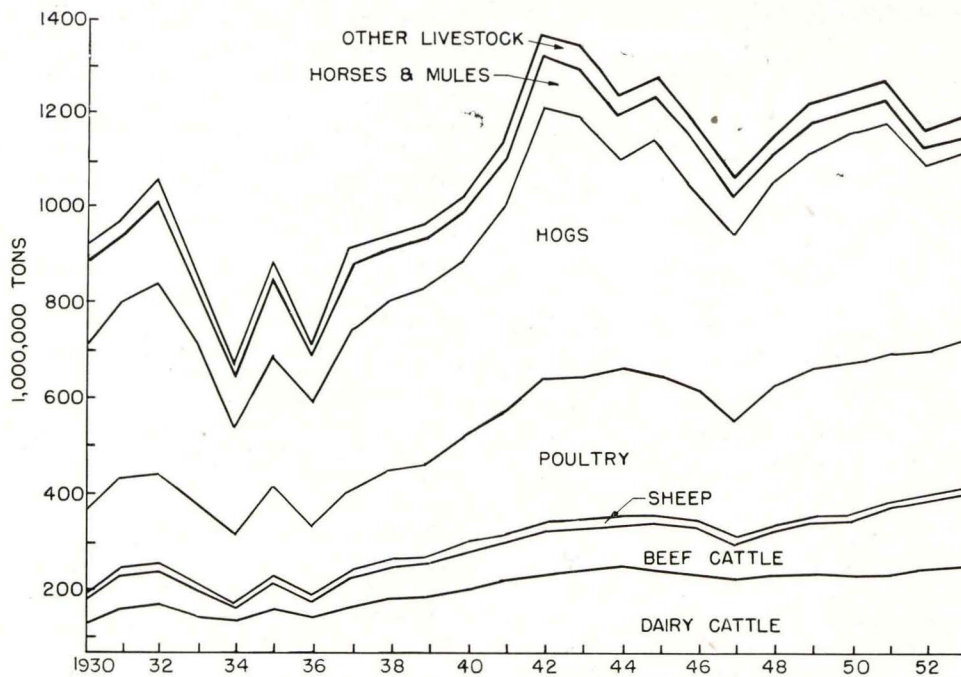


Fig. 15. All concentrates (excluding corn in silage) fed to different kinds of livestock, United States, annually, 1930-53.

pose a separate problem, considered later in this report).

Past variations in corn production since 1890 are shown in fig. 16. This chart shows that the long-run trend cannot be represented very well by a single straight line. Accordingly, the long-run trend is represented by a moving average. The length of the moving average used here is 11 years, centered on the middle year.

Filling in the shortages from 1934 to 1936 would have required stocks of nearly 2 billion bushels. But nothing like this succession of severely short crops occurred at any other time during the 87 years of record. It seems only common

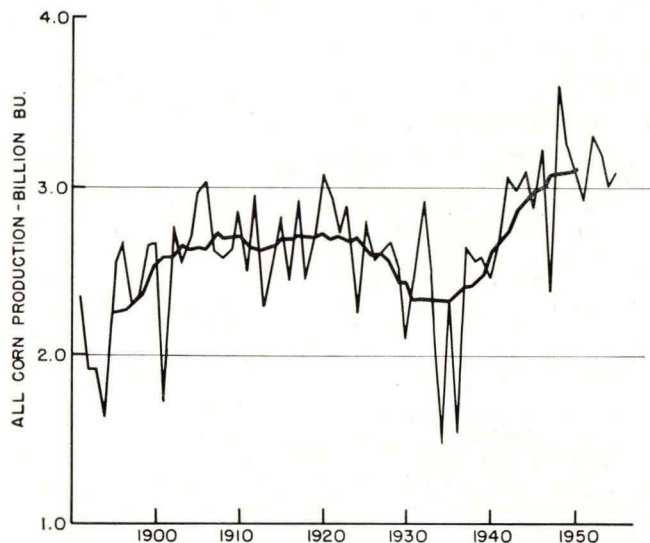


Fig. 16. United States corn production, annually, 1890-1955, and 11-year moving average trend.

sense to omit one of the two drouth years, 1934 or 1936, as too exceptional to be included.

