1953

Agricultural Production Trends in South Dakota, 1925-51

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AGRICULTURAL PRODUCTION TRENDS IN SOUTH DAKOTA

1925-51

by

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Bachelor of Science Degree at South Dakota State College, June, 1947

A Thesis

Submitted to the Faculty

of

The South Dakota State College

of

Agriculture and Mechanic Arts

November, 1953

In Partial Fulfillment of the Requirements

For the Degree of Master of Science

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This thesis is approved as a creditable independent investigation by a candidate for the degree, Master of Science, and acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

ACKNOWLEDGMENTS

Gratitude is hereby expressed to Mr. Lyle M. Bender, Extension Farm Management Specialist, who originally suggested the project and made many valuable suggestions and contributions throughout the work.

Professor Limen T. Smythe, in charge of the study, gave encouragement and assistance when it was most needed and contributed greatly to the final form of the work.

Mr. Rex Helfinstine, Bureau of Agricultural Economics read the manuscript and suggested changes. Mr. Ray Pengra, Assistant Experiment Station Economist, made available the basic production figures required for the Economic Area indexes.

Mr. Glen T. Barton, U. S. Department of Agriculture, was extremely helpful in supplying the basic data for the State indexes and other information requested. Chapter II is to a large extent paraphrased from Mr. Barton's pertinent publications and from his letters to the author. Mr. Cary Palmer, Agricultural Statistician in Charge of the South Dakota Crop and Livestock Reporting Service, and his staff cooperated in making available for the study the most recent production estimates.

The author's wife, Marion, spent many hours making and checking tables and graphs. In the process of typing the manuscript in its final form, Miss Johanna Mans made many intelligent editorial suggestions.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

FIGURE PAGE

LIST OF APPENDIX TABLES

CHAPTER I

INTRODUCTION

Agricultural production in the United States and South Dakota has undergone revolutionary changes since the turn of the century and, in particular, within the last quarter-century. Diverse trends are greater in some areas of the United States than they are in others. Changes among the various geographical regions of the country may vary widely and in different directions. The same relationship applies between the regions and the states that are included in each region.

Even within the various states, diverse trends are to be found. That is, total agricultural production, with which this study is concerned, will not vary as much for the state as a whole as it will for particular economic areas.

A. STATEMENT OF THE PROBLEM

In order to understand and evaluate the changes taking place in agricultural production within the United States and within South Dakota, we need much factual information as to where we are and as to what changes are taking place. The U. S. Department of Agriculture has for years been compiling and analyzing all sorts of statistical data about agricultural production for the United States and Regions. Summaries of these studies are available in such publications as Agricultural

Agriculture, as well as in various pamphlets and other more specific literature. 1/

The Department of Agriculture has developed several indexes to aid in analysis of production data. These are the indexes of gross farm production, farm output, and production for sale and farm-home consumption. These indexes, for the United States as a whole as well as for the geographic regions, are available in the literature cited above.

The Crop and Livestock Reporting Services of the States have been collecting basic data on agricultural production for their respective areas. The South Dakota Reporting Service confines its published information principally to the actual production figures and estimates, on a yearly basis, for the State as a whole and with little or no analysis.

Previous to this study there had been no gross-farm-production or farm-output indexes available for South Dakota, although Ralph E. Ward of the Department of Agriculture has prepared an index of production for sale and farm-home consumption for the State. 2/ C. R. Hoglund compiled production figures for South Dakota with indexes on a somewhat different basis. 3/

1/ See list in bibliography.

2/ Ward, Ralph E., "Trends in Volume of Agricultural Production, Land Utilization and Farm Income, Northern Great Plains, 1924-43," Research Memorandum No. 28, revised, U. S. Department of Agriculture, Lincoln, Nebraska, November 1944.

3/ Hoglund, C. R., "Crop, Livestock and Miscellaneous Statistics For South Dakota Agriculture," Agricultural Economics Pamphlet No. 22, South Dakota State College, Brookings, South Dakota, February 1947.

B. OBJECTIVE

The purpose of this study is: (1) to bring together available agricultural production information on South Dakota and the economic areas, and (2) to calculate total, group, and individual measures of production similar to, and for the same period covered by, those used by the U. S. Department of Agriculture to measure agricultural production for the United States and the geographic regions. Such information will be of value in analyzing the changes that have been taking place and will aid in developing educational programs to help improve agricultural productivity. No attempt will be made here to analyze the results obtained except in the most general terms as they relate to trends in production.

C. HYPOTHESIS

Long lists of production figures are very difficult to handle both statistically and analytically. Further difficulties present themselves when attempts are made to combine the production of individual items of farm output. For any single year, the gross value of the production based on the current year's price may be satisfactory, but is of little use in comparing trends of production over a period of years since the value of the dollar also changes.

The hypothesis of the present study is that indexes, or relatives, can be constructed which will disclose and describe the changes in agricultural production and productivity that have taken place within South Dakota in the last twenty-five years; and that the most useful

indexes for determining production and productivity trends will be the indexes of gross farm production, farm output, crop production per acre, livestock production per breeding unit, and output per man hour, now used by the Department of Agriculture.

D. REVIEW OF LITERATURE

1. GENERAL

"The term index has a rather general meaning and may be applied to a single item or to a series of items. It is usually a percentage or a series of percentages expressing a comparison between the data for a certain month or year and another month or year or other period chosen as the base." 4/

Index numbers indicate changes and differences. The simplest index number is the ratio of the price (or production) in one period as compared with the price (or production) in another period expressed as a percentage, with one of the periods as base. Production in one period means little unless it is compared with production in another; it does not indicate whether the production was relatively high or relatively low. Mention of "one million pounds of beef production in 1943" says nothing about what is "normal" or "usual". But if it is stated that beef production in 1943 was 50 percent greater than in 1939, the figure at once becomes more meaningful. If comparable figures for a number of years are presented, it is then possible to determine

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4/ Davies, George R., and Crowder, Walter F., Methods of Statistical Analysis, p. 91, John Wiley & Sons, Inc., New York, 1933.

trends; the reliability of the trends, of course, being related to the number of years for which information is supplied.

These are simple index numbers, or relatives, as many choose to call them. They are comparisons between various years of the production of a single commodity. By a similar but more difficult method, production of many unlike units may be combined into a total index of production. 5/

Most authors appear to be in accord that relationships applied to a single item of production, for example, corn, are to be termed relatives, and that when several items are combined the proper term to apply is "index". Several items may be combined either by averaging the relatives of each or by aggregating the production figures and making an index of the aggregate. Mills expresses this viewpoint well when he says:

> The representation of the terms in a time series as relatives, with reference to a fixed base, makes possible a ready comparison of the values for different dates and enables one to follow the trend of the series much more easily than when the data are presented in the original form. Comparison of the trends of different series is also facilitated.
>
> Though the term index number has been applied to such relatives it is better practice to reserve the term for figures which represent the combination of a number of series. 6/

This leaves open to question, however, at just what point a relative becomes an index number. When the production of corn is combined

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5/ Pearson, Frank A., and Bennett, Kenneth R., Statistical Methods, pp. 55-6, John Wiley & Sons, Inc., New York, 1942.

6/ Mills, Frederick C., Statistical Methods, p. 162, Revised, Henry Holt and Co., New York, 1940.

with the production of other feed grains and put into relative terms can it be called an index of feed grains, or is an index number a total of all grains, or of all crops, or only of total farm output? For the purposes of this study, therefore, all relatives are referred to as indexes with the realization that all indexes are relatives, although the reverse need not be true.

A very important consideration for the making of index numbers is the selection of a base period. The purpose for making the index has much to do with the selection. Customarily, a period of time that is generally considered as having been "normal" is chosen as the base period. By "normal" is meant a time during which prices and production were relatively stable. However, since it is difficult to find any one particular year that was "normal", indexes are frequently based on a series of years that best fulfill the qualification.

There are indexes in which the base moves up from year to year on the assumption that there are no normal periods and that a moving base will keep the index more up-to-date but with a stabilizing influence of a series of past years. There are other types of bases in which all of the years used in the series are totalled and averaged to be used as the base, so that the base will change over time, but only slowly.

> Although a particular base may be satisfactory for a number of years, that base becomes meaningless as time passes, and it eventually becomes desirable to shift to a more recent period. The reasons are: (1) the dispersion of price relatives becomes so great that no average is reliable; (2) the pattern of consumption changes to such an extent that no aggregate of commodities can be found which includes the major expenditures common to both periods; (3) the quality of many commodities,

nominally the same, progressively changes with time. 7/

In selecting a base period, a useful solution is to choose the same period that is used in indexes already in existence and which will be used for comparison purposes. In the instance at hand, 1935-39 was chosen as the base for precisely that reason.

The base period, once decided upon, is conventionally set at 100, although it could just as well be 1,000 or 100 times the number of items in the index, or any other number that would suit the purpose. The indexes presented here are based on 100, again, principally to compare with existing indexes and so that percentage changes are easily calculated.

The discussion thus far has been restricted to simple, unweighted indexes, though some authors 8/ choose to say that there is no such thing as an unweighted index since merely adding price-quantity aggregates together will produce an index that is weighted by the quantity marketed. They insist that an unweighted index is "an evenly weighted" index wherein each quantity is weighted by 1.

Weights are employed to allow each commodity to have a reasonable influence in the index. An approved method of weighting production indexes is by multiplying the volume of output of each commodity for the base year (or years) by the average price of each commodity for the base period. When the production figures for all of the other

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7/ Croxton, Frederick E., and Cowden, Dudley J., Applied General Statistics, p. 586, Prentice-Hall, Inc., New York, 1945.

8/ e.g. see: Fisher, Irving, The Making of Index Numbers, p. 7, Revised, Houghton Mifflin Co., Boston, 1927, and Mills, op. cit. p. 184.

years in the series are also multiplied by the same average price, an index is obtained which indicates that year-to-year values have changed because the volume of production changed since the price is held constant. Values that are obtained in this manner for each of the commodities in the series can then be added together and for any year will show changes relative to the base period. By weighting each of the commodities by its average price for the same base period, the relation to each other is maintained throughout the series.

Difficulty with weighting ensues when the relative importance of the different commodities in relation to the total changes, as it does constantly. To offset this, there have been a number of different methods of weighting suggested and various means of checking the so-called accuracy of the methods. Croxton and Cowden 9/ have shown that for most practical purposes any of the approved systems of weighting result in approximately the same index numbers, the differences in them being in tenths of one percent and thus not noticeable when the index numbers are rounded to whole numbers. Thus the practical importance of the argument over which is the right weight to be used is of doubtful significance. Croxton and Cowden even suggest in the same passage that exact weights are not required to arrive at approximately the same results except for the most important commodities. 10/

The preceding discussion has been presented as a general picture of what indexes are, how they are made, how reliable they are. As has

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9/ Op. cit. p. 595.
10/ See also Fisher, op. cit., pp. 432, 346.

been indicated, there is no concensus of opinion as to what is best in an index number. Despite its name, Fisher does not insist that his "ideal" is perfect, but only that it is the best available and that it is probably more accurate than the statistical information with which the formula will be used. 11/

The purpose of the index appears to be the deciding factor as to what base and which system of weights will be employed.

2. AGRICULTURAL PRODUCTION INDEXES

The sale and farm-home-consumption index has been published by the Department of Agriculture for a number of years. Gross-farm-production and farm-output indexes were added in 1945. All of these indexes are to be found in the Department's annual Agricultural Statistics, as well as various other publications. 12/

E. PROCEDURE

The decision to construct indexes of production comparable to those published by the United States Department of Agriculture imposed several limitations on them from the beginning. As has already been mentioned, the base period and weighting procedure of the Department of Agriculture were adopted. Average prices for South Dakota were used in obtaining

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11/ Fisher, op. cit. pp. 224-225. Davis, Harold T., and Nelson, W. F. C., Elements of Statistics, Revised, The Principia Press, Inc., Bloomington, Indiana, 1937, p. 113, report that the "ideal" formula fails to meet some tests.

12/ A list of pertinent publications of the Department of Agriculture will be found in the bibliography.

constant-value production figures. Average prices for the individual Areas should have been used in the construction of area indexes, but area prices by commodities are not available for South Dakota. Thus, the South Dakota average prices were also applied to the area production figures to get constant-value production.

Further complications arose in the calculations of the area indexes in the form of inadequate production data, particularly in the production of livestock and livestock products, for which the net production estimates are not made by economic areas. Even within the realm of plant production, some crops are considered so unimportant within the particular area that they are not reported, or do not show up when the figures are rounded into thousands of tons or bushels.

Within both the state and the economic areas, total production could not be estimated exactly because there are no estimates available of the value of farm gardens, lumber production, and some other minor products that are included in the indexes for the United States.

