

August, 1943

Research Bulletin 321

The Proper Size and Location of Corn Stabilization Stocks

BY GEOFFREY SHEPHERD AND DAVID G. PATERSON

AGRICULTURAL EXPERIMENT STATION
IOWA STATE COLLEGE OF AGRICULTURE
AND MECHANIC ARTS

AGRICULTURAL ECONOMICS SUBSECTION
RURAL SOCIAL SCIENCE SECTION

AMES, IOWA

CONTENTS

	Page
Summary	3
Size of stocks required	3
Location of stocks	4
Introduction	5
The size of the stabilization stocks	5
Stabilizing market supplies and prices against fluctuations in production	6
The effect of using some wheat for seed	8
Stabilizing prices against fluctuations in demand	11
Compromise solution	12
The level of loan rates	14
The location of stabilization stocks	15
The flat loan rate	15
Effects of location differentials	17
Should the stabilization stocks continue to be concentrated?	21

SUMMARY

The Commodity Credit Corporation has been endeavoring to stabilize the supplies and prices of the staple crops by extensive storage operations. Two problems arise in connection with its program for corn — the tendency for stocks of corn to grow larger than necessary for stabilization purposes, and the tendency for the stocks to be heavily concentrated in certain producing areas. The questions this bulletin is intended to answer are: (1) What should be the outside limits of the size of the stabilization stocks of corn? (2) Where should the stocks be located; should they be concentrated in a few states, or spread over the Corn Belt?

SIZE OF STOCKS REQUIRED

The chief purpose of the ever-normal granary program for corn is to stabilize market supplies by carrying over the excess above average production in years of good crops to add to supplies in years of short crops. An additional purpose is to meet sudden changes in demand before changes in production can catch up with them.

How large are the stocks of corn required for these purposes?

Study of fluctuations in corn production in the past shows that the outside limit of the size of stocks required to stabilize corn supplies is about 700 to 800 million bushels. The quantity required to meet sudden changes in demand is about 200 to 300 million bushels. Total stabilization stocks of about 1 billion bushels, therefore, would be adequate for stabilization purposes. This is a much larger quantity than has been carried previously; but if fluctuations in market supplies are to be reduced, fluctuations in stocks must be greatly increased, and this calls for maximum stocks several times larger than the maximum stocks that were carried before government storage operations were undertaken.

Since the CCC started storage operations in 1933, stocks have shown a tendency to exceed even the large size required for stabilization purposes. The stocks of cotton were several times larger than necessary from 1938 to 1942; the stocks of wheat were much too large in 1942; and the stocks of corn would have been too large in 1942 but for the wartime increase in the rate of feeding to livestock and the increase in the use of corn for industrial alcohol. The loan rates have persistently been set too high, thus increasing production and cutting down consumption to the point where stocks have shown a tendency to become excessively large. One way to keep the loan rates for corn from being set too high would be to dissociate them from parity, and set them afresh each year at levels that would provide the hog-corn price ratio required to induce farmers to attain the hog production goals that year. Another less satisfactory but more automatic method would be to

reduce the loan rate by some such amount as 1 percent for every 1 percent by which the stocks exceed 1 billion bushels. If the loan rate were announced each year shortly before corn planting time, for example about Jan. 15, it would affect corn production as well as consumption in the right direction.

LOCATION OF STOCKS

The stabilization stocks have been concentrated heavily in the western Corn Belt states. It was thought at first that the geographically flat loan rate was the chief cause of this concentration, but the institution of location differentials in 1941 and 1942 has reduced the concentration only to a small extent. Apparently, the surplus-producing character of the area is the chief determinant of the percentage of the crop that will be stored. If this is true, storage stocks will continue to accumulate most in the western part of the Corn Belt.

This, however, is fortunate, since the western Corn Belt states are subject to much more severe and long-lasting fluctuations in production than the eastern states. Stabilization stocks need to be larger (in terms of percentages of production in each state) in the western part of the Corn Belt than in the eastern part in order to meet the larger fluctuations in production that take place there. The small reduction in concentration resulting from the effect of location differentials in the loan rate has brought corn stocks in the different states to approximately the proper relative sizes needed for efficient operation.

The Proper Size and Location of Corn Stabilization Stocks¹

BY GEOFFREY SHEPHERD AND DAVID G. PATERSON

The stabilization operations of the Commodity Credit Corporation have become a major instrument for controlling the prices, the production and the flow of the great staple crops to market. They have brought an element of overall rationality into the marketing of these crops that was lacking in the unregulated open competitive market. They afford a means for stabilizing the market supplies and prices of farm products against fluctuations in production — a problem that has plagued producers and consumers for many years.

But in solving old problems they have created some new ones. One of these problems is the tendency for the stabilization stocks to grow larger than necessary for stabilization purposes. Another is the tendency for the stocks to be heavily concentrated in certain producing areas. This bulletin deals with these two problems, with respect to corn. It attempts to answer these two questions: (1) What should be the outside limits of the size of the stabilization stocks of corn? (2) Where should the stocks be located; should they be concentrated in a few states, or spread over the Corn Belt?

THE SIZE OF THE STABILIZATION STOCKS

Corn production fluctuates more from year to year than the production of any other major crop in the United States. The chief reason for this is the variation in yields with good and bad weather. These variations cause severe fluctuations in corn prices, and in hog production and prices also. This increases the costs of producing, processing and distributing these products, and causes production to average less over a period of years than if the fluctuations in corn production could be leveled out.

It is impossible to smooth out production, but the flow of corn to market can be smoothed out by storage operations designed to withhold the excess over average production in good crop years and release it in short crop years. That has been the chief purpose of the storage operations conducted by the Commodity Credit Corporation since 1933 — to smooth out variations in physical supplies.

¹ Project 722 of the Iowa Agricultural Experiment Station.