If we omit 1936, the size of stocks required to stabilize corn supplies drops to 862 million bushels, the shortage in 1934. This would have been about right for 1901 and 1947 also. Working stocks of 100 to 150 million bushels would bring this figure to about 1 billion bushels.

In the present stage of the science of weather forecasting, it is impossible to tell a year or more in advance when a short crop is going to come. Under these conditions, the best way to have storage stocks on hand, ready to fill in a short crop when it does occur, is to build them up as rapidly as possible from big crop years and carry them until they are needed.

This would be an easy thing to do if corn crops alternated regularly in size from large one year to small the next. But corn crops come in irregular sizes at irregular times. The storage rules have to be built on these irregular variations on the basis of statistical probabilities.

The nature of the distribution of these irregular variations in corn production about the trend line is shown in fig. 17. This chart shows that the distribution is somewhat skewed to the left. There are not many short-crop years, but when they do come they are very short. In contrast, there are many large-crop years, but none of them are very large.<sup>25</sup>

Study of the chronological order of occurrence of these different size crops shows that there is a tendency for several years of moderately good

<sup>25</sup> A similar chart based on Iowa corn yields shows a similar asymmetrical distribution. (F. V. Waugh. Graphic analysis in economics research, Agr. Handbook 84. U. S. Dept. Agr., Agricultural Marketing Service. June 1955. p. 5)



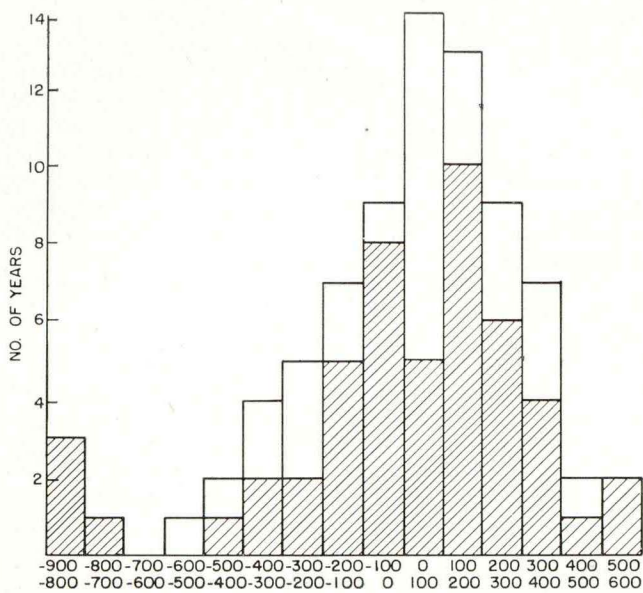


Fig. 17. Distribution of variations in corn production about the 11-year moving average trend. Shaded portion of bars years from 1900 to 1949; empty portion of bars years from 1870 to 1900.

corn crops to come consecutively, followed by one or two severely short crops. Stabilization stocks, therefore, usually would build up over a period of several years and then be drawn down at one swoop. The stocks frequently would need to be carried for as long as 5 years at a time. Stocks would have accumulated like this for several years and then have been used up in 1 year, over several 4, 5 or 6-year periods in the past—from 1875 to 1881; from 1895 to 1901; from 1920 to 1924; from 1931 to 1934; and from 1942 to 1947.

#### USDA ESTIMATE OF STABILIZATION STOCKS REQUIRED

Our estimate of 1 billion bushels as the size of stabilization stocks needed to do a complete stabilization job is the same as the figure reached independently by USDA analysts using a different approach.<sup>26</sup> These analysts, observing that most of the year-to-year variation in corn production results from variations in yields caused by the weather, studied the nature of these variations and set up the following objective of storage operations as reasonable: To offset one very low yield and one moderately low yield in sequence, while maintaining minimum working stocks of about 150 million bushels. This 2-year sequence of one very low yield and one moderately low yield could be expected on the average to occur about once every 12 years. When it occurred, it would create a deficit of about 850 million bushels. This deficit plus 150 million bushels adds up to 1 billion bushels. The storage program to smooth out the market supplies of corn completely, therefore, would need to accumulate up to 1 billion bushels of corn.