Lack of data on the number of workers on farms, average hours worked on farms, and similar figures, limited the productivity indexes which were to be derived from the basic production indexes obtained.

F. BASIC DATA

The Bureau of Agricultural Economics of the Department of Agriculture supplied photostatic copies of basic data for South Dakota, including weights to be used for South Dakota and the method of determining them. The various publications of the South Dakota Crop and

Livestock Reporting Service also furnished basic year-to-year production summaries and estimates.

Some major problems of method and of lack of data for particular years were resolved by letter or by personal contact. Some revision of the basic data to the most recent estimates available was accomplished by a meeting with the South Dakota Crop and Livestock Reporting Service. Some points that were not clear through reading of the literature available were discussed in a conference between Lyle Bender of South Dakota State College and Glen T. Barton of the Department of Agriculture, at the latter's office in Washington, D. C. The general, over-all procedure was also discussed with Mr. Barton at that meeting, to ascertain that the South Dakota indexes would be as nearly comparable as possible to the United States and regional indexes of gross farm production and farm output.

The United States Census of Agriculture furnished the basic material for the indexes of productivity for South Dakota. Lyle Bender supplied cropland data for the area indexes from material assembled in connection with his work on a Doctoral dissertation.

CHAPTER II

INDEXES OF AGRICULTURAL PRODUCTION FOR SOUTH DAKOTA

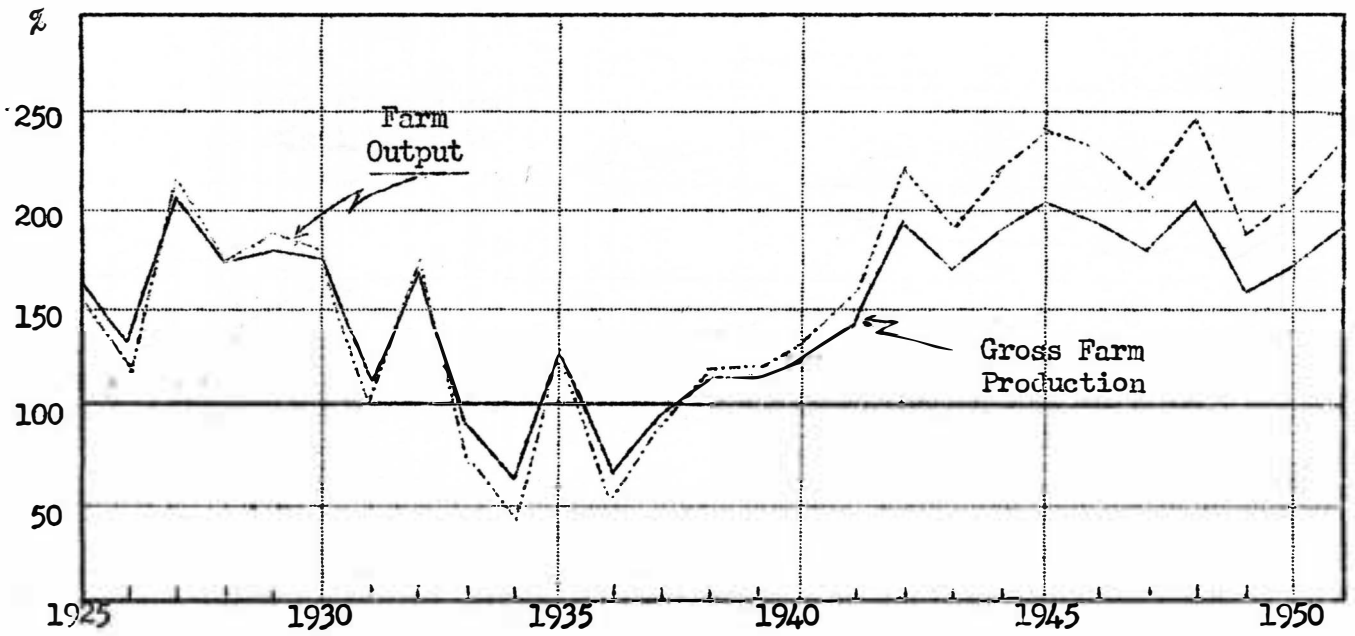
A. THE COMPOSITE INDEXES

Gross farm production is a measure of total production of farm land, labor, and capital resources in each calendar year, with certain minor exceptions that will be noted later. It measures changes in the volume of production of both farm "producer's goods" and output of products for human consumption. Thus it includes all crop production, pasture consumed by livestock, production of livestock and livestock products. The latter includes only the "product added" by livestock in the conversion of feed and pasture into livestock and livestock products and into farm-produced animal power (horses and mules). The product-added method is employed to avoid the double-counting of feed consumed.

The farm output index measures production available for eventual human use. It is gross farm production minus farm-produced power. It should also exclude other "producer's goods" such as seed production and a part of the breeding stock, but the calculations required are too difficult to undertake for the very minor effect they would have on the index. The farm-output index still provides a reasonably accurate measure of farm production that is available for human use each year.

Figure 1 shows that fluctuations are greater in the farm output index than they are in the gross farm production index, although both follow the same general course.

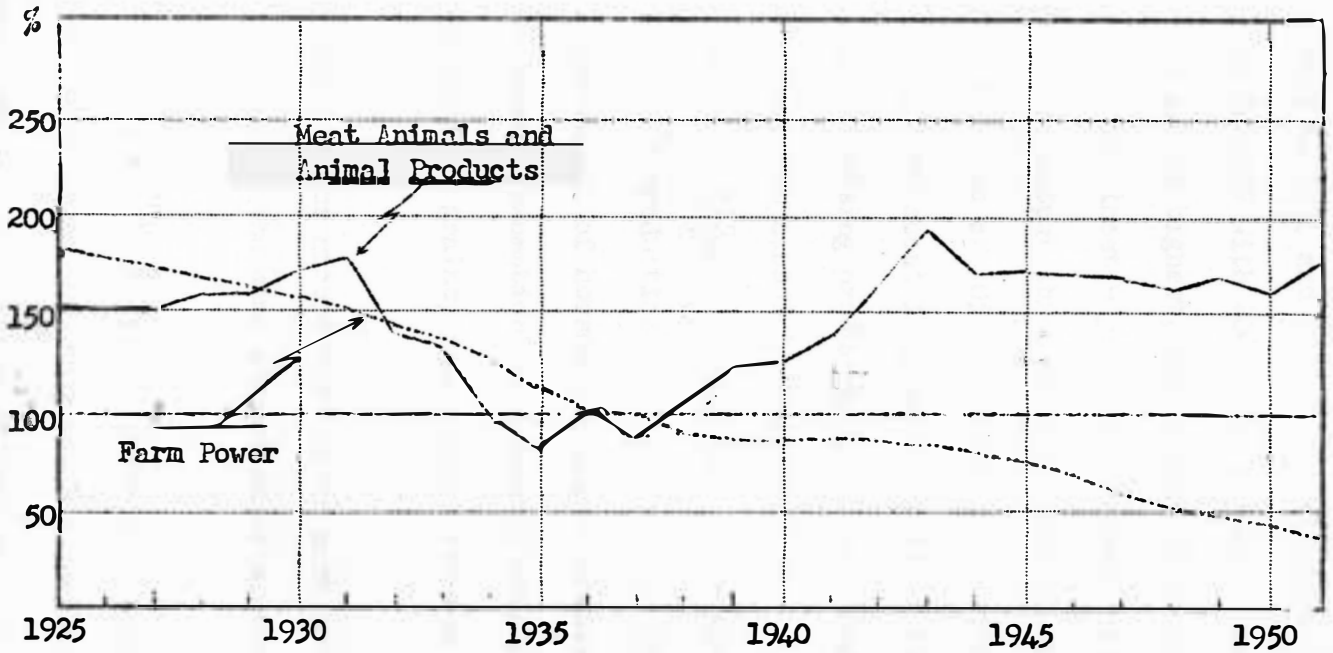
FIGURE 1. INDEX NUMBERS OF GROSS FARM PRODUCTION AND FARM OUTPUT, SOUTH DAKOTA, 1925-51 (1935-39 = 100) 1/



Data for 1950-51 are preliminary. Source: Table A1

1/ Farm Output is Gross Farm Production minus Horse-and-Mule Aggregate.

FIGURE 2. INDEX NUMBERS OF ALL LIVESTOCK PRODUCTION SOUTH DAKOTA, 1925-51 (1935-39 = 100)



Data for 1950-51 are preliminary.

Source: Table A1

The courses of both gross farm production and farm output have had several important fluctuations over the years shown. They had a general downward trend until about 1936 with a steadily rising tendency since then. Sharp drops occurred in 1934 and 1936. The all-time high for gross farm production was in 1927 with 206 index points. Production in both 1945 and 1948 ranked second highest, which were 79 percent greater than in 1939, or an average of almost 9 percent increase per year.

The highest peak of farm output throughout the twenty-six years was in 1948 which had an increase of 105 percent between 1939 and 1951, or an average yearly increase of about 11 percent. All of the major components had a share in the rising production, although declining values of farm-produced power has caused the ratio of livestock production to crop production to decline. Figure 2 shows that as horse-and-mule numbers decline, the amount of production of livestock and livestock products rises. The displacement of horses and mules permits greater production of goods for human consumption by releasing cropland for the production of more feed and food grains, and pasture for the grazing of other livestock.

Changes in all of the various groups that go to make up total gross farm production have not been in the same direction or at the same rate of increase or decrease.

Tables 1 and 2 point out changes in relative importance of crops and livestock, and within each group. During the base period crops accounted for just under two-thirds of gross production, but during the five-year period from 1945-49 the contribution of crops had risen to three-fourths.

TABLE 1.

RELATIVE IMPORTANCE OF CROP GROUPS

(1935-39 Average Prices)

Date	Percent of gross farm production value All Crops	Total	Percent of total crops					
			Food Grains	Feed Grains	Hay	Oil	Pas-ture	Misc.
1925-29	68	100	19	54	10	4	11	2
1930-34	59	100	23	45	10	2	17	3
1935-39	64	100	22	46	13	1	16	2
1940-44	70	100	21	51	12	3	12	1
1945-49	74	100	23	52	9	5	10	1

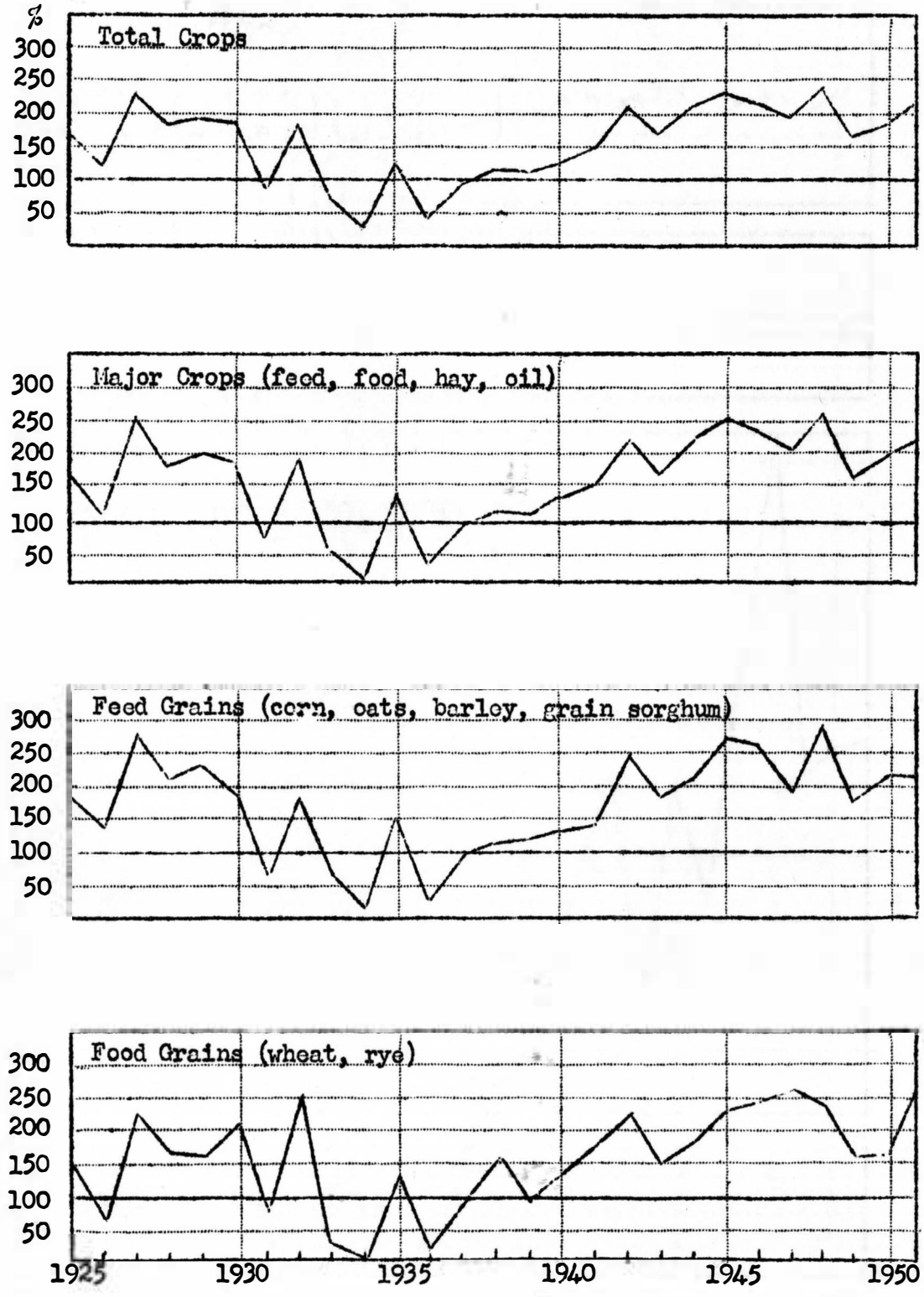
TABLE 2.