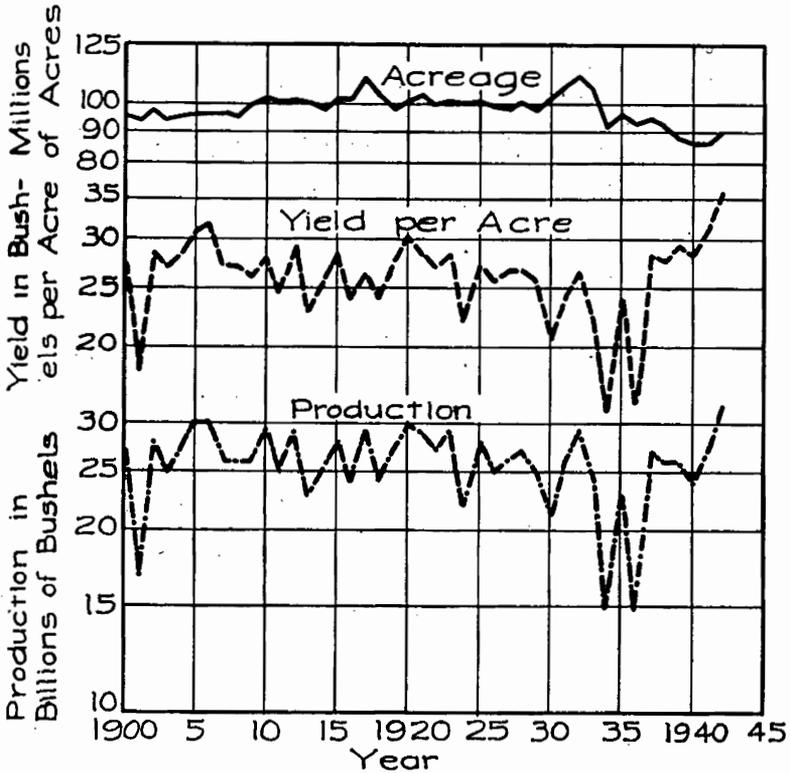


Fig. 1. Corn acreage, yield per acre, and production in the United States, 1900 to 1942.

If demand remained constant, this would stabilize prices. But demand fluctuates also, and a secondary objective of stabilization operations has been to meet these variations in demand as well as in supply.

How large are the stocks required to attain these two objectives? This question is considered in the next two sections.

STABILIZING MARKET SUPPLIES AND PRICES AGAINST FLUCTUATIONS IN PRODUCTION

The original objective of the ever-normal granary program was to smooth out variations in physical supplies — to withhold the excess over average supplies in years of large crops and release it in years of short crops. The size of the stocks required for this type of stabilization operation can be determined on an objective statistical basis.

Figure 1 shows that the long-time average yield of corn in the United States has been about 26 bushels to the acre. The trend of yields has remained horizontal². The size of the stocks that would have been necessary for complete stabilization of supplies in the past can be calculated by multiplying the excess over the average yield of 26 bushels to the acre by the acreage planted, each year in succession, to see how large the stabilization stocks would grow before they would be drawn down in years of short crops.

This procedure shows that from 1860 to 1900, the stocks required for complete stabilization of supplies by storing the excess over average production in good crop years would at no time have grown larger than a billion bushels. During the decade from 1900 to 1910, however, seven large crops occurred in succession, and the stabilization stocks would have increased to about 2 billion bushels. In the 1920's they would have grown larger yet, to nearly 3 billion bushels. Yet they still would not have been large enough to fill in the gap caused by the succession of four short crops from 1933 to 1936 inclusive.

In view of these facts, the conclusion was reached in an earlier study³ that complete stabilization of the market supplies of corn should not be attempted. Drouths as severe as those from 1933 to 1936 have occurred only once in 75 years, and it would clearly not be sensible to carry large stocks of corn for perhaps 50 years or more in order to cope with drouths of such severity. If the years 1934-36 are excluded, stocks of a billion bushels would have been large enough to stabilize supplies.

But yields are likely to vary less in the future than they have in the past. The yields from the hybrid corn now used so extensively apparently fluctuate less, proportionally, than the yields from the open-pollinated varieties previously used. When drouths come in the future, corn yields will not be reduced so much, proportionally, as they were in the past. In addition, acreage control upwards as well as downwards may be used to reduce the size of the stabilization stocks required. For these reasons it was concluded that the outside limit of the size of stocks required for stabilizing the physical supplies of corn in the future should be set at about 700 or 800 million bushels.

This would stabilize only the supplies of corn. The production of the other feeds (principally oats and barley) fluctuates somewhat less than the production of corn, but oats and barley are produced in much the same general area as corn, and there is

² The yield will probably average higher than 26 bushels in the future, for hybrid seed corn is being used more and more widely, and it outyields the ordinary open-pollinated varieties by about 15 percent in the heart of the Corn Belt.

³ Controlling corn and hog supplies and prices, Technical Bulletin No. 826, June, 1942, U. S. Department of Agriculture, by the senior author of the present bulletin.

some correlation (+0.5) between fluctuations in the U. S. average yields of corn and oats. These variations in the yields of the different crops reinforce each other rather than offset each other. The total production of corn, oats and barley together (with the different grains weighted according to their relative feeding values per bushel) fluctuates less, proportionally, than the production of corn alone, but more absolutely (in terms of bushels). The same thing is true of their weighted average yields.

The storage program for corn has been in effect since 1933, and a program for barley was initiated in May, 1940. A program for oats would round out the picture, and complete coverage would then be provided for all of the major feeds. So far, however, no program for oats has been put into effect. The chief reason for this may be that it would cost more to store oats than corn. A bushel of oats occupies the same space as a bushel of corn, but has only half the feeding value, so oats require twice as much storage space per unit of feeding value as shelled corn. Ear corn takes nearly twice as much space per bushel as shelled corn (therefore taking nearly as much space as oats), but a crib costs less to build and maintain than a bin. Corn and oats can be substituted as feeds without much difficulty over a fairly wide range, so the lower cost of storing corn has been considered sufficient reason for not embarking on a storage program for oats.

A storage program for oats would require carrying storage stocks up to about 250 or 300 million bushels in size. If no storage program for oats is undertaken, about 100 million bushels more corn should be added to the corn stocks in order to carry the load of fluctuations in oats production in addition to corn production. (This figure, 100 million bushels of corn, is a little less than half the 250 to 300 million bushels of oats that would be required for stabilization, because a bushel of oats has about half the feeding value of a bushel of corn, and because the correlation between the fluctuations in the production of the two crops is not very high.) The estimate of 700-800 million bushels of corn given earlier would in that case be raised to 800-900 million bushels.