After reaching this conclusion, the USDA an-

alysts go on to say that they do not consider it necessary to offset variations in corn production bushel for bushel by storage operations. They point out that there is some flexibility in feeding requirements, and that corn, important as it is, provides only about one-quarter of the total supply of livestock feeds, including other feed grains, by-product feeds, hay, range and pasture.

It is true that corn provides only about one-quarter of the supply of livestock feeds, if range and pasture are included. But the statement ignores the heterogeneity of the conditions under which the different kinds of livestock and feed are actually produced. Aggregating all livestock and all feeds like this covers up the dislocations that take place in specific parts of the livestock industry, particularly the hog industry. Corn provides about 75 to 80 percent of the total supply of livestock feed for hogs,<sup>27</sup> and variations in corn production and prices have marked effects on hog production, as shown earlier in figs. 14 and 15.

Furthermore, at times when corn is scarce and high in price, oats and other feeds usually are scarce and high in price too. Physical and economic limitations thus reduce the extent of substitution of one feed grain for another below the extent permitted by nutritional considerations. Less substitution of feeds can take place than would be possible if the production of the different feed crops varied independently.

The USDA analysts recognize this point a little later in their report. They say: "There is another factor, however, which tends to increase corn requirements. Yields of other feed grains tend to fluctuate in the same direction as do yields of corn, so that the variation in total feed-grain production is about 20 to 25 percent larger (in tons or equivalent bushels of corn) than in production of corn alone. To cover this additional source of variation would have required a total carryover of 900 million to 1 billion bushels of corn plus the equivalent of another 100 million bushels in the form of reserves of other grains in excess of working stocks."<sup>28</sup>

Our research leads us to a similar figure. Our conclusion is based upon the results of adding the production of the different feed grains together each year, to show how much variation there is in the total.

It would not be accurate to add bushels, for a bushel of oats (32 pounds) is only a little more than half as heavy as a bushel of corn (56 pounds). It is more accurate to add the grains on a poundage or tonnage basis. This is not fully accurate, for a pound of oats does not have as much feeding value as a pound of corn; it contains a higher percentage of hull. But it is accurate enough for our purposes.<sup>29</sup>

27 R. D. Jennings. Consumption of feed by livestock. U. S. Dept. Agr. Cir. 836. 1949. p. 86.

28 Reserve levels for storable farm products. Senate Document No. 130. 1952. p. 4.

29 The problems of ease of storage and the stability of the grain in storage are additional but less important considerations which we cannot go into here.

26 Reserve levels for storable farm products. Senate Document No. 130 1952 p. 4.



Figure 18 shows the total production of the feed crops, corn, oats, barley and sorghum grains, added on a tonnage basis, annually since 1926 when the data began. The 11-year moving average is shown too.

Study of these data shows that the greatest shortage below the 11-year moving average occurred in 1934, the same as in the case of corn. We can leave the similar shortage in 1936 out of account here as an exception, as we did with corn.

The shortage in the most severe drouth year, 1934, was 35.8 million tons; the carryover at the end of the 1934 season, 3.5 million tons, brings this figure up to a total of 39.3 million tons as the minimum size of stocks needed to stabilize the total supplies of feed grains in 1936. A more recent severe shortage year was 1947. The shortage in 1947 was 23.3 million tons, and the carryover at the end of the 1947 season was 7.8 million tons, the two quantities adding up to 31.1 million tons.

It would be conservative statistical procedure to use the more recent and smaller 1947 figure of 31.1 million tons rather than the larger 1936 figure. This 31.1 million tons is equivalent in weight to 1.1 billion bushels of corn. This is more than the quantity of corn needed to stabilize corn supplies, which we estimated above to be 1 billion bushels. Evidently the variations in the production of the different grains do not offset, but are positively correlated and reinforce each other.