RELATIVE IMPORTANCE OF LIVESTOCK CLASSES

(1935-39 Average Prices)

Date	Percent of gross farm production value All Livestock	Total	Percent of total livestock production (product added)					
			Beef Cattle	Sheep	Hogs	Dairy	Poul-try	Horses & Mules
1925-29	32	100	15	1	20	16	15	33
1930-34	41	100	16	2	19	18	15	30
1935-39	36	100	18	4	12	20	17	29
1940-44	30	100	21	5	18	17	20	19
1945-49	26	100	27	3	18	16	22	14

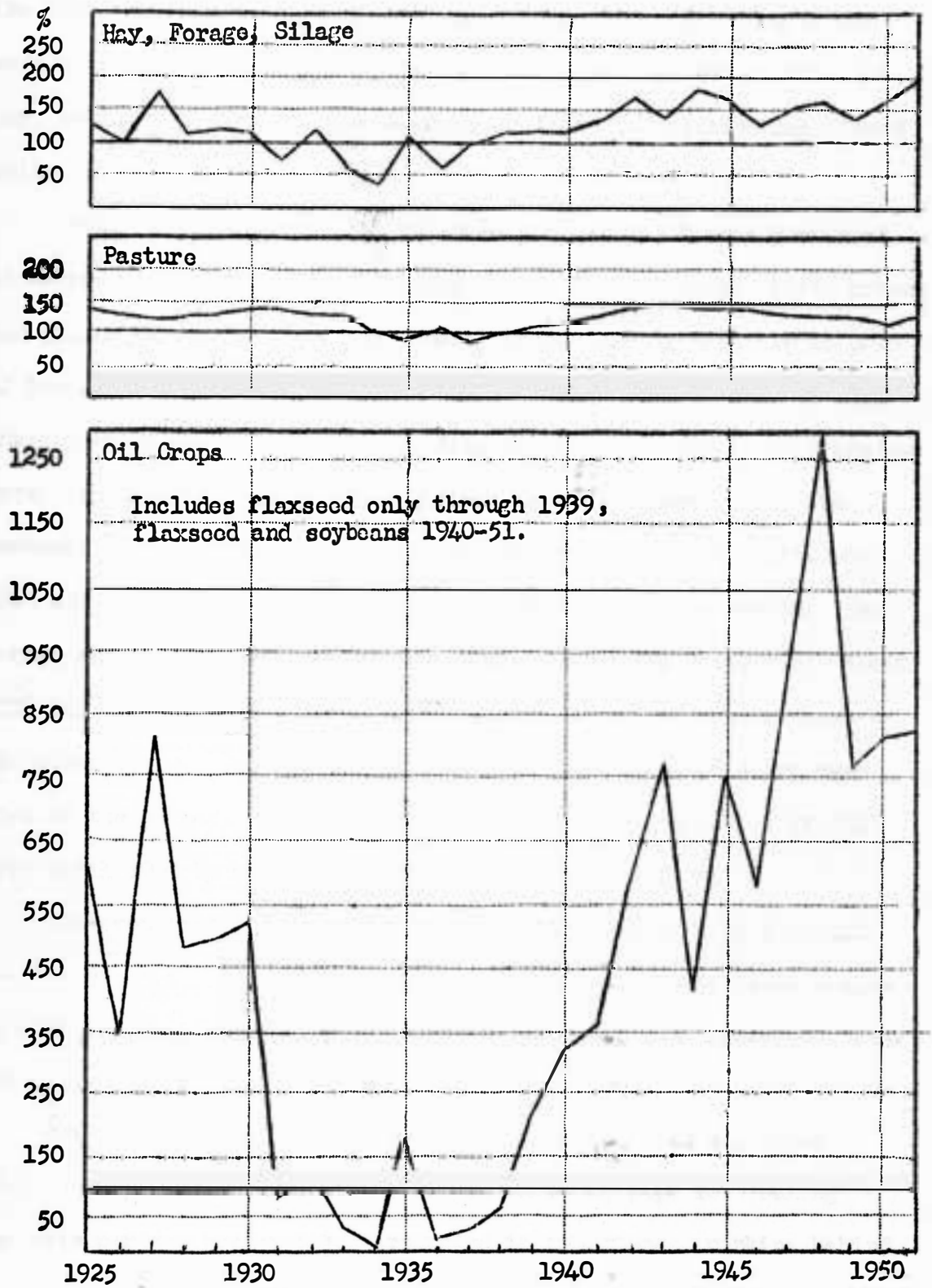
FIGURE 3A. INDEX NUMBERS OF VOLUME OF CROP PRODUCTION, BY CROP GROUPS, SOUTH DAKOTA, 1925-51 (1935-39 = 100)



Data for 1950-51 preliminary.

Source: Table A1

FIGURE 3B. INDEX NUMBERS OF VOLUME OF CROPS PRODUCED, BY CROP GROUPS (CONTINUED) (1935-39 = 100)



Data for 1950-51 preliminary.

Source: Table A1

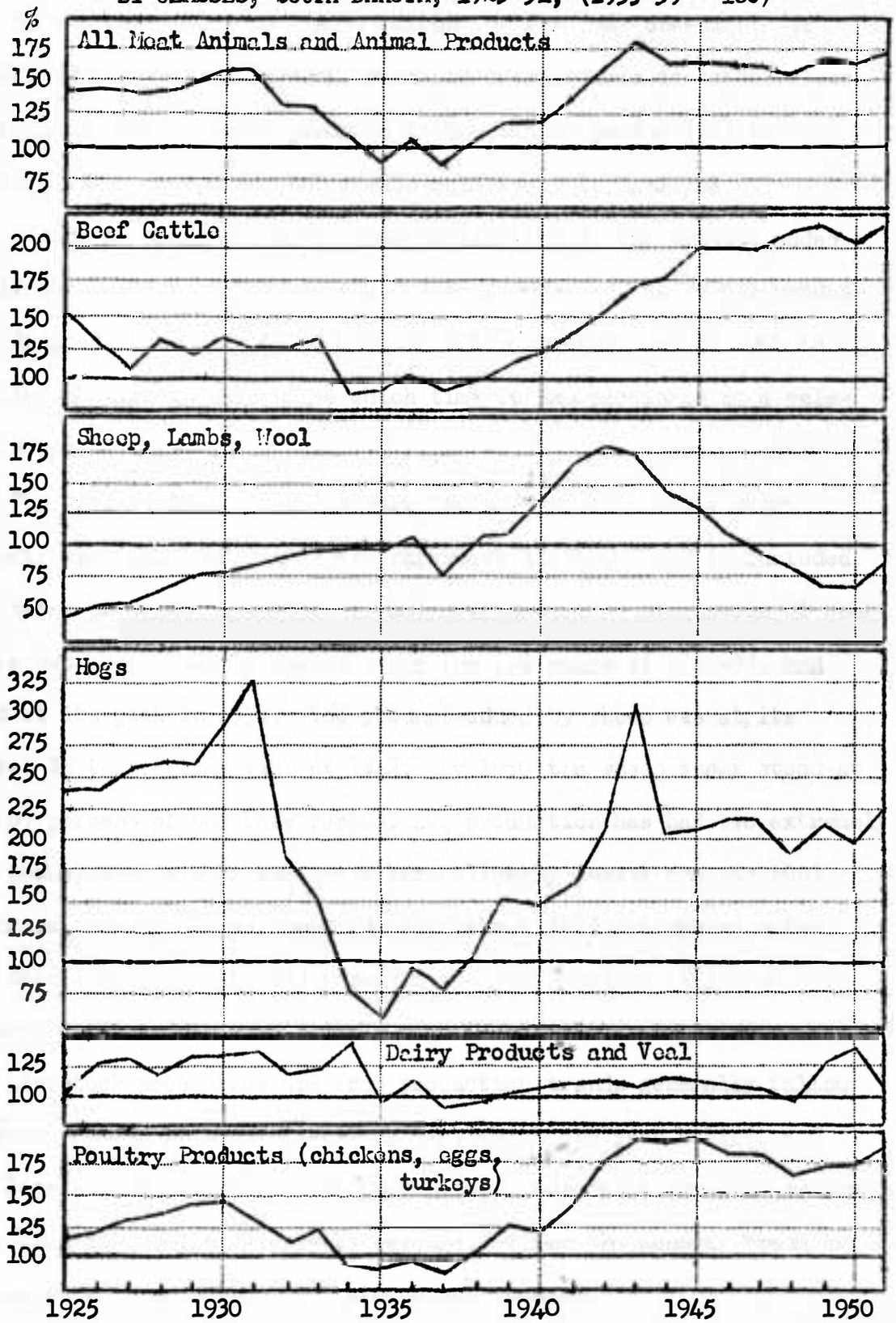
Feed grains accounted for almost half of all crop production during the base period and slightly over one-half in 1945-49. Food grains were only 1 percent higher in the latter period than during the base. Hay, pasture, and miscellaneous crops declined in relative importance while oil crops gained somewhat.

Total crop production has followed the general trends portrayed in Figure 1. Figures 3A and 3B show trends for all crops, major crops, and groups of crops. The same general trends are discernible in each of the graphs although there is much wider variation in some of them than in others. In the earlier years, the fluctuations in food grains were more erratic than for feed grains; in more recent years, the reverse is true. The year of highest production in feed grains was 1948 and for food grains 1947 although 1932 ran a close second. Hay, forage and silage have had the same long-time rising trend since about 1936 but the fluctuations have been much less severe than for some of the other crops. Pasture values have been relatively constant over most of the period. A high point was reached in 1943 with a gradual drop until 1951 by which time some recovery was evident.

Oil-crop production has had very erratic fluctuations although the trend since 1936 has been upward, as with all of the other crops. As with feed grains and hay, 1948 was to date the best production year for oil crops.

Beef cattle are the most important livestock item since the decline of horses and mules as shown in Table 2, page 16. During the base period, beef cattle were third in importance, ranking behind

FIGURE 4. INDEX NUMBERS OF PRODUCT ADDED BY MEAT ANIMALS, BY CLASSES, SOUTH DAKOTA, 1925-51, (1935-39 = 100)



Data for 1950-51 preliminary.

Source: Table A2

horses and mules and also dairy products. In the period of 1945-49, beef cattle have taken the lead, accounting for over one-fourth of product added by all livestock, with poultry products in second place and hogs in third. Dairy products in the latter period fell into fourth place. Sheep and wool remain relatively insignificant.

Figure 4 demonstrates the wide variability in the product added by different classes of livestock. Through most of the 1930's production dropped, but began to pick up in 1938 and continued to climb to an all-time high in 1943 since which time it has continued at a relatively constant level.

The production of hogs has been the most erratic while dairy products have remained within the narrowest limits. Veal is included with dairy products to conform to BAE practice. The production of beef cattle has been steadily upward since the low years of 1934-37, and stood at its peak in 1951. The product-added by sheep was at its highest in the wartime year of 1942. By 1950 the sheep index stood at only 67 percent of the base period. Hog production has had two extremely high peaks, one in 1931 and the other, slightly lesser one, in 1943. Otherwise, the trend was downward until about 1935 and upward after that date. Poultry products rose quite rapidly between 1937 and 1943 and have continued on a relatively high level to the present time.