THE EFFECT OF USING SOME WHEAT FOR FEED

Future policies with respect to wheat may bring a new element into the picture. Ordinarily, some of the wheat crop is fed to livestock. From 1922 to 1926 the quantity fed was, on the average, about 50 million bushels a year. For the crops of 1936 to 1941, the average was about 100 million bushels a year. The feeding of wheat from the 1942 crop is being subsidized by the CCC; 125 million bushels was sold by the CCC for feeding purposes at prices equivalent to 85 percent of corn parity, and 150 million more at 100 percent of corn parity. Together with the wheat

that is being fed without subsidies, about one-third of the 1942 wheat crop is likely to be fed to livestock. The percentage of the 1943 crop fed may be equally high.

After the great expansion in the wartime demand for meat and therefore for livestock feed has passed, the percentage of the wheat crop fed will no doubt decline from its current levels, but the upward trend evident before the war is likely to continue. Since 1900 the price of wheat has been steadily declining relative to the price of corn. Reductions in the cost of producing wheat have apparently been greater than the reductions in the cost of producing corn, until some observers believe that wheat in the heavy wheat-producing areas can be produced now at as low a cost as corn in the Corn Belt. If this is true, a large proportion of the wheat crop will be fed. If, on the other hand, the price of wheat continues to be supported by means of CCC loans at artificially high levels relative to corn, and the AAA continues to be unable to reduce wheat production, wheat stocks will continue to increase in size and wheat feeding will continue to be subsidized in order to keep the wheat stocks from increasing to unmanageable proportions. Either way, it seems that an increasingly large proportion of the wheat crop will be fed to livestock.

In that case, the stocks of wheat can be drawn upon, as well as the stocks of corn, when corn supplies are short. The ever-normal granary for corn could contain some wheat as well as corn. Does this mean that less corn needs to be carried than the 700 to 800 million bushels arrived at above on the basis of corn alone?

The answer depends mainly upon whether fluctuations in wheat production coincide with fluctuations in corn production. If whenever short corn crops depleted the stabilization stocks of corn, short wheat crops depleted the stabilization stocks of wheat also, wheat stocks could not be relied upon as part of the stabilization stocks of feed, along with corn. But if there is no positive correlation between variations in the size of the two crops, wheat stocks can be used, except only in the cases where small crops of corn and wheat happen to coincide, either by accident or because of an unusually widespread drouth or other weather catastrophe.

Examination shows that the correlation between the variations in the yields of corn and wheat is zero, except only for the positive correlation resulting from the extremely severe drouths of 1934 and 1936 and the extremely good weather of 1942. Figure 2 shows that if those 3 years are ignored, the correlation between the average yield of corn in the United States and wheat yields (both the spring wheat and the winter wheat) is, for all practical purposes, zero. This is true of wheat yields per acre harvested as well as per acre seeded.

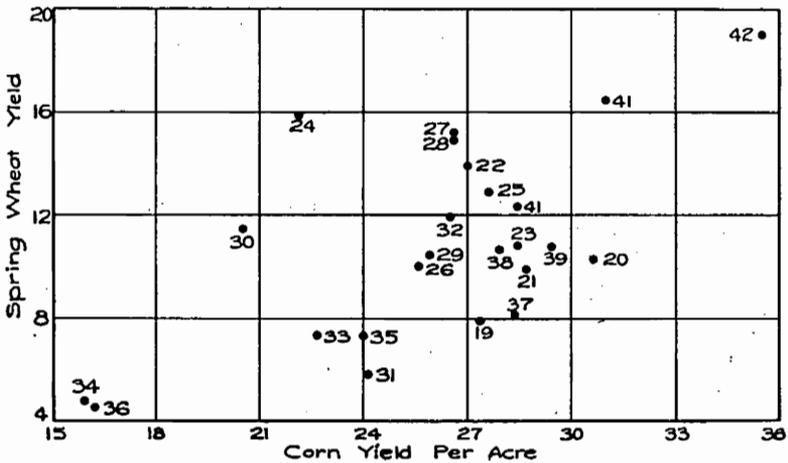
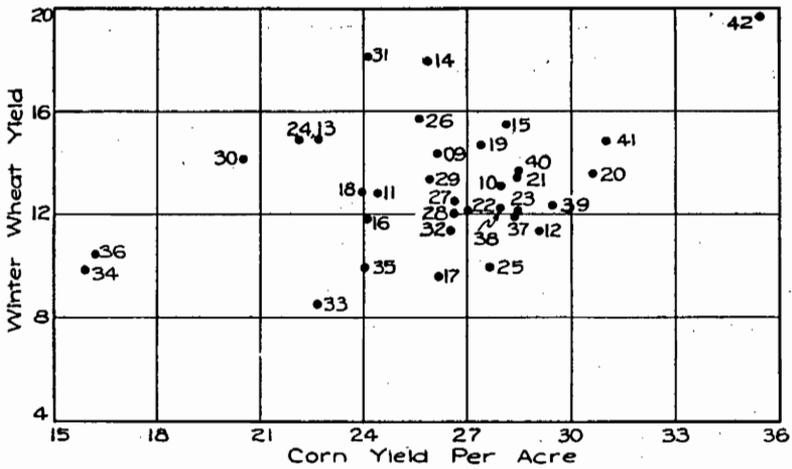


Fig. 2. Relations between the average yield of corn and the average yield per seeded acre of spring wheat and winter wheat.

This does not, however, point to the simple answer that wheat stocks can be counted as part of the stabilization stocks of corn. The two crops are produced, in the main, in different areas, and the shipping charges from the wheat areas to the corn feeding areas would average perhaps between 10 and 20 cents per bushel and range up to considerably higher figures. In the areas where wheat and corn are produced in large quantities, such as Kansas, the variations in the sizes of the two crops correspond closely. The closer the corn and wheat areas lie to each other, and the

lower the shipping costs between them, the more closely do variations in production coincide. And when the need for large reserves of feed is greatest — when very severe drouths occur on a national scale, as in 1934 and 1936 — the total production of wheat reaches its lowest levels along with a low production of corn. In view of these considerations, it appears that the use of an increasingly large percentage of the wheat crop for livestock feed will not appreciably reduce the size of the stocks of corn needed to stabilize corn supplies. It may reduce the size of the stocks of corn needed to meet changes in demand. That subject is considered in the next section.

STABILIZING PRICES AGAINST FLUCTUATIONS IN DEMAND

If the demand for corn remained constant, stabilizing the physical supplies would stabilize prices also. But the demand for corn fluctuates violently; the same size crop that sold for 85 cents a bushel in 1927-28 sold for 32 cents a bushel in 1931-32. The difference between the two prices was entirely the result of differences in the strength of the demand.