If storage costs for the different feeds were equal, stabilization stocks for each one would be desirable. In the case of oats, however, storage costs are high per unit of nutrition. A bushel of

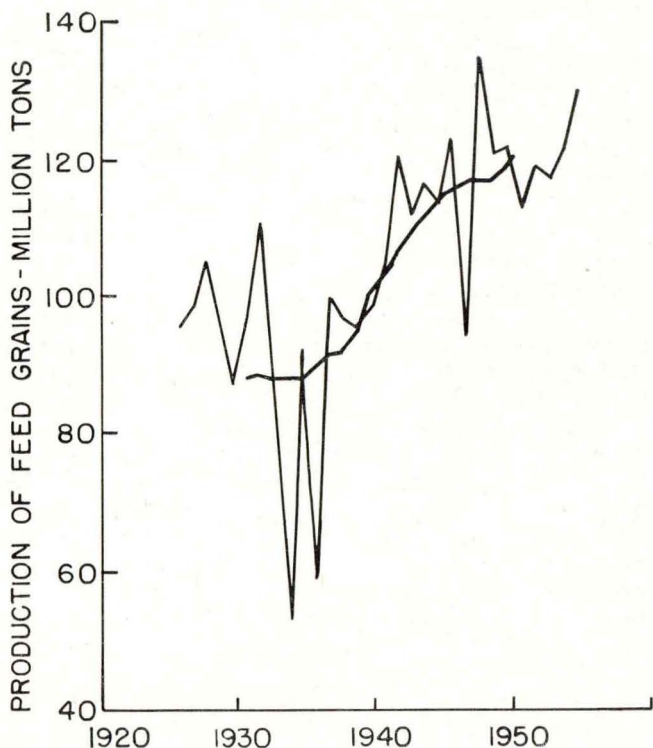


Fig. 18. United States total production of feed crops (corn, oats, barley and sorghum grains), added on a tonnage basis, 1926-55, and 11-year moving average trend.

oats takes up the same space as a bushel of corn (both are defined as  $5/4$  of a cubic foot) but there is a high proportion of hull in oats (oats weigh 32 pounds per bushel, while corn weighs 56) and the feeding value of a bushel of oats is only about half of the feeding value of a bushel of corn. Accordingly, it would cost only half as much to store a given quantity of feed, in nutritional terms, in the form of corn as in the form of oats.

Feed grain storage costs would be minimized, therefore, if a substantial part of the oats element in the total feeds storage program were replaced by corn. Oats and corn are fairly close substitutes within a certain range; beyond that range, substitution becomes more difficult. Perhaps the program should go only about 100 million bushels in the direction of stabilizing oat supplies by corn storage, as the USDA analysts suggest. This 100 million bushels of corn, added to the 1 billion bushels of corn required for corn stabilization, brings the total stocks of corn required for a feed grain stabilization program to 1.1 billion bushels.

#### VARIATIONS IN DEMAND

The preceding sections have dealt with storage operations to stabilize market supplies and prices against year-to-year variations in production. Are storage operations suited also to stabilizing against variations in demand?

This is an entirely different matter from stabilizing against year-to-year variations in production. Variations in demand are not year-to-year variations in the first place; they run from 3 years in length, as in the case of the Korean conflict, to 10 years or more, as in the case of the depression of the 1930's and the war and postwar boom of the 1940's. And in the second place, the objective is not to stabilize supplies in line with a relatively constant demand, but to unstabilize them in line with a varying demand.

Nevertheless, "stocks of storables can be very useful in allowing adjustments to these swings in demand. From the standpoint of building and maintaining a market for farm products, reserve stocks allow the effective demands of users or consumers, both domestic and foreign, to be more surely and immediately met than will dependence on increasing acreages, which involves not only a considerable time lag but also the 50-50 chance that below average yields will further delay the ability to increase marketings. On downswings, a strong storage program can also be very useful in conserving supplies or maintaining efficiency. That is, very low prices in the past, for grains especially, have resulted in many instances in increasing waste and inefficient feeding practices—situations which dissipate resources and benefit no one. Storing surplus stocks under such circumstances not only conserves resources and supports market prices at the time but also enables farmers to better meet future increases in demand."<sup>30</sup>

<sup>30</sup> Reserve levels for storable farm products. Senate Document No. 130. 1952. pp. 7-8.