Livestock production and crop production trends generally follow the same course, although livestock lags about one year behind, and with less variability than crop production. Due to its greater proportion, crop production is largely responsible for the general trend of the gross-farm-production and farm-output indexes.

METHOD OF CONSTRUCTING INDEXES

The index numbers of gross farm production constructed for the State include all of the items produced on the farm for which information is available or can be derived. Neither the United States indexes as published by the Department of Agriculture nor the South Dakota indexes presented here include farm forest products, greenhouse products, fence posts or nursery products.

In addition, the South Dakota indexes do not include some products that the United States indexes do, either because they are not grown in South Dakota or are grown in such small quantities that they are not estimated. Broilers and grass and legume seed production fall into this class. The United States indexes do include an estimate of the value of farm gardens; the South Dakota indexes do not. Fruits and nuts are included in the former while only apples are included in this category in indexes for South Dakota (until estimates ceased in 1944). Commercial truck crop production is included in the South Dakota index under minor crops so long as estimates have been available.

Another minor difference in the two indexes comes about in the method of treating product-added by horses and mules. The Department of Agriculture was able to make calculations adjusting for annual appreciation in value of horses and mules under two years of age and for depreciation of animals over two years of age. Appreciation and depreciation in value was not taken into account in the South Dakota indexes.

However, exclusion of these minor products and adjustments for appreciation and depreciation of horses and mules will not greatly affect

the indexes of gross farm production or of farm output.

Farm-output indexes were calculated by subtracting the quantity-price aggregates of farm produced power from total quantity-price aggregates of gross farm production.

FORMULA, WEIGHTS, AND BASE PERIOD

In constructing the index numbers of gross farm production and farm output, Laspeyres' formula, $\frac{q_1 p_o}{q_o p_o}$, was used. The q's refer to quantities of the individual farm products included, with q_1 the quantity in any given year and q_o the average quantity for the five-year base period, 1935-39. The p's refer to the average farm price of the product for the five-year period. This same formula was used for the individual areas with the state average prices used as weights.

The 1935-39 average farm prices of the various products included provided the primary basis for weighting and combining the individual products into totals. For each year the output of each product was multiplied by its 1935-39 average South Dakota farm price, shown in Table 3. These "constant-dollar" data for each product were then summed to obtain quantity-price aggregates for groups of products and for total production. Table 4 illustrates the method of arriving at 1935-39 average farm prices of farm products. The total production of corn, for example, in each of the five years was multiplied by the season average price for the particular year. The average of the total values for the five years was then divided by the average total production to obtain the weighted average price.

TABLE 3.

SOUTH DAKOTA AVERAGE 1935-39 PRICES USED AS WEIGHTS IN CONSTRUCTING THE SERIES

Corn .504 bu.
Oats .223 bu.
Barley .347 bu.
Grain sorghums .484 bu.
All tame hay 5.533 ton
Wild hay 4.195 ton
Sorghum for forage 3.323 ton
Wheat .769 bu.
Rye .396 bu.
Buckwheat .516 bu.
Beans 3.359 bag
Irish potatoes .603 bu.
Soybeans 1.978 bu.
Flaxseed 1.490 bu.
Sweet corn 9.43 ton
Cucumbers .57 bu.
Apples 1.138 bu.
Sugar beets 5.295 tons
Eggs .0139 each
Chickens .1279 lb.
Turkeys .1531 lb.
Beef cattle .0673 lb.
Veal calves .0685 lb.
Sheep .0382 lb.
Lambs .755 lb.
Hogs .0753 lb.
Wool .222 lb.
Butter .299 lb.
Butterfat .267 lb.
Wholesale milk .017 lb.
Retail milk .090 lb.
Value of milk or cream consumed on farm .012 lb.
Horses and mules $68.00 per head, all ages

TABLE 4.

METHOD OF ARRIVING AT SOUTH DAKOTA AVERAGE PRICES OF FARM PRODUCTS

South Dakota - Corn

Year	Production	Value	Season average farm price
	Thous. bu.	Thous. dol.	Dollars
1935	50,044	25,022	.50
1936	8,446	9,122	1.08
1937	42,255	18,592	.44
1938	35,688	15,703	.44
1939	47,355	24,151	.51
Average	36,758	18,518	

1935-39 average price per bu. .504

Published in "Farm Production, Distribution and Value of Corn 1909-1941", BAE, December 1944.

The product-added-by-livestock technique was used in combining crop production and livestock production. This method avoids double-counting of feed crop production and pasture consumed.

Product added is a derived figure. F. M. 53 contains a table of estimates that the Bureau of Agricultural Economics used in estimating the feed and pasture consumed by livestock for the Regions of the United States. 13/ Lyle Bender of the Department of Agricultural Economics and members of the Department of Animal Husbandry at South Dakota State College cooperated in adjusting the basic figures to more nearly fit South Dakota conditions. The only corrections made, however, were an upward adjustment of pasture proportion of total feed in the case of beef cattle and sheep. The factors as used for the South Dakota indexes are shown in Table 5.

In arriving at the product added by livestock, the quantity-price aggregates for each year are multiplied by the total feed factor and the feed value thus obtained subtracted from the total quantity-price value of production to obtain the value of the product added by the livestock.

Pasture value is derived by applying the factors indicated to the total feed value. The same feed and pasture factors were used each year for each of the classes of livestock.

The product-added method can be illustrated for beef cattle. The

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13/ Barton, Glen T., and Cooper, Martin R., "Farm Production in War and Peace", F. M. 53, U. S. Department of Agriculture, Washington, D. C. December 1945, p. 62.

farm price for the 1935-39 period averaged about $6.73 per cwt. Studies have shown that about 65 percent of the cost of beef production is for feed; therefore, the product added per hundred pounds of beef is 35 percent at average 1935-39 prices.

TABLE 5.

FACTORS USED IN ESTIMATING FEED CONSUMED BY LIVESTOCK

WEST NORTH CENTRAL REGION

	Total feed as proportion of gross livestock values	Pasture proportion of total feed
	percent	percent
Beef cattle	65	30
Sheep, lambs and wool	70	45
Egg production	45	
Chickens raised	50	
Broilers	--	
Turkeys	45	4
Hogs	75	4
Dairy cows and veal calves	$0.00663 1/	25 1/
Horses and mules	37.00 2/	$6.00 2/

Source: Barton, Glen T. and Cooper, Martin R. "Farm Production in War and Peace", Bureau of Agri. Econ., U. S. Department of Agriculture, F. M. 53. Table 17, Page 62. Pasture percentage adjusted upward to more nearly fit South Dakota conditions. Department of Animal Husbandry and Department of Agricultural Economics assisted in adjusting estimates.

1/ Pounds of milk.

2/ Total value at 1935-39 average price per head, all ages for 1942.

The product-added technique is especially preferable in cases of smaller areas where in-and-out shipments of feeder livestock and feed occur. It credits the crop production to the division in which the feed was grown and the livestock production to the area in which the feed was fed. It also divides the total pounds of livestock production

between divisions in which feeder animals were grown and the division in which they were finished. 14/

1935-39 was chosen as the base period because it was the base used by the Department of Agriculture for their indexes. They in turn selected it because:

> First, it is the officially accepted base period for some other indexes constructed in the Bureau of Agricultural Economics as well as for considerable number of other indexes calculated by other agencies. Secondly, the period 1935-39 was the last full 5-year period that was prewar. Although the war in Europe began in the fall of 1939, United States farm production in 1939 was not greatly affected. 15/

SOURCES AND KINDS OF BASIC DATA

Production data up until about 1949 were obtained from the Bureau of Agricultural Economics in the form of photostatic copies, although estimates for some of the commodities were not complete through all of those years. Data for later years were also preliminary estimates and were later corrected to the most recent estimates. The information furnished was checked, corrected and completed in consultation with members of the Crop and Livestock Reporting Service, and until the time that the index was put into final form, the most recent estimates of the Service were used. Some of the most recent production figures were obtained by letter from the Reporting Service.

14/ Barton and Cooper, op. cit. p. 56.
15/ Ibid. p. 56.

USES AND LIMITATIONS

The gross-farm-production index is the best to measure the total contribution of farm resources because it includes farm-produced power. From some viewpoints, however, the inclusion of farm-produced power results in some duplication as for example in wheat production which measures in part the farm-produced power which was one of the input factors in the process of wheat production. 16/ The farm-output index is the most sensitive to droughts and other variations due to weather because it does not contain farm-produced power, but it is the best for measuring the level of production for human consumption.

It is the thesis of this paper that the various indexes of production presented can be of valuable assistance in analysis of agricultural production in South Dakota. They are, first of all, comparable to indexes that are available for the United States and major geographical regions of the United States. The variability of trends within limited areas may provide a lead as to why trends for larger areas are taking place. Conversely, trends in the United States as a whole, for example, may be indications of future changes in South Dakota.

Secondly, indexes of production can be combined with indexes of cropland, numbers of farms or farm operators, numbers of livestock, or other desired combinations to obtain indexes of productivity. The latter can be very useful in productive capacity and efficiency studies. They may also be compared with indexes of machinery as an indication

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16/ Barton and Cooper, op. cit. p. 67.

of the part that city-produced power has played in rising productivity. They may be compared with indexes of input costs. Or, consumption indexes might be used in comparison with changes in indexes of gross output or of groups of products.

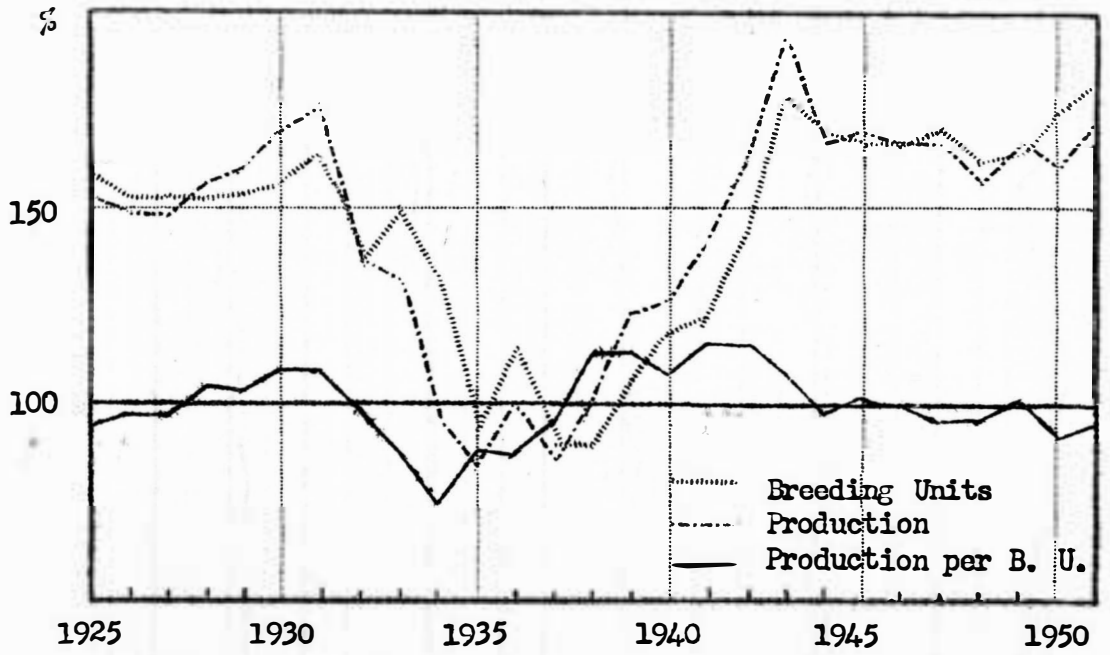
Lastly, a knowledge of production trends and productivity, which these indexes provide can be of incalculable worth in the development of educational programs for farmers. It is quite possible, too, that farm leaders would find them helpful in evolving a farm policy.

These indexes should not, however, be used as absolute measures of production or productivity; they are only relative changes in production and intended to show relative trends. Analysis of the changes shown must also resort to actual production figures, changes in relative importance of the various commodities, and other factual information that is available.