Accordingly, storage operations have been used to stabilize prices against fluctuations in demand as well as in supply. The Federal Farm Board, set up in June, 1929, conceived that "stabilization means keeping prices from going unduly low in periods of large supplies or poor demand . . . and unduly high during periods of short supplies or of inflation."⁴ The Farm Board went on the rocks attempting to effect this sort of stabilization — trying to hold prices up not only when crops were large but also when the demand began its long decline in 1929. The CCC, set up to replace the Farm Board in 1933, tried to do the same thing. It continued to hold prices up even after the demand had recovered, and by 1940 had accumulated considerably larger stocks of cotton and wheat than were necessary for stabilization purposes.

Then came the war in 1941. The great increase in demand that came with it converted the large stocks from a burden into a major military asset, a "war chest" of food and fiber. The policy of stabilizing prices against fluctuations in demand had wrecked the Federal Farm Board in 1933 and brought the CCC close to major difficulties in 1940, but the usefulness of the large stocks during the present war has revived the idea that prices should be stabilized against fluctuations in demand as well as in supply. This sort of stabilization would not only reduce fluctuations in prices but would also build up a "war chest" of reserve supplies that could be used in times of great emergency.

But a storage policy of this sort would not be a good way to deal with changes in demand, for several reasons. The length

⁴ Third annual report, Federal Farm Board, 1932.

of time intervening between the bottom of a depression and the top of a boom is so great, and so uncertain in length, that physical deterioration and the cost of storing corn for so long a time would become excessive. The cost of storing corn from 1932 to 1942, at 5 cents per year, would be 50 cents per bushel. If the stocks are regarded not as stabilizers from depressions to boom periods, but as a war chest, the costs would be higher yet; it would have been a considerable burden after World War I to have carried substantial storage stocks of this character as a reserve against the needs of the next war.

Storage operations would mean that during depressions the Federal Government would be withholding large stocks from consumption, at a time when many low-income consumers would not have enough to eat. It would increase the paradox of starvation in the midst of plenty. This sort of thing is bad enough when it is done by private industrial manufacturing corporations; it would be difficult to defend if it were undertaken on a large scale by the Federal Government.

Several other steps should be taken before storage operations are resorted to. The best way to meet changes in demand is first of all to do everything possible to keep them from happening — to stabilize industrial activity in order to keep demand stable in the first place. This calls for stabilizing industrial activity by means of appropriate governmental fiscal policy, by large scale public works projects, social security programs and all the other measures that can maintain demand at a high level.

It is too much to hope that these activities will be completely successful in stabilizing industrial activity. Some degree of depression may materialize in spite of all that is done along these lines. An additional weapon should at least be prepared, ready to go into action if needed — an extensive nutritional program, such as the Food Stamp Plan, for unemployed and low income groups. In time of depression, these groups do not have enough purchasing power to buy an adequate and balanced diet. They begin to suffer nutritional deficiencies at the same time that farms begin to suffer from low farm prices. Both result from the same cause, and both can be remedied or at least alleviated by extensive programs designed to provide low-income consumers with an adequate ration at reduced prices or free. This calls for large scale government subsidy of consumption among low income groups. The bulk of the corn crop is used for livestock feed, so a subsidy to the consumption of livestock products would support the price of corn.

COMPROMISE SOLUTION

If this is not sufficient to stabilize prices, farmers will press for commodity loans at relatively high rates, in order to hold prices

up directly. The objection to this is that it would tie up quantities of products in storage, as mentioned above. The outcome will probably be a compromise between farmers' demands for prices to be supported and consumers' demands that they be permitted to decline. The best way to support prices moderately would be to use a moderately high loan, high enough to give some relief to farmers but low enough to induce them (along with other means such as AAA activities) to reduce production moderately. Reducing production would be better than building up very large stocks, for the costs of storage for 5 or 10 years would be burdensome, and it would be better to reduce production for a few years by methods which would store up fertility in the soil and permit a rapid expansion of production later on when demand increased again. The AAA was not able to reduce production as a long-time proposition from 1933 to 1940, at a time when prices were rising. But it should be able to do it as a short time measure, when prices are moderately declining. It is easier to change production in line with changes in demand than against them.

There is an inherent time lag in the response of production to changes in demand, so the lower loan rate should be based upon the most accurate forecasts possible and announced in advance, shortly before the time for planting corn and other crops. This forecasting can never be perfect, and small stocks could well be carried to correct errors in estimates and to fill in the brief space of time before production can change enough to match changes in demand. These stocks do not need to be very large. Two or three hundred million bushels of corn would probably be enough for this purpose. This quantity, added to the 700 or 800 million required for stabilizing market supplies against fluctuations in production, would total about 1,000 million bushels of corn. An outside limit of a billion bushels of corn, therefore, would seem to be large enough for all stabilization purposes.

This is a large quantity, much larger than the quantities that have been carried in the past. The largest total stocks of corn ever held in the United States on Oct. 1 were the 1940 stocks of 700 million bushels. But only 20 percent of that quantity (140 million bushels) was owned by the CCC, and less than half of it (320 million bushels) was under loan; the rest (240 million bushels) was held by farmers and other private owners. Farmers and other private owners continued to hold about as much corn, free of CCC loans, as they did before the CCC was created. The CCC holdings of corn, plus the quantities under loan, did not displace any private holdings; they were simply additions to the private holdings.

A two-fold conclusion, then, emerges: (1) The nation should prepare to carry stocks of corn up to 1 billion bushels in size as part of the program for more rational over-all control of corn

prices, production and consumption than was exercised by private traders through the open competitive market system of earlier years. (2) Only a part of these stocks need to be held by the government stabilization corporation. A major part of the stocks will be held in private hands, not under CCC ownership or loan.

THE LEVEL OF LOAN RATES

Adequate safeguards should be set up to keep stocks from accumulating to a larger size than necessary for stabilization purposes. There is a tendency for loan rates to be set too high, which caused the stocks of cotton to accumulate to a size several times larger than necessary from 1938 to 1942. It also caused the stocks of wheat to be much too large in 1942, and would have had a similar effect on the stocks of corn but for the great war-time increase in the rate of feeding to livestock and in use by the industrial alcohol industry.