This indicates that additional quantities of corn, over and above the 1.1 billion bushels needed for stabilization against variations in supply, would be helpful in dealing with variations in demand.

How large these additional quantities should be is an open question. In view of the longer time span of variations in demand, the quantities required could easily run into billions, and deterioration or the cost of rotating stocks to avoid deterioration would increase more than in proportion to the length of the time span. This precludes the possibility of meeting these changes in demand adequately by storage operations, for the costs of storing additional billions of bushels would be prohibitive. A less costly and almost as fully effective plan would be to store only enough corn to meet an increase in demand for 1 year. This would solve the problem created by the inherent time lag of about a year in corn production response. During that one year, arrangements could be made to meet the increase in demand in subsequent years by increased production.

How large should the storage stocks be for this one year?

Some light can be thrown on this question by study of a specific year, 1947, when a strong demand cut into the supply-stabilization stocks and left them too small to fill out the short crop harvested in the fall of 1947. Demand-stabilization stocks of something approaching half a billion bushels would have done the job then. Perhaps 400 million would be a minimum figure. This quantity, added to the 1.1 billion needed for stabilization against variations in supply, would make a total of 1.5 billion bushels.<sup>31</sup>

#### COMPLETE STABILIZATION?

Some observers object to completely smoothing out the effects of variations in production by storage operations. It is stated that this would be uneconomic, because it would not result in a perfect market over time.<sup>32</sup> For in a perfect market, prices would vary from year to year enough to cover the costs of storing surpluses in big crop years over to short crop years;<sup>33</sup> but if supplies were completely stabilized, there would be no rise in prices from large crop years to small crop years to cover the costs of storage.

Two observations may be made on this point.

In the first place, the objective of the corn stabilization program is to stabilize market supplies, not to equalize storage costs and speculative gains. There is some evidence that in the open market before the CCC was created, private

speculation brought the grain market reasonably close to the criterion of perfection over time; the gains from carrying grain over from years of low prices to years of high prices were about equal to the costs. If an equivalence of storage costs and speculative gains were the objective, that was already attained in rough and ready fashion under the open market. But that was the market the CCC was created to get away from.

It may well be that CCC loan rates at fixed percentages of parity got too far away from cost considerations to be practical. The flexible loan rates written into the Agricultural Adjustment Act of 1938 but later discarded, and the table of loan rates in the Agricultural Act of 1949, may represent a sensible intermediate point between the open market and complete stabilization. The table provides for reducing the loan rate by 1 percentage point for each 2-percentage-point increase in total corn supply. This is a loan rate elasticity of a little less than  $-2.0$ ; for 1 percent measured from the 90 percent of parity base which the table starts from is actually 1.1 percent (of 90). The corn loan rate elasticity, then, is  $2/-1.1 = -1.8$ . This is about three times as high as the open-market corn price elasticity.

In the second place, the way the CCC operations actually work out renders it unlikely that complete stabilization can be attained in any case. There is enough corn that is not eligible for loan on account of grade, and enough farmers who do not qualify for loans or who do not go to the bother of taking one out, that less than complete stabilization is attained as a matter of actual practice whether it is desirable or not.

Finally, the costs of the storage program need to be taken into account. The costs in 1953-54 and 1954-55 were \$75 million to \$85 million a year, as shown in an earlier section of this report; it seems likely that they will run higher in the future, perhaps around \$100 million. Storage costs rise rapidly as the degree of stabilization comes closer to completeness and larger stocks are carried for longer periods of time. It seems unlikely that drastic changes in the storage program, which would permit more complete stabilization, will be made. For example, it seems unlikely that the present system of nonrecourse loans to farmers will be replaced by outright CCC purchases and sales, because that would cost more and would also "put the government in the grain business" far more than it is at present. Taking all these things into account, it seems likely that the degree of stabilization attained in the future will fall some distance short of completeness.

To summarize, then:

(1) There is a fairly solid statistical basis for concluding that the size of stocks required for complete stabilization of corn and other livestock feed supplies against variations in production is about 1.1 billion bushels.