B. SOUTH DAKOTA INDEXES OF BREEDING UNITS AND PRODUCTION PER BREEDING UNIT

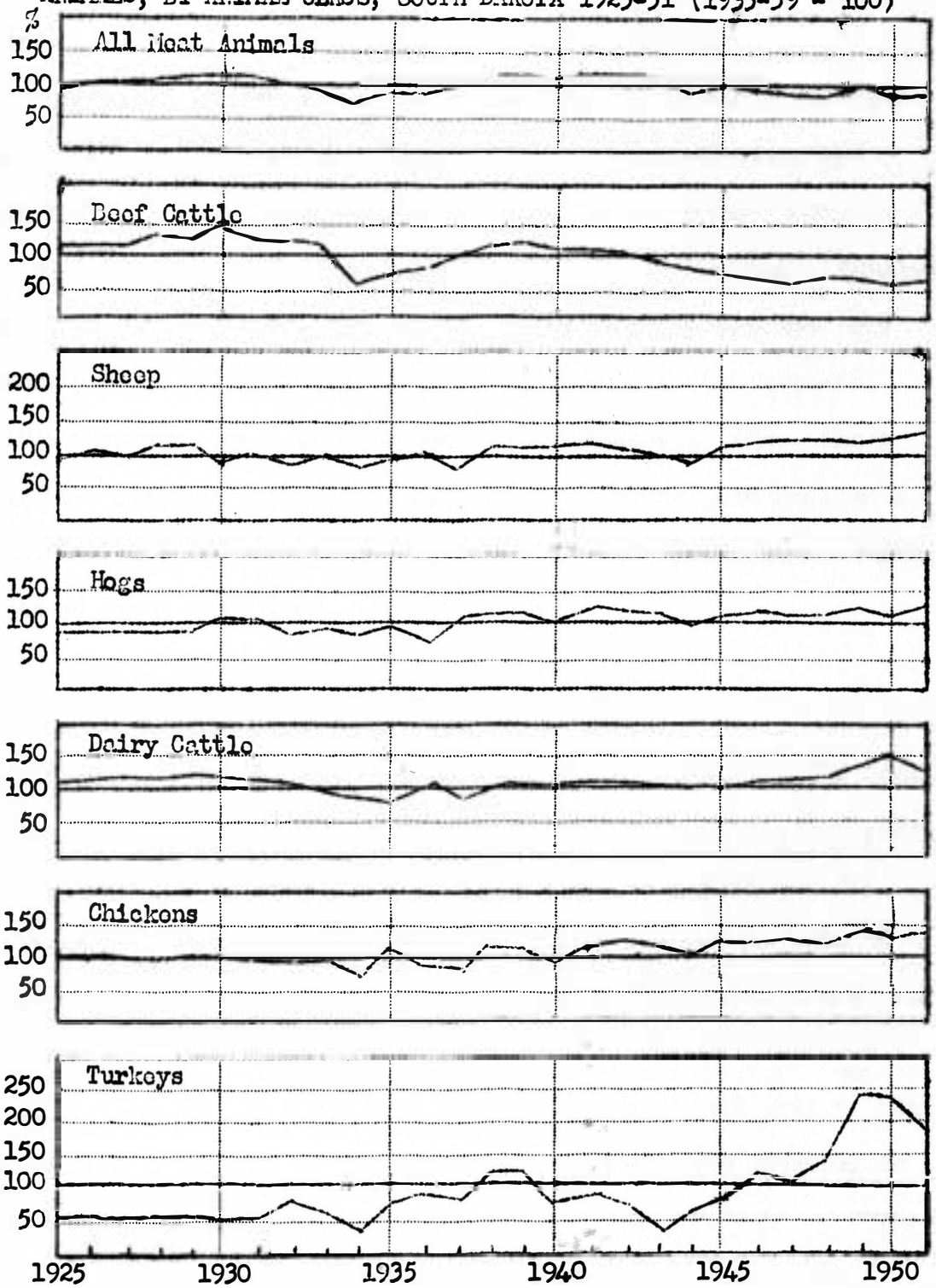
The index of breeding units stood at an all-time high in 1951 (although preliminary estimates for 1952 indicated that it would go still higher). However, the index of production per breeding unit was at a peak in 1941, as shown in Figure 5. Only once since 1945 has it been above the 1935-39 average. The index of production and the index of breeding units follow the same general course, although the breeding units index has a somewhat smoother trend. The production-

FIGURE 5. INDEX NUMBERS OF BREEDING UNITS OF MEAT ANIMALS, GROSS LIVESTOCK PRODUCTION, AND PRODUCTION PER BREEDING UNIT, SOUTH DAKOTA, 1925-51 (1935-39 = 100)



Data for 1950-51 are preliminary. Source: Tables A3, A4, A5

FIGURE 6. INDEXES OF PRODUCTION PER BREEDING UNIT OF MEAT ANIMALS, BY ANIMAL CLASS, SOUTH DAKOTA 1925-51 (1935-39 = 100)



Data for 1950-51 are preliminary. Sources: Tables A3, A4, A5

per-breeding-unit index is the least erratic of all, tending to hover near the 1935-39 average over the period of years covered.

Figure 6 shows turkey production to have had the greatest increase on a production-per-breeding-unit basis, with chicken production per breeding unit following next in order. Neither of the groups appears to show much relation to the trends in productivity of the other livestock.

Beef production per breeding unit is the only group that has been consistently below 100 in recent years. The trend has been downward since 1939 with the lowest point to date being reached in 1950. Sheep and hogs have generally followed courses that are almost identical with each other for most of the period. Dairy cattle have indicated a slight upward trend since about 1945.

METHOD OF CONSTRUCTING THE INDEXES

The index of breeding livestock is based on the number of milk cows two years and older, beef cows two and older, ewes one and older, turkeys, hens and pullets all ages on farms on January 1 of each year, and the number of sows farrowing in the spring of a given year and the fall of the preceding year. A breeding unit is defined as 1 beef cow, 1 ewe, etc.

The numbers of the various types of breeding units were combined into a total by weighting according to contributions of each unit to the gross livestock production in the 1935-39 base period. For example, in 1935-39 there was an average of 250,800 beef cows two and older on farms on January 1. Gross production value at 1935-39 average prices was $2,259,000. The average number of breeding units (beef cows two and

older) divided into the average gross value at 1935-39 average prices ($2,259,000) gives an average value of production per breeding unit of $88.75. The $88.75 per breeding unit was used as a constant weight for all of the other years for beef cattle with a resulting table of breeding unit values for each year. The same procedure was used for all other livestock. The weight used for each is contained in Table 6. Individual indexes of breeding units were then worked out with the 1935-39 average as a base. And a composite index of livestock breeding units was compiled by aggregating the breeding unit values.

TABLE 6.

WEIGHTS ASSIGNED TO BREEDING UNITS 1/

Beef cattle	88.75
Sheep	5.834
Hogs	88.978
Milk cows	37.18
Chickens	2.0995
Turkeys	9.26

1/ A breeding unit is defined as 1 cow, 1 ewe, etc. Method is discussed in text above.

In one particular case, turkeys, the number on farms as of January 1 were not available prior to 1929. Rather than completely omit those years from the combined index, an approximate number of breeding units was arrived at by assuming that production per breeding unit had remained constant from 1925 to 1929, thus using 1929 breeding unit data with 1929 production per breeding unit for 1929. This per-pound production figure

for 1929 was then applied to the other four years to get an approximate number of breeding units. One justification for such a procedure seemed to be provided in that the Bureau of Agricultural Economics also found it necessary to devise a similar method with regard to turkey production in early years. 17/ Appearances indicate that the production of turkeys had become fairly well established and of some considerable volume before the agencies concerned began to obtain estimates on numbers and volume of production, the latter apparently being gathered at an earlier date than numbers.

The index of livestock production was the same as used in building up the gross production index series, although for the present purposes the gross production value aggregate, rather than product-added, was used. Veal calves were included in dairy production, eggs with chickens, and wool production with sheep.

The index of production per breeding unit is obtained by dividing the index of breeding units into the index of livestock production.

USES AND LIMITATIONS

The population of the Nation is expanding rapidly, which means that ever-increasing quantities of food and fibre will be needed to feed and clothe more people. At the same time the land area available for crop production and the pasturing of food-producing animals is limited. Thus the increasing quantities of production required must come from increased productivity of available land. Since animals

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17/ Barton and Cooper, op. cit. p. 65.

require some feed that must be produced on land that would otherwise be available for food grains and other products directly available for human consumption, productivity in meat animals is also a prime consideration.

The breeding-unit series of indexes provides us with information on past and current production and productivity. They supply a basis for determining where more emphasis in research and education is required.

The terms "productivity" and "efficiency" are commonly used interchangeably. For the purposes of the present study, Black's definition is used.

> Output per unit of input is...one measure of productivity. The term efficiency is now commonly used for this measure. Also it has become apparent that some acres of land can use more fertilizer and other input factors to good advantage than others, and this also contributes to productivity. To this measure the term capacity is now commonly applied. Efficiency and capacity, in fact, are referred to as the two dimensions of productivity...18/

In the terms proposed by Black more data with regard to the level of efficiency and capacity to produce are needed. In-shipments of chicken and turkey eggs for hatching purposes and also of chicken and turkey poults must be taken into account in determining relative degrees of productivity.

Further limitations on the usefulness of productivity indexes often result from lack of information that is an integral part of efficiency or capacity; e.g., the quality of the input, time and

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18/ Black, John D. and others, Farm Management, The MacMillan Co., New York, 1948, p. 407.

effort expended, and efficiency of the machines used.

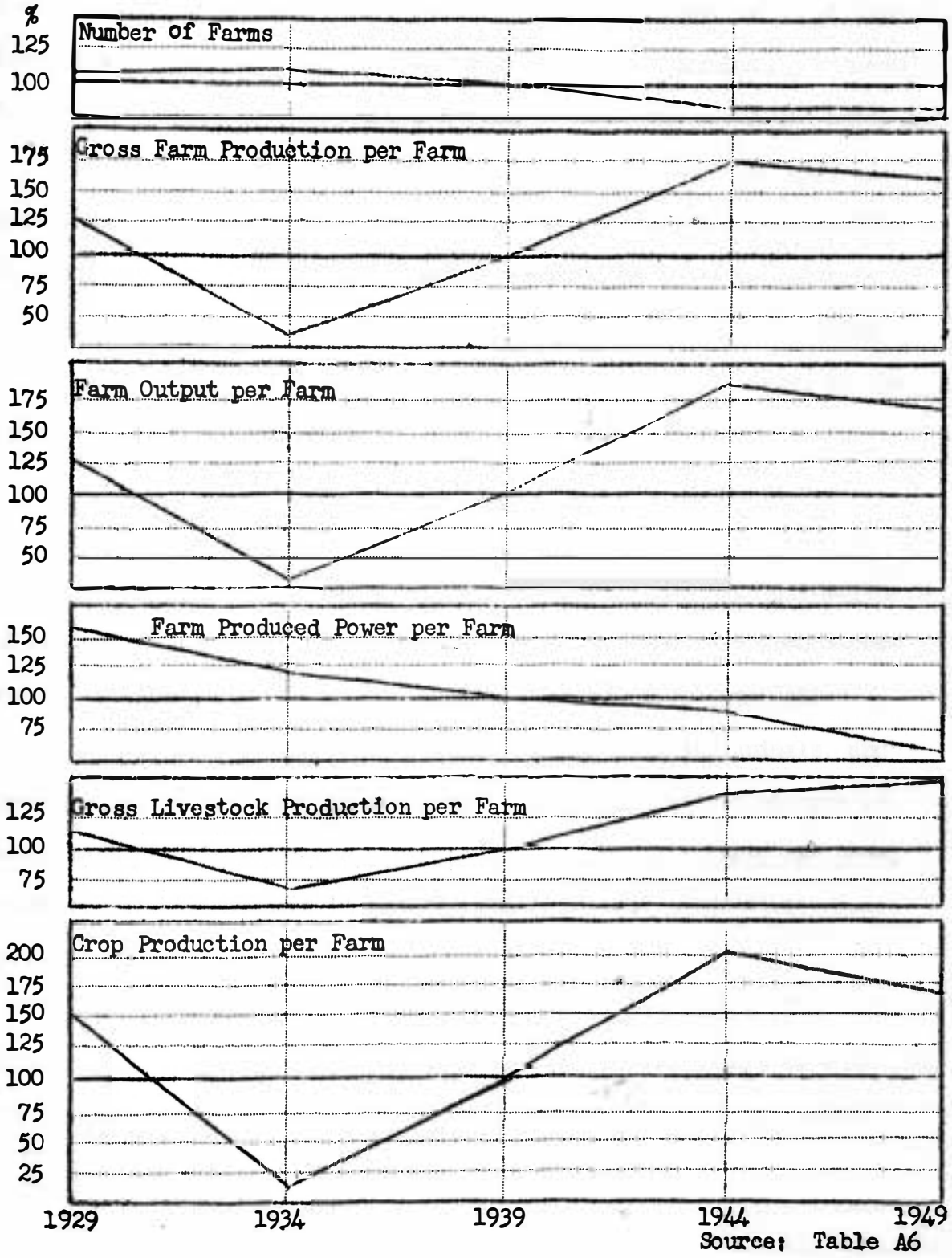
C. INDEXES OF PRODUCTION PER FARM

1944 was the peak year in production per farm relative to 1939 at the same time that the number of farms was decreasing (Figure 7.). Farm output per operator has increased somewhat more than gross farm production per operator since 1939. Farm-produced power per operator has decreased along with decreases in production of horses and mules. Production of other livestock and livestock products has increased by nearly one-half during the 10-year period. Between 1939 and 1944 the production of crops per operator had more than doubled though backsliding by 1949 to a net gain of 65 percent above the base year.