This tendency derives support from the emphasis on 1909-14 parity prices, which are out of line with economic realities, because the cost of producing corn has been reduced materially by the use of hybrid seed, mechanization and other changes in cultural practices. The loan rates should be dissociated from parity and based instead upon two things: One is the ratio with livestock prices that will induce the production of the quantities of livestock needed. The other is the level of corn prices required to induce the necessary production of corn. This is the procedure that is being followed at the present time, its adoption being made relatively easy by the strength of the demand, which makes for high prices.

The loan rate thus determined should be announced shortly before corn planting time, say Jan. 15 after the Jan. 1 stocks of corn are known. This would give farmers time to make up their minds as to how many acres of corn they would plant in response to that loan rate. If the yields on that acreage turned out to be higher than average, most of the excess over average would be put under the loan or withheld by farmers without loans. If the yields turned out to be lower than average, the storage stocks that had previously been built up would be drawn down. In either case the supplies available for consumption would be equal to the acreage planted multiplied by the average yield (the yield that would have resulted if the weather had been average).

If the demand declines substantially after the war, it may not be so easy to adhere to this procedure. If so, the tendency for loan rates to be set too high could be corrected by providing by law that whenever the size of the stabilization stocks of corn exceeded a billion bushels, the loan rate should automatically be reduced by 1 percent for every 1 percent by which the stocks of old corn Oct. 1 were greater than 1 billion bushels. A provision

of this sort was included in the Agricultural Administration Act of 1938, but the loan rate was tied to the size of the crop, exclusive of the carry-over, whereas it should be tied to the carry-over, exclusive of the size of the crop. If this loan rate were announced each year just before corn planting time, it would affect production as well as consumption in the right direction.

THE LOCATION OF STABILIZATION STOCKS

The second problem considered in this bulletin is the proper location of the stabilization stocks of corn.

The problem of the proper location of the stabilization stocks of corn was not given much attention until 1940. By that time the heavy concentration of storage stocks of corn in Iowa, Illinois and Minnesota brought the problem to public attention. These are the heaviest corn-producing states in the Union, and their stocks would be expected to be larger than those of other states where less corn is produced. But Iowa's stocks were twice as large, in proportion to her production, as the stocks for the United States were in proportion to United States production. Minnesota's were 50 percent larger than proportional. Illinois' were approximately proportional to her production. Corn was going into storage instead of into hogs, perhaps to the detriment of the best interests of these states from a livestock feeding point of view.

Three questions were raised. Why had the stocks accumulated so heavily in those states? Should they continue to be concentrated thus? If not, how should they be dispersed in the future?

THE FLAT LOAN RATE

From 1933, when the first loans on corn were made, to 1938, the loan rate had been uniform over the country. In the Agricultural Administration Act of 1938, an area called the "commercial corn area" was outlined, including all counties in which the average production of corn was 450 bushels or more per farm and 4 bushels or more for each acre of farm land in the county.⁵ This area included most of the Corn Belt, and about 99 percent of the loans were made in the area. The loan rate outside this area was 75 percent of the rate within the area. But the rates in both cases, in the area and outside of it, were geographically uniform or flat.

Normally the price of corn is lower in the heavy surplus producing states such as Iowa and Illinois than in the eastern Corn Belt states (the Iowa farm price averages 9 or 10 cents lower than the Ohio price), and the conclusion seemed reasonable

⁵ The Agricultural Administration Act of 1938, Sec. 301 (4) (A).

that this was the explanation for the concentration of corn stocks in the low-price surplus-producing areas. The flat loan rate was higher relative to the open market price in those areas, and, offering a more attractive outlet than the open market, caused corn to accumulate more heavily there.⁶

Accordingly, it seemed that the way to overcome this concentration of stocks was to institute location differentials in the loan rate for corn to bring the rates more nearly in line with the prices. The loan rate for cotton had originally been geographically flat, but in 1938, because of the accumulation of cotton in the low price areas, location differentials were instituted, based on shipping charges to the heavy consuming or export areas. Location differentials were similarly used with wheat from the time of the first loan in 1938. The need for location differentials for corn loan rates appeared to be evident, the precedent had already been established with cotton and wheat, and the only question was: What should the differentials be based on in the case of corn? Should they be based on freight rates, and if so, on corn, or hogs or other products? Or should they be based on average corn prices by counties or other small areas, over a recent period of years, and if so, what years?

After much discussion, differentials were finally instituted for the 1941 corn crop, based on average farm prices by crop reporting districts (the smallest areas for which data existed) over the previous 16 years, adjusted to 20 year state averages and broken down by counties. The range from the lowest to the highest rate in the commercial corn area was 14 cents; but in order not to make too severe a break with the previous flat rate, the range was arbitrarily reduced to 10 cents by flattening off at the top and bottom.

The differentials for the 1942 crop were based on simple averages of the monthly prices for (1) the 20-year period July, 1922, through June, 1942, and (2) the 5-year period June, 1937, through June, 1942, excluding in each case the months falling within the crop years 1934-35 and 1936-37. The simple average of these two period-averages was used, thus giving more weight to the recent years. The 10 cent limitation imposed upon the differentials in 1941 was removed. The differentials are shown by states in table 1. The differential in each case is to be added to or subtracted from the average loan rate for corn for the United States as a whole (85 percent of United States farm price parity in the case of the 1942 crop).

⁶L. J. Norton. Effects of the uniformity of corn loans, regardless of location. *Ill. Farm Econ.*, No. 67, p. 437-439.

T. W. Schultz and O. H. Brownlee. Our U. S. Iowa corn granary and how it has affected hogs in the Corn Belt. *Iowa Farm Econ.*, 7 (1): 8-10, 16 illus.

TABLE 1. LOAN RATE DIFFERENTIALS FOR THE 1942 CORN CROP.
(Cents per bushel.)

Illinois	minus	4.0
Indiana	minus	2.6
Iowa	minus	7.7
Kansas	minus	1.6
Michigan	plus	4.2
Minnesota	minus	10.9
Missouri	plus	1.0
Nebraska	minus	6.1
Ohio	plus	1.5
South Dakota	minus	11.2
Wisconsin	plus	2.2

These differentials represent only the average differentials in prices. The actual differentials in prices vary widely from year to year, and even from month to month. From 1921 to 1940, the range in the monthly fluctuations in the Iowa-Ohio differential was 42 cents. The chief reason for the annual fluctuations is the changes that take place from year to year in relative sizes of the corn crop in the different states.