(2) There is a less solid foundation for the conclusion that if some degree of stabilization against variations in demand is desired during the first year when a change in demand takes

<sup>31</sup> Work on the development of storage rules is in progress at Iowa State College. The work centers around an attempt to find a way of determining carryout so that the marginal social cost of feed grain storage for the *i*th time period equals the marginal social cost of the consumption unevenness that could be avoided by increasing the feed grain storage of the *i*th time period.

<sup>32</sup> Holbrook Working. Price supports and the effectiveness of hedging. *Jour. Farm Econ. Proc.* 35:5. Dec. 1953. p. 811.

<sup>33</sup> Geoffrey Shepherd. *Marketing farm products: economic analysis.* Iowa State College Press, Ames, Iowa. 1955. Ch. 2.



place, stocks of the order of 400 million bushels would be needed, in addition to the 1.1 billion required under (1) above. The total, therefore, would be 1.5 billion bushels.

(3) Complete stabilization appears to be unattainable under existing arrangements, so a practical working size of storage stocks for the present type of program would be substantially less than 1.5 billion bushels. How much less cannot as yet be determined on a firm statistical basis. A round figure of 1 billion bushels would be a reasonable quantity.

#### MAINTAINING 1-BILLION-BUSHEL STOCKS

This 1 billion bushels is the size of stocks that the program would aim to accumulate during good crop years, to have on hand to fill in very short crops such as 1947, 1936 or 1934 and 1910, or moderately short crops such as 1951, 1930, 1924 and 1913.

No one can tell when a short crop is coming. In many cases, after 1 billion bushel stocks have been accumulated, another good crop (or two, or more) may come along before the short crop comes. The good crop or crops may be expected to increase the size of stocks above 1 billion bushels, if loan rates and prices are kept at the same levels as before.

Provision can be made to keep this accumulation of stocks above 1 billion bushels within moderate bounds by setting up a schedule which would automatically lower the loan rates whenever the stocks grew larger than 1 billion bushels.

The flexible loan rates in the present legislation referred to above are a step in this direction. Another form of this sort of schedule, outlined below, might keep stocks more nearly in line with the desired goal.

The proposal is that whenever corn supplies exceeded 4.2 billion bushels (an average crop of 3.2 billion bushels plus stabilization stocks of 1 billion bushels) the loan rate would be reduced in proportion to the excess. That is, if total corn supplies were 4.4 billion bushels (roughly 5 percent in excess of 4.2 billion), the loan rate would

be reduced 5 percent. This would automatically bring the loan rate down toward the long-run working level needed for stabilization purposes.

A reduction of 5 percent in the loan rate would increase corn consumption about 3 percent. It also would reduce corn production the next year to some extent, for illustration, 2 percent. Thus, the total supply of corn the next year would be reduced to 4.2 billion bushels. The loan rate then would go back up to its former level.

But this would put the loan rate back too high and induce supplies in excess of stabilization needs again. This could be avoided by adding a further provision: Whenever the total supplies exceeded 4.2 billion bushels, the loan rate would automatically be reduced as above; but, instead of going back up to its original level (if total supplies the next year fell below 4.2 billion bushels), the rate would stay at the new lower level.

The loan rate then would stay at this lower level, probably for the next several years. But if the total corn supply continued to be above 4.2 billion bushels, the loan rate would be lowered each year in proportion to the excess over 4.2 billion bushels—until the resulting increase in corn consumption and decrease in corn production brought the level of supplies down to 4.2 billion bushels or less. The rate would continue then at this lower level unless stocks fell below some minimum safe level, say 500 million bushels, when the loan rate would be raised in proportion to the shortage.

In effect, this would provide stable loan rates while supplies ranged between 3.7 billion and 4.2 billion bushels. But it would move the rates up or down whenever supplies fell outside of this range.

Thus, the right long-run level of loan rates would be reached, a level that would smooth out most of the year-to-year variation in supplies—without leading either to a long-run accumulation of excessive stocks or to insufficient stocks. The rate then would remain unchanged for a number of years at a time, until stocks rose above the maximum or fell below the minimum.



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