METHOD OF CONSTRUCTING THE INDEXES

Census data were used in constructing these indexes, and thus placed a limitation on the number of years for which accurate information could be secured as to number operators and/or farms. Census figures are for the year of the census-taking. For the purposes of this study, the assumption was made that the number of farms for 1940, for example, was the same as for 1939, so that the production-per-acre and production-per-operator indexes could be compared. Justification seemed to be contained in the fact that for some of the Census years, the numbers of operators were taken as of January 1 of the Census year, and for some years as of April 1. Since farmers customarily move off the farm, or shift from farm to farm, about March 1, the Census

FIGURE 7. INDEXES OF NUMBER OF FARMS AND PRODUCTION PER FARM, SOUTH DAKOTA, 5-YEAR PERIODS (1939 = 100)



Source: Table A6

enumeration does not then give exactly similar figures either, there being six farm-years between some Census dates and only four farm-years between the intervening ones. Further, the Bureau of Agricultural Economics has also found it necessary to do some interpolating between Census years in setting up series similar to the ones presented here. 19/

The index of farms is a simple "unweighted" index, with 1939 as base year. The production index has also been reworked but with 1939 as base year and 1935-39 average prices as weights so as to maintain the same relationship between the various crops included. The index of farms is then divided into the index of production to arrive at the index of production per farm.

USES AND LIMITATIONS

Gross production per farm and output per farm are over-all measures of productivity. They reflect changes in output resulting from higher yields obtained from favorable weather and improved crop varieties, from use of better breeding units and better care of the animals, and from the use of labor-saving equipment. They also reflect changes in management practices and the general level of prices. There has been, however, more improvement in crop than in livestock productivity as shown in Figure 7, page 37.

Indexes of production per farm do supply an indication of attainable outputs under certain conditions, and may indicate ways of combining the various factors when used with other indexes of input and output.

19/ e.g., Statistical Bulletin 83, p. 25.

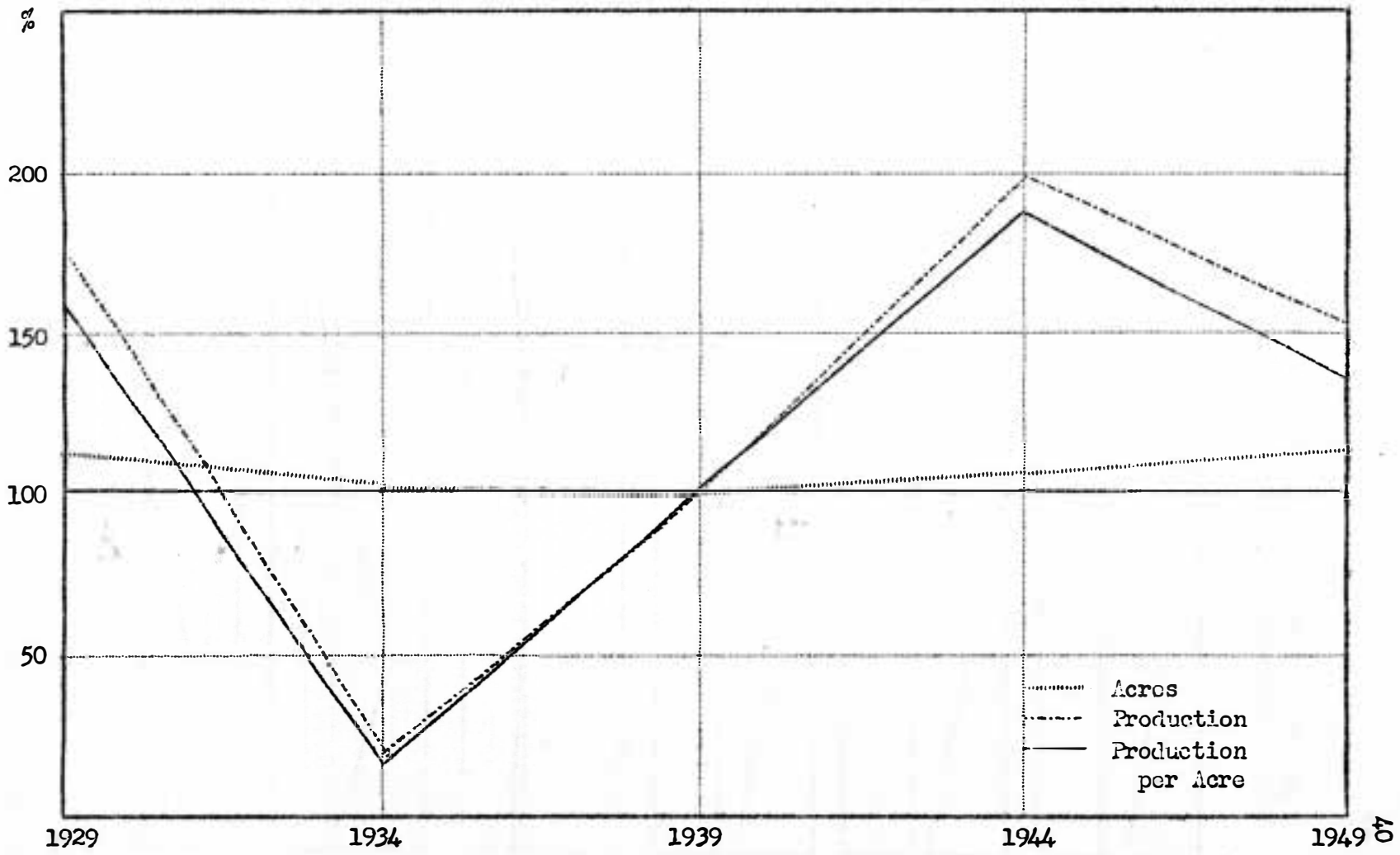
Production per farm, unfortunately, does not tell much about the productivity of workers or the productivity per hour of work. Neither does it indicate why productivity should decline in any period. On the other hand, a rise in productivity per farm may be due entirely to a diminishing number of farms with a steady total output, although a measure of efficiency of production may be involved in this. More complete data for intervening years would give a more complete picture.

D. INDEXES OF PRODUCTION PER ACRE

The total number of acres devoted to cropland has remained within narrow limits throughout the period with only a slight downward trend until 1939 and a correspondingly slight upward trend since then. Due to this relatively steady acreage of cropland, the production-per-acre trend follows quite closely that of the index of total production. Production per acre was 88 percent above 1939 and 169 percent above 1934. (Figure 8).

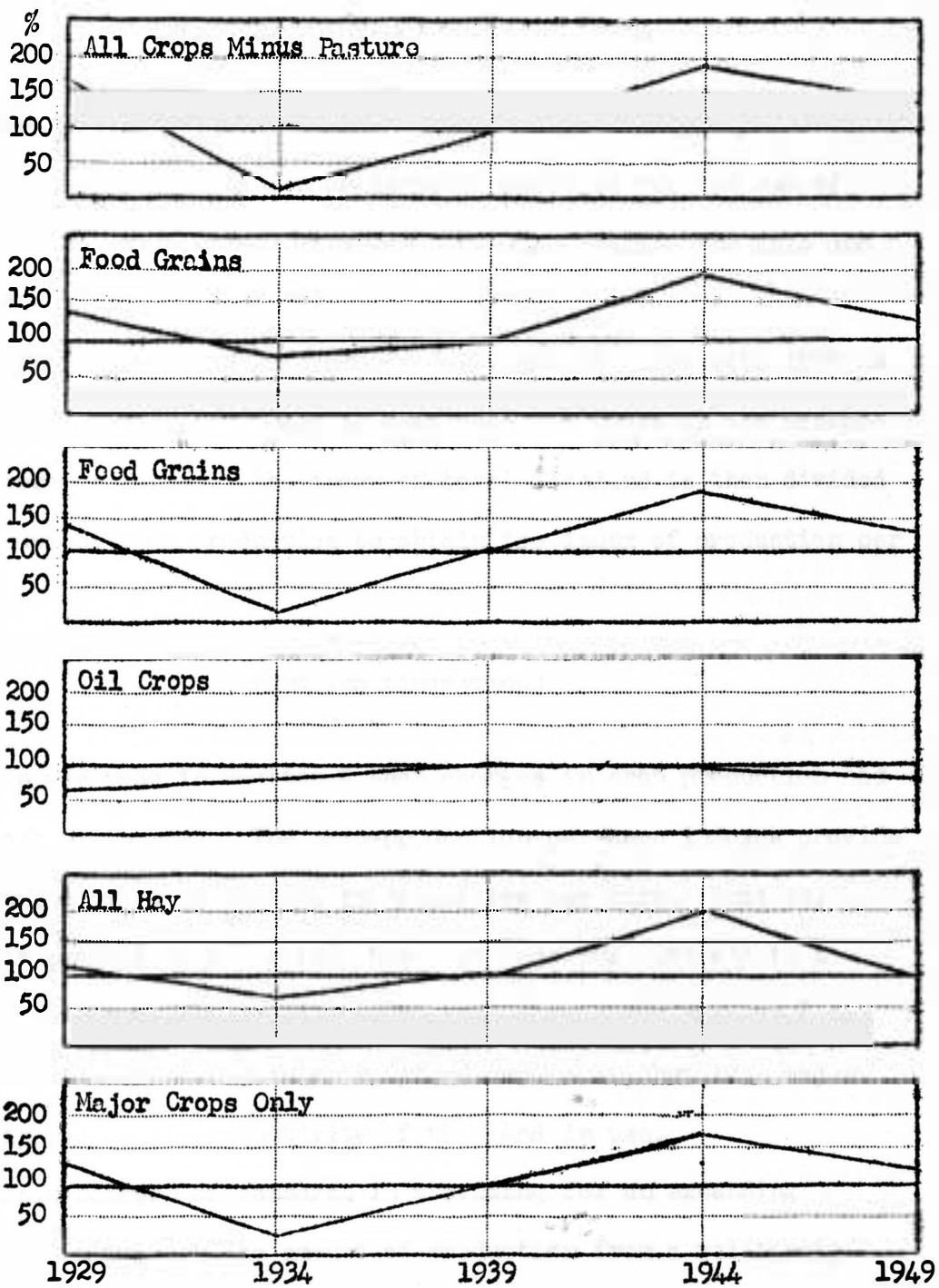
Figure 9 shows what has happened in the production per acre of individual crop groups. Except in the case of oil crops the trends have been very similar although of slightly different proportions. Feed grains have changed more in the years shown than have food grains with the greatest variability occurring in the low period of 1934 when feed grains dropped to 83 percent below 1939 production per acre and food grains remained at only 20 percent below 1939. Hay production per acre dropped less than did feed grains in 1934 and was higher in 1944. Oil crop production per acre was at a high point in 1939 having

FIGURE 8. INDEX NUMBERS OF CROPLAND, VOLUME OF ALL CROP PRODUCTION, AND PRODUCTION PER ACRE, SOUTH DAKOTA, 5-YEAR PERIODS (1939 = 100)



Source: Table A7

FIGURE 9. INDEXES OF CROP PRODUCTION PER ACRE, BY CROP GROUPS, SOUTH DAKOTA, 5-YEAR PERIODS (1939 = 100)



Source: Table A7

had a slight upward trend until then and somewhat less of a downward trend into 1949.

METHOD OF CONSTRUCTING THE INDEXES

Cropland, as used here, means the total crop land as reported by the U. S. Census minus rotation or plowable pasture; or, the sum of acres planted to major crops, wild hay harvested, fallow and idle and miscellaneous crops. 20/

The index of cropland is a simple "unweighted" index with 1939 as base year. The production index is that used for crops in the production per operator series. The index of total cropland is then divided into the index of crop production to obtain the index of production per acre.

USES AND LIMITATIONS

Mention was made in Section C that changes in crop production had been the most pronounced. The crop-production-per-acre indexes provide a partial explanation of changes in production per farm. That is, increases in productivity per farm have not been due entirely to a diminishing number of farms with correspondingly larger size of farms, nor to a slight increase in total cropland available, but to a major degree to increases in productivity of the land in use.