There is a question whether the loan rate differentials should vary from year to year to some extent in line with variations in the relative sizes of the crop in the different states. On the whole, it appears desirable not to do this. A stable loan rate structure from year to year reduces to a minimum the shipping of corn from one area to another one year and perhaps back again the next year, as crop sizes vary from year to year. Occasional local surpluses go into storage for a year or so, instead of being shipped out each year.

In the case of price ceilings, however, a stable differential structure would not work. Local shortages could not be made up by increased inshipments if the fixed differentials based on average prices were not high enough to cover transportation costs. It would seem to be necessary to provide for variations from year to year in the differentials for price ceilings.

EFFECTS OF LOCATION DIFFERENTIALS

It was expected that the location differentials instituted after 1940 would rectify at least most of the tendency for corn stocks to be concentrated most heavily in the low-price surplus-producing states. But as the 1941-42 season progressed, and corn loans were made, week by week the figures told an interesting story: Corn was going under the loan in about the same percentages in each state as during the year before. By the end of the crop year the percentages of the 1941 corn crop put under loan in each state during 1941-42 were not greatly different from the percentages of the 1940 crop put under loan during 1940-41. Table 2 and fig. 3 show that the concentration of loans in the western part of the Corn Belt was almost as great under differential loan

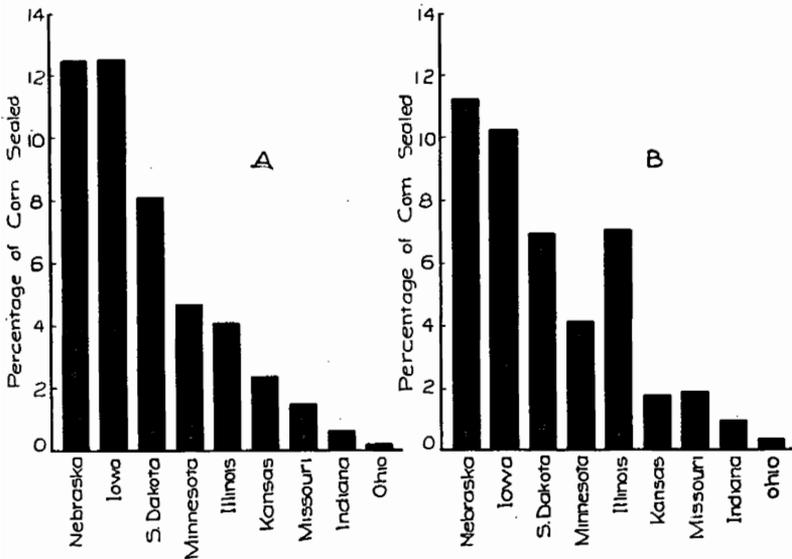


Fig. 3. Quantity of corn put under loan as a percentage of corn production in each state (A) under the flat loan rate in 1940-41, and (B) under differential loan rates in 1941-42.

rates in 1941-42 as it had been under the flat loan rate in 1940-41.⁷

Why was this? Why did not the differential loan rates reduce the concentration of corn loans in the low-price surplus-producing areas?

Analysis of the data by states shows that equal relations between the loan rate and the farm price do not cause equal percentages of the corn crop to be put under loan in the different states.⁸ Corn

⁷ The data for the 1942 crop will not all be in until the 1942 loan season closes on Sept. 30, 1943. The data for the loans made up to date (May 15, 1943) show much the same concentration of loans in the western part of the Corn Belt as in the case of the 1940 and 1941 crops. The 1942 percentages for each state may be made comparable with the 1940 data by dividing them through by a single figure (0.88) to bring the percentage of the 1942 crop that was put under loan for the nine states as a whole up to the same percentage as that of the 1940 crop that was put under loan. (The 1941 data were left in their original form, since the conversion figure in their case would be practically 1.0.) The percentages for 1942 thus computed are:

Nebraska	10.8	Missouri	2.4
Iowa	13.6	Kansas	2.4
South Dakota	4.5	Indiana	0.8
Minnesota	1.6	Ohio	0.3
Illinois	0.5		

The 1942 percentages for the three states in the southwest (Nebraska, Iowa, and Kansas) average about as high in 1940. The two states in the northwest (South Dakota and Minnesota) run much lower; so does the central state, Illinois. The south central and eastern states (Missouri, Indiana and Ohio) run the same as in 1940 or slightly higher. There is more variation from the 1940 data by states in this case than in the case of the 1941 loans, but only a slight general reduction, if any, in the concentration of loans in the west.

⁸ David G. Paterson. The size and location of stabilization stocks of corn. Unpublished thesis. Library, Iowa State College, Ames, Iowa, 1942.

TABLE 2. QUANTITIES OF CORN SEALED AS PERCENTAGES OF PRODUCTION IN EACH STATE IN 1940-1941 AND 1941-1942.

	(1) (2)		(3) (4)		(5) (6)	
	Quantity of corn sealed 1,000 bushels		Production 1,000 bushels		Corn sealed as a percentage of production	
	(1940)	(1941)	(1940)	(1941)	$\frac{(1)}{(3)} \times 100$ (3)	$\frac{(2)}{(4)} \times 100$ (4)
Nebraska	13,205	17,707	105,587	157,638	12.51	11.23
Iowa	59,380	47,725	473,760	464,814	12.53	10.27
South Dakota	4,053	3,465	50,166	50,006	8.08	6.93
Minnesota	8,035	8,188	172,457	196,245	4.66	4.17
Illinois	13,590	28,228	328,735	401,362	4.13	7.03
Missouri	2,972	1,987	124,044	133,216	2.40	1.76
Kansas	633	1,041	42,352	57,224	1.49	1.82
Indiana	921	1,711	145,558	177,030	.63	.97
Ohio	260	592	122,360	160,974	.21	.37
Totals	103,049	110,644	1,565,019	1,778,509	6.58	6.22

Source: Loan data from letter of Feb. 3, 1943, from Mr. William McArthur, Director, Grain Division, CCC, to Geoffrey Shepherd.

starts going under loan in Iowa, Nebraska and Kansas even when the spread between the loan rate and the farm price is negative (the loan rate is below the price) by as much as 7 to 10 cents. In other states the spread has to be within 2 or 3 cents of zero before corn begins to go under the loan. In all cases, as the spread increases positively the percentage of the crop put under loan increases, but at different rates in the different states. An increase in the spread of 5 cents is associated with an increase of 5 percent in the amount of corn put under the loan in Iowa, but only $\frac{1}{4}$ of 1 percent in Ohio.