The basic concern of research in providing for an expanding population is increasing the amount of production from a relatively

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20/ This definition was prepared by Lyle Bender of South Dakota State College as part of work for a Doctor's thesis.

stable input of land. Indexes of production per acre are thus an integral part of production analysis.

The 5-year periods used here do not indicate highs and lows for intervening years, nor do they indicate averages over the intervening years. Year-by-year indexes would serve much better in the indication of trends, since weather conditions in any particular year are of the utmost importance.

CHAPTER III

INDEXES OF CROP PRODUCTION FOR THE ECONOMIC AREAS

A. TOTAL PRODUCTIVITY

State units are often too large and heterogenous and county units too small and too numerous to be usable for many statistical purposes. The Bureau of Census has found an increasing need for a set of areas intermediate in size between state and county for tabulating and publishing of data. A single set of intermediate areas that is uniform throughout the United States has been established by the U. S. Department of Commerce for this purpose:

> The name "State economic areas" has been given to this grouping of counties in order to convey the implication that each State has been divided into its principal units and that within each unit a distinctive economy prevails, insofar as it is possible to do this using county units. The term "economy" is used here in its broadest sense; it refers to the total adjustment which the population of an area has made to a particular combination of natural resources and other environmental factors. 21/

The letters behind some of the numbers indicate areas that are to be combined for non-agricultural purposes.

The 1950 Censes of Agriculture used the system of Economic Areas for the first time. A different system is still being used by the Crop and Livestock Reporting Service. A program of arranging all available agricultural production data by economic areas is now in progress at South Dakota State College under Ray Pengra of the

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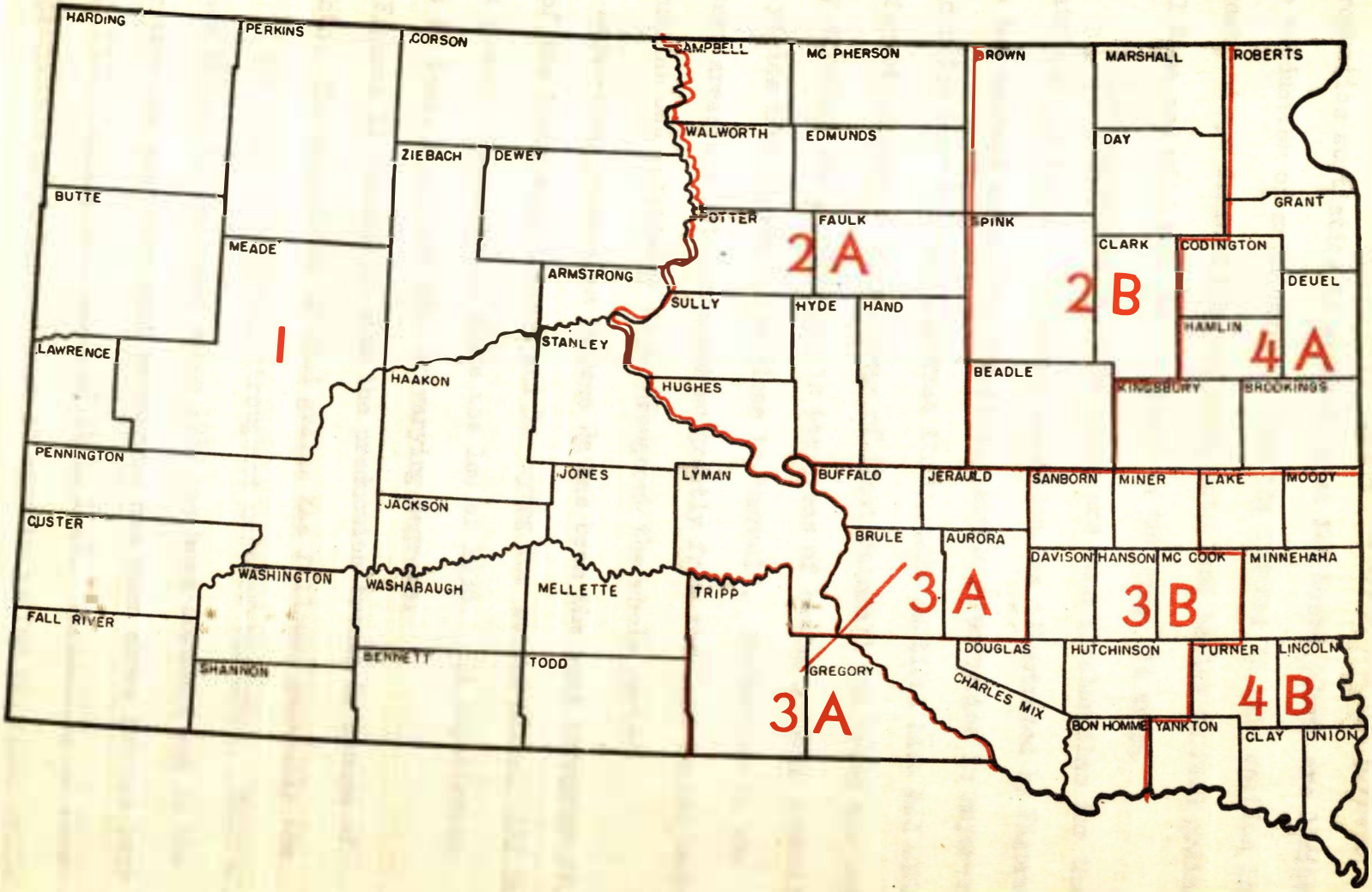
21/ Bogue, Donald J., "State Economic Areas", U. S. Government Printing Office, Washington, D. C., pp. 1-2.


HARDING
PERKINS
CORSON
CAMPBELL
MC PHERSON
BROWN
MARSHALL
ROBERTS
WALWORTH
EDMUNDS
DAY
ZIEBACH
DEWEY
BUTTE
GRANT
POTTER
FAULK
2 A
SPINK
CLARK
CODINGTON
MEADE
2 B
DEUEL
ARMSTRONG
SULLY
HYDE
HAND
HAMLIN
4 A
1
LAWRENCE
STANLEY
HAAKON
BEADLE
HUGHES
KINGSBURY
BROOKINGS
PENNINGTON
JONES
LYMAN
BUFFALO
JERAULD
SANBORN
MINER
LAKE
MOODY
JACKSON
CUSTER
BRULE
AURORA
DAVISON
HANSON
MC COOK
MINNEHAHA
WASHINGTON
WASHABAUGH
MELLETTE
TRIPP
3 A
3 B
FALL RIVER
DOUGLAS
HUTCHINSON
TURNER
LINCOLN
SHANNON
BENNETT
TODD
GREGORY
CHARLES MIX
4 B
BON HOMME
YANKTON
CLAY
UNION

Department of Agricultural Economics. At least for the present, production statistics by economic area for South Dakota are limited to production of major crops. Thus the indexes in this section include wheat and rye in food grains; corn, oats, and barley in feed grains; all tame and wild hay; and flaxseed as the only oil crop.

Variations within economic areas are much greater than for the State and may be in a different direction, as illustrated by Figure 10. The two eastern areas show relatively little fluctuation in major-crop production over the years, whereas the western sections have had widely different outputs. In the areas of least rainfall the trend has been very erratic; and conversely, in the areas of better growing conditions the yields have stayed quite close to "normal". Production in the eastern areas has not increased so greatly from the base period because production was relatively high throughout the whole period.

Major-crop production in Area 2a has been the most irregular of all of the areas with Areas 1 and 3a vying for second place. All have had a general upward trend since the low of 1936. All experienced drops in 1943, 1946, and 1949 of varying degrees.

Figures 11 through 14 show the production trends by groups of products. The production of food grains has followed generally the trend of the major-crop totals throughout most of the areas. However, in Areas 3b and 4b the trend since 1939 has been downward and in the latter area the only time that production has been above 100 was 1937 through 1940, falling just short of it in 1947. Variability of food-grain production in 3a has not been so erratic as for the major crops as a whole.

In all but the two eastern areas feed-grain production has shown much more erratic behavior, although trends in each of the areas have been similar to that of total crop production. Area 4b has been continuously above the base period since 1937 in the production of feed grains. Production in 4a has been generally hovering near normal in recent years with a slight downward trend.

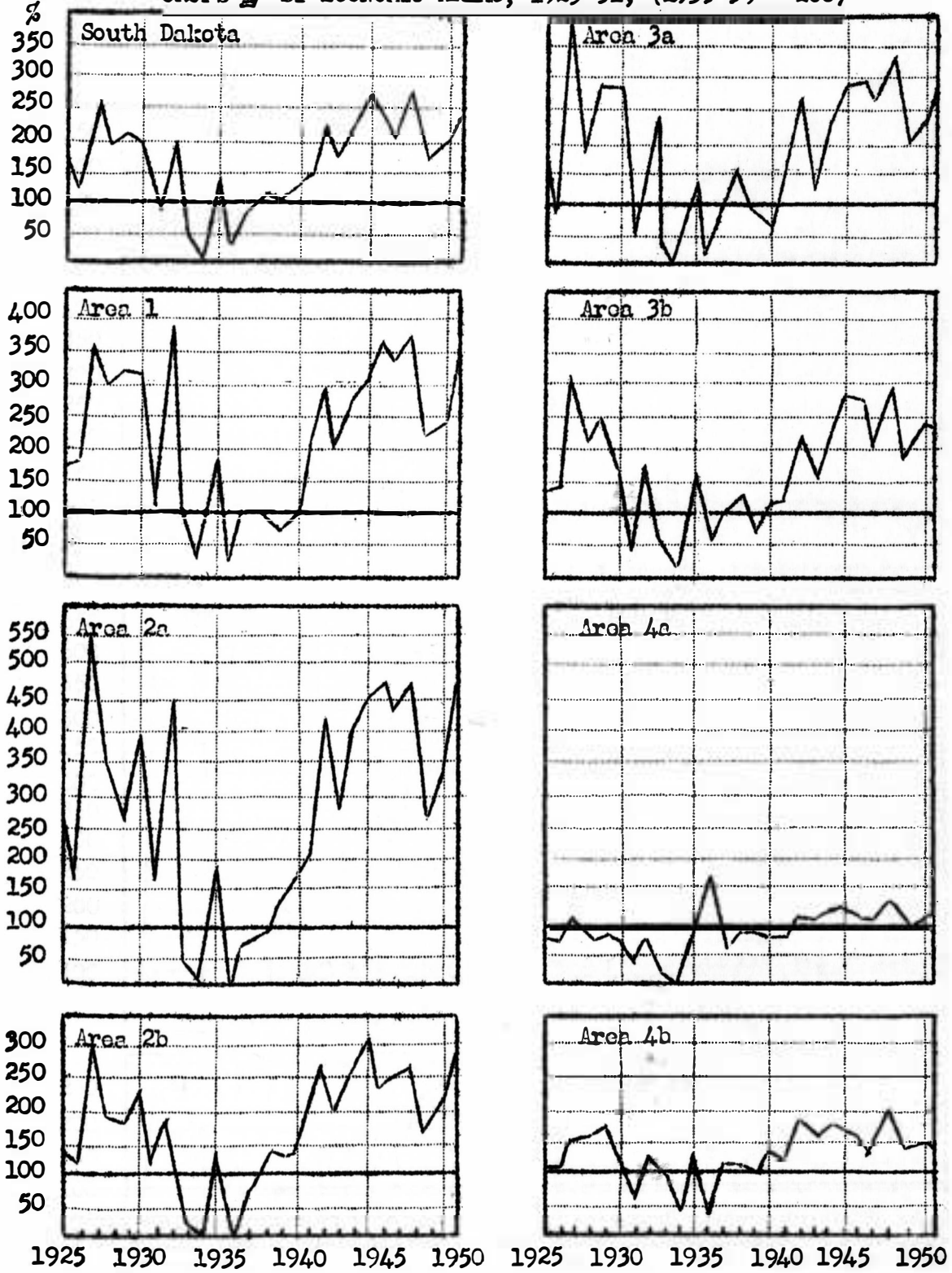
Hay output has shown less tendency to vary as widely as other crops. An upward trend since the base period is demonstratred throughout the areas, but again with Areas 4a and 4b showing a quite constant production. Area 3a has experienced greater extremes than any of the other areas with Area 2a and Area 1 following in that order.

Flaxseed production has had extremely wide variance, especially in Area 1 where the index soared to almost 24,000 in 1927. Area 2a had an index number of 8,286 for the same year, with Area 3a showing a high point of 3,750 in 1929 and Area 3b 2,775 in 1948. Areas 4a and 4b have remained within more moderate limits, although even there the index numbers have come near or surpassed 1,000. The average production of flax during the 1935-39 base period was extremely low which accounts for the extremely erratic behavior.