This means that even if the loan rates in each county were identical with the average prices in each state, or uniformly above or below them, different percentages of the crop would move into storage in the different states.

The differences in the percentages of the corn crop put under loan in the different states appear to depend chiefly upon the extent of the surplus production of corn in the states, not upon relative loan rates. In general, the greater the surplus production of corn in the state, the higher is the percentage of the crop put under loan. If most of the corn in a state is fed up locally each year, as in Ohio, very little corn will be put under loan even though

the loan rate is considerably higher than the price; nearly all of it will need to be fed, so why put it under loan only to take it out again in a few months? But if a good deal of the corn is going to be sold as cash corn anyway, as in Iowa, farmers are more likely to put it under loan, where they can eventually "sell it to the government" if they wish. Evidently, corn goes under the loan in large percentages of production in the low-price surplus-producing areas, not so much because of the low price as because of the surplus production.

The CCC non-recourse loans on corn have been most attractive to the farmers who normally sell some corn as cash grain. Corn that normally would be sold anyway can be placed under government loan without requiring any change in the farming systems. The only requirement has been the need for additional storage space. This has been partly taken care of, since the corn-resealing programs have provided for storage payments to borrowers, which have encouraged many farmers to build additional cribs.

But farmers who normally feed to livestock all the corn they raise can not seal much of their corn without altering their farming enterprise. A change in their enterprise may leave some buildings and equipment idle or may under-utilize labor. This appears to be the reason for the small amounts of corn sealed in the eastern Corn Belt even under differential loan rates.

Apparently, the smaller the size of the area considered, the more important is the influence of the amount of surplus corn available. In the state of Iowa, for example, the range in the 1941 loan rate from the lowest county rate to the highest was 6 cents (the range in the 1942 loan rates is 6 cents also). These differences in loan rates approximately reflect the normal differences in prices in the different counties of Iowa. But the percentages of the crop actually put under loan in the different counties ranged from zero to 27 percent, both in 1941 when there was a range of 6 cents in the loan rates within the state, and in 1940 when the loan rate was flat. The small extent to which the introduction of location differentials in 1941 affected the percentage of the crop put under loan is shown by counties in fig. 4. The relation between the percentages stored in the 2 years is close to 1 to 1 throughout.

All this means that even with location differentials fully reflecting differences in average prices by counties and states, as they do now,⁹ corn will still continue to accumulate in storage in much higher percentages of production in the surplus-producing areas than in the self-sufficient or deficit areas.

⁹ The arbitrary limitation of the range in county rates to 10 cents in 1941 was removed in 1942, the range now being 16 cents in the main commercial corn area, extending 8 cents higher for a few counties in Maryland and southeastern Pennsylvania.

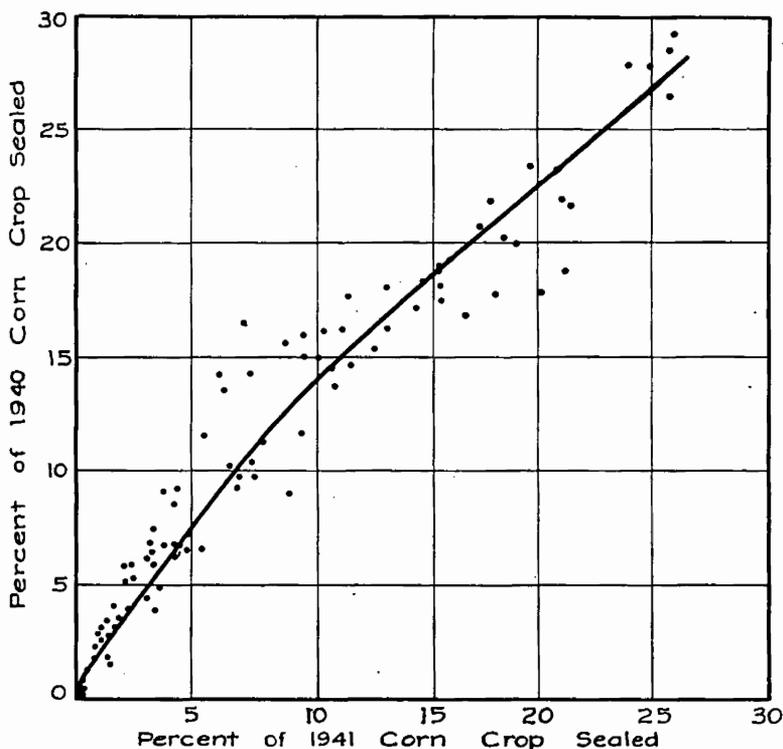


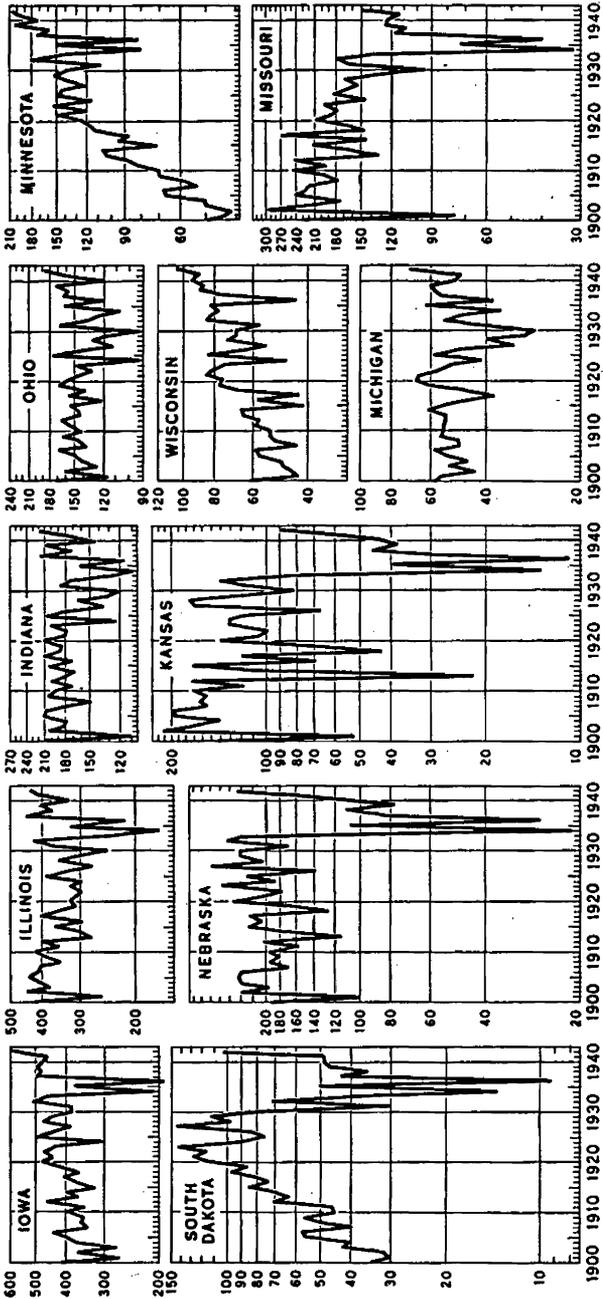
Fig. 4. Quantity of corn put under loan in each county in Iowa, as a percentage of corn production. Data for 1940-41 plotted along the vertical axis; data for 1941-42 along the horizontal axis.

SHOULD THE STABILIZATION STOCKS CONTINUE TO BE CONCENTRATED?

Is it desirable to have storage stocks continue to accumulate most heavily in the surplus-producing areas — not quite so heavily as under the geographically flat loan rate, but still in much larger percentages of production than in the other areas?

Figure 5 shows that fluctuations in corn production from year to year are greater in the western and southern Corn Belt states than in the central, eastern, and northern Corn Belt states. They also last longer. In South Dakota, Nebraska and Kansas, and to a lesser extent in Missouri, the 1934 and 1936 drouths reduced corn production to about 10 percent of its previous levels. Production was not only severely reduced; it stayed severely reduced for several years and had not completely recovered by 1941.

PRODUCTION OF CORN IN SELECTED STATES. IN MILLIONS OF BUSHELS. 1900-1942



U. S. DEPARTMENT OF AGRICULTURE

FIG. 3570P BUREAU OF AGRICULTURAL ECONOMICS

Fig. 5. Production of corn in selected states, in millions of bushels, 1900-1942.

A chart of hog production in those states looks very similar to these charts of corn production, only less extreme. Hog production in the western and southern Corn Belt states was cut roughly in half by the drouths, and remained at that low level for several years.¹⁰

This means that the stocks of corn required for stabilizing supplies in these states would have to be very large. They would have to be not 25 nor 30 percent of an average crop, as in the eastern Corn Belt states, nor 50 percent as they were in Nebraska in 1941, but several times as large as an average crop. If corn supplies were to have been completely stabilized at average production (175 million bushels) in Nebraska, for example, stocks as large as 700 to 800 million bushels would have been needed. Reserve stocks in 1933 would have been four times as large as an average crop. And these stocks would have had to be carried for a good many years — 5 or 10, at least. The cost of storage could easily amount to as much as the total value of an entire corn crop.

Is there any other way to meet the situation in these western states at less cost than this?

During the present emergency, a ready answer is to move in supplies of wheat at feed prices whenever corn supplies are short. There is plenty of wheat on hand, and the wartime emergency justifies the CCC's taking a loss on it for feeding purposes. But in ordinary times this sort of loss should be avoided if possible. When drouth severely reduces the size of the corn crop in the western states, it usually reduces the size of the wheat crop, too.

In ordinary times, one of the best ways would be to let supplies accumulate most heavily in Iowa, and let Nebraska draw upon them when she has used up her own reserves. Iowa raises three or four times as much corn as Nebraska, and ships out 10 or 15 percent of it, usually east and south. South Dakota could draw on Minnesota for most of her ever-normal granary supplies. The 1934 and 1936 drouths cut corn production only about 50 percent in Iowa and Minnesota (and less than that in eastern Corn Belt states) and production in those states snapped back to normal or higher immediately after the drouths. Substantial stocks built up in Minnesota, Iowa and Illinois would have been relatively ample for the western states to draw on, particularly since the eastern states were less hard hit by the drouths and did not need to draw on Minnesota, Iowa and Illinois as much as usual. One good way to handle the severe fluctuations in the western states, therefore, would be to hold large enough ever-normal granary

¹⁰ See fig. 19, Production of hogs in seven Corn Belt states 1924-40, p. 59, Controlling corn and hog supplies and prices, Technical Bulletin No. 826, June, 1942, United States Department of Agriculture, by the senior author.

stocks in the states just east of the Missouri River to supply a major part of the needs of the states just west of it, after those western states have used up their own reserves. It would be cheaper for the CCC to absorb the freight costs, if that were considered desirable, than to pay the storing costs west of the river.

An additional factor that does not show up in the production figures needs to be taken into account — insect damage. East of the 100th meridian, insect damage increases with distance south. Corn in storage in Missouri is subject to high insect damage. Fortunately, the price of corn in Missouri ordinarily runs from 5 to 10 cents higher than in Iowa — enough to cover the costs of transportation in most cases. This indicates that one way to reduce insect damage is to hold large enough supplies in Iowa and Illinois to provide ever-normal granary supplies for Missouri as well.

One final consideration remains. Iowa, Minnesota and Illinois are the states with the highest percentages of surplus corn production over local needs. This means three things: First, corn prices are lower there than almost anywhere else; second, these three states have surplus corn available, and, being centrally located, they can ship it in any direction as needed; and, finally, as shown above, the states that have the largest surpluses are the ones that seal the most corn and in many cases eventually let the CCC take it over.

Apparently, large storage stocks of corn will continue to accumulate in Minnesota, Iowa and Illinois. Fortunately, this is where they are needed. They are an asset and not a liability, and ample storage space should be provided for them. The stocks of corn on farms in Iowa on the last Oct. 1 before the United States declared war were 200 million bushels, a little less than half an Iowa crop. These stocks are not too large, as originally believed. They are about the right size. These three states are good places to keep extra supplies for the states just west and south, as shown above, and plans could well be made to carry stocks equal to half a crop, or more, in these states whenever crops in the future are large.