METHOD OF CONSTRUCTING THE INDEXES

At the time this study was undertaken, the writer was optimistic about the availability of data so that a gross-farm-production and a farm-output index for each of the economic areas could be constructed along the same lines as that for the State. Since the information

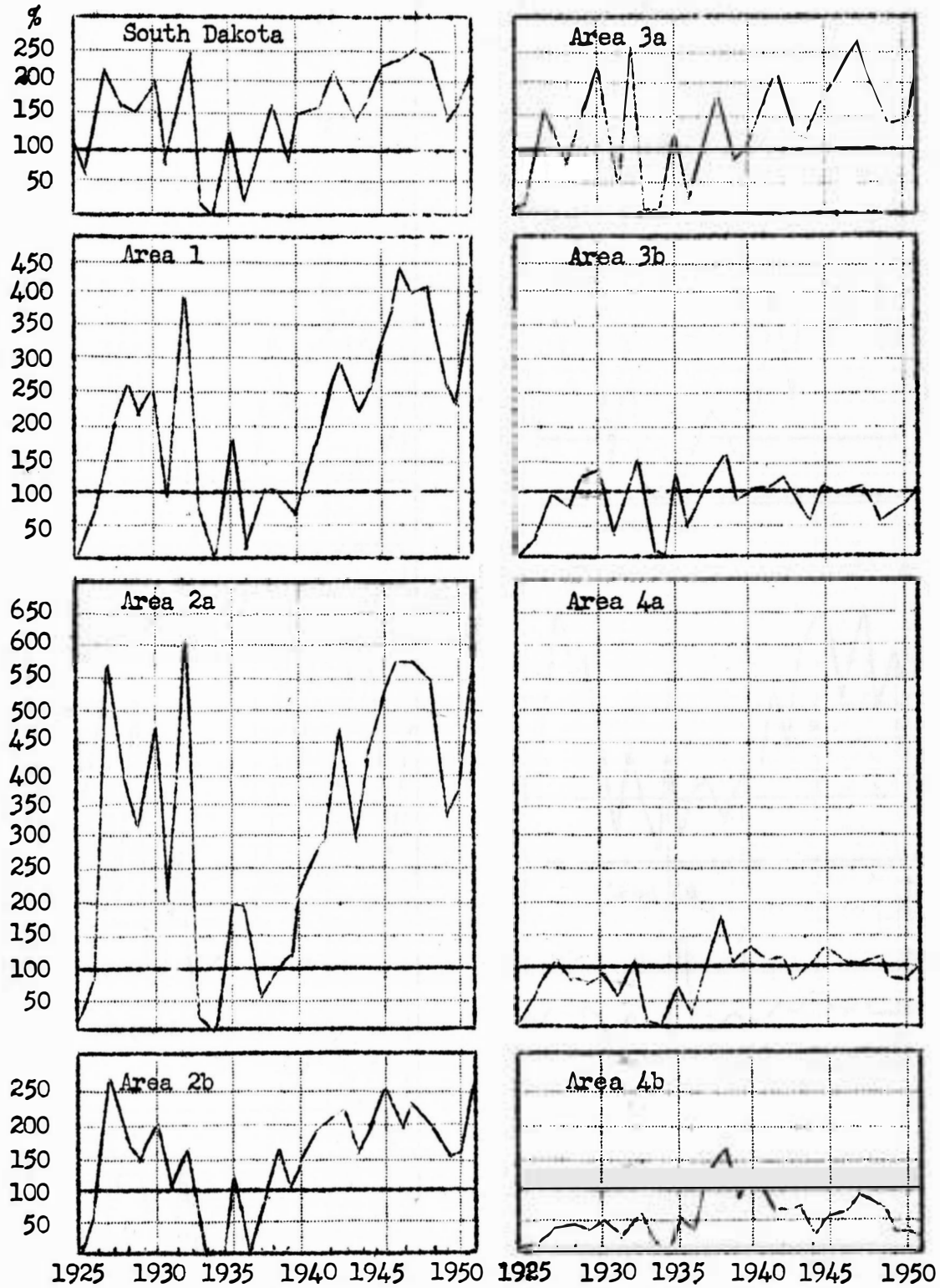
FIGURE 10. INDEX NUMBERS OF VOLUME OF PRODUCTION OF MAJOR CROPS 1/ BY ECONOMIC AREAS, 1925-51, (1935-39 = 100)



Data for 1950-51 are preliminary. Source: Table B1

1/ Contains wheat, rye, corn, oats, barley, all hay, flax.

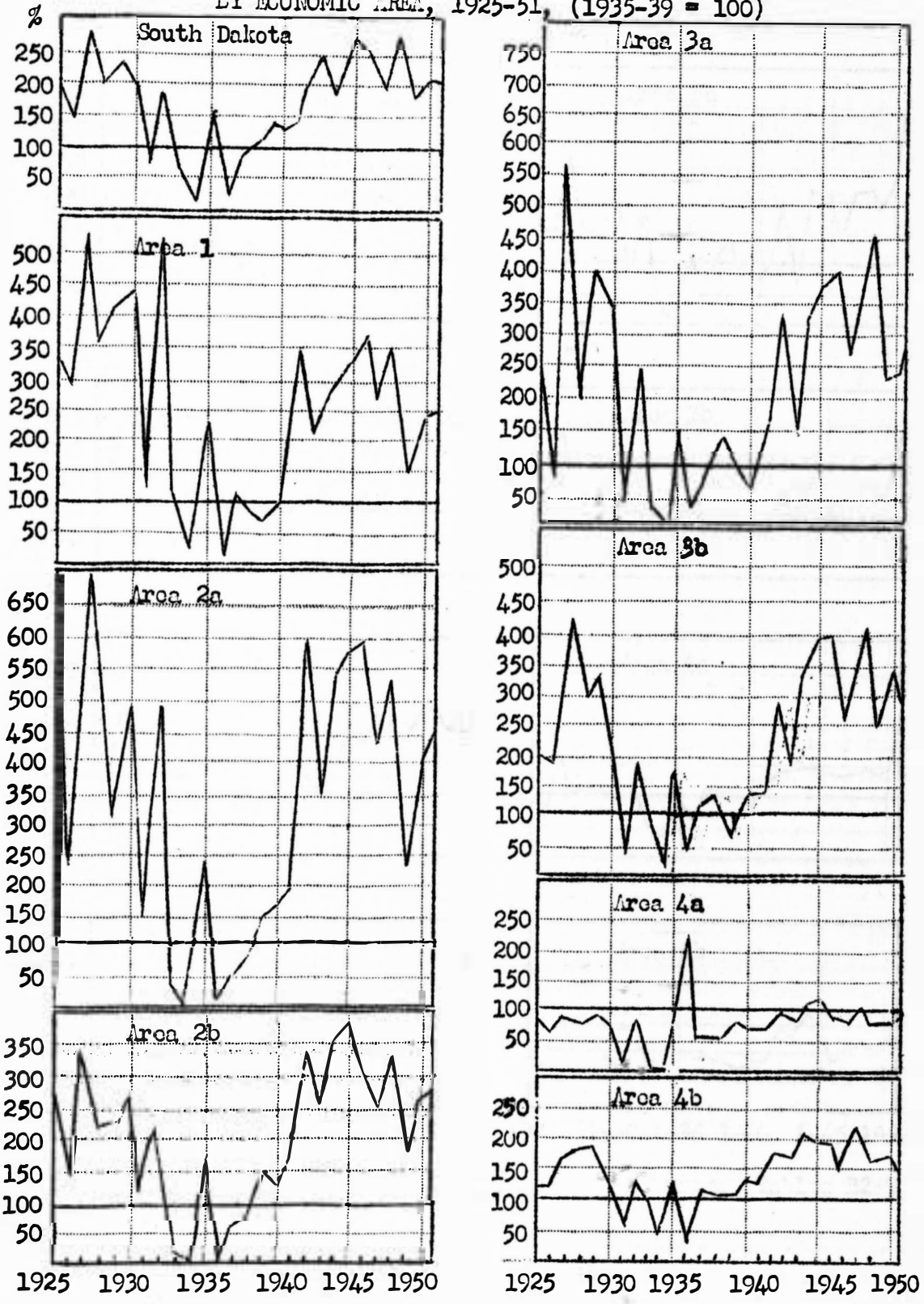
FIGURE 11. INDEX NUMBERS OF PRODUCTION OF FOOD GRAINS 1/ BY ECONOMIC AREA, 1925-51, (1935-39 = 100)



Data for 1950-51 are preliminary. Source: Tables B2-9

1/ Contains wheat and rye.

FIGURE 12. INDEX NUMBERS OF PRODUCTION OF FEED GRAINS 1/ BY ECONOMIC AREA, 1925-51, (1935-39 = 100)

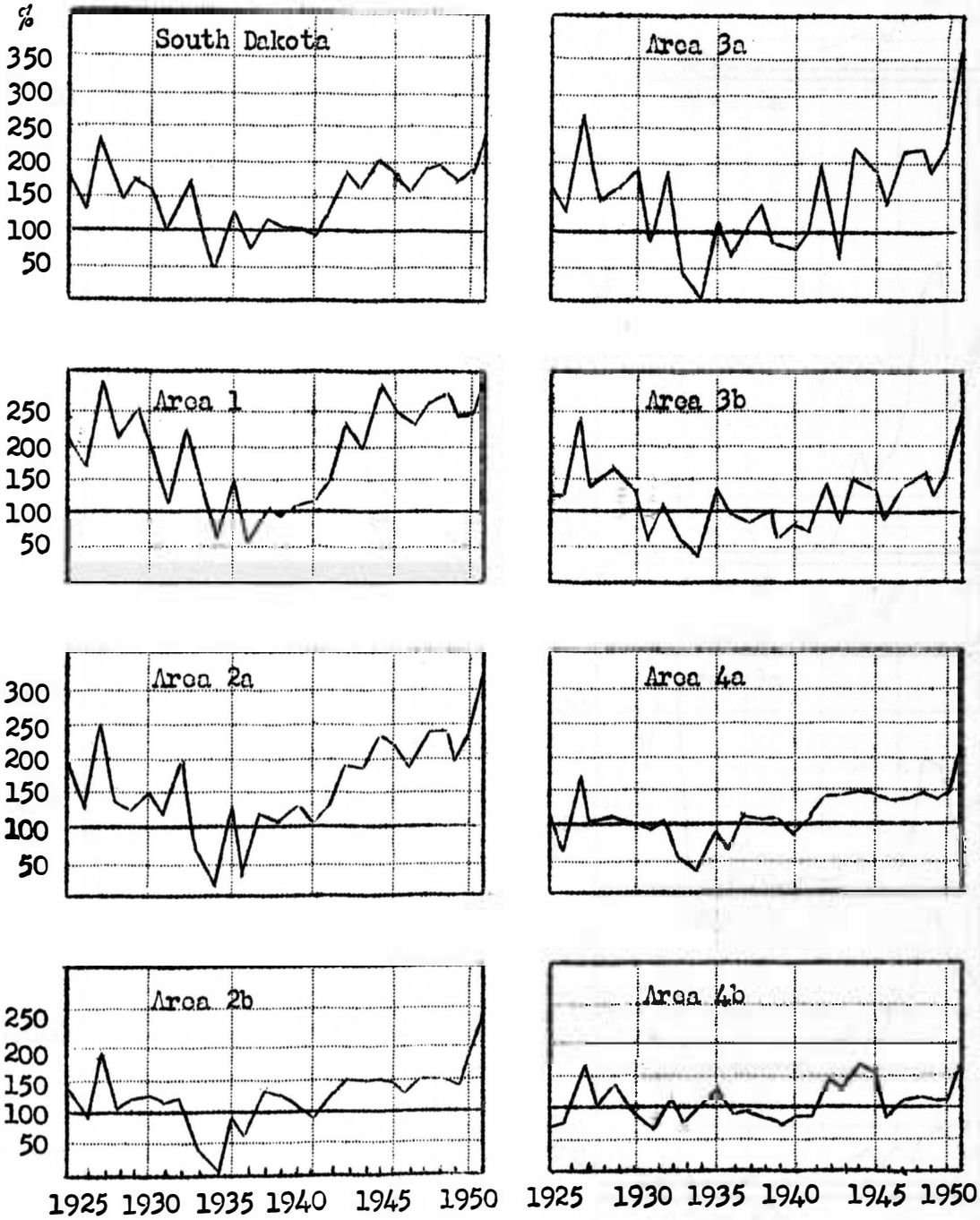


Data for 1950-51 are preliminary.

Source: Tables B2-9

1/ Contains corn, oats, and barley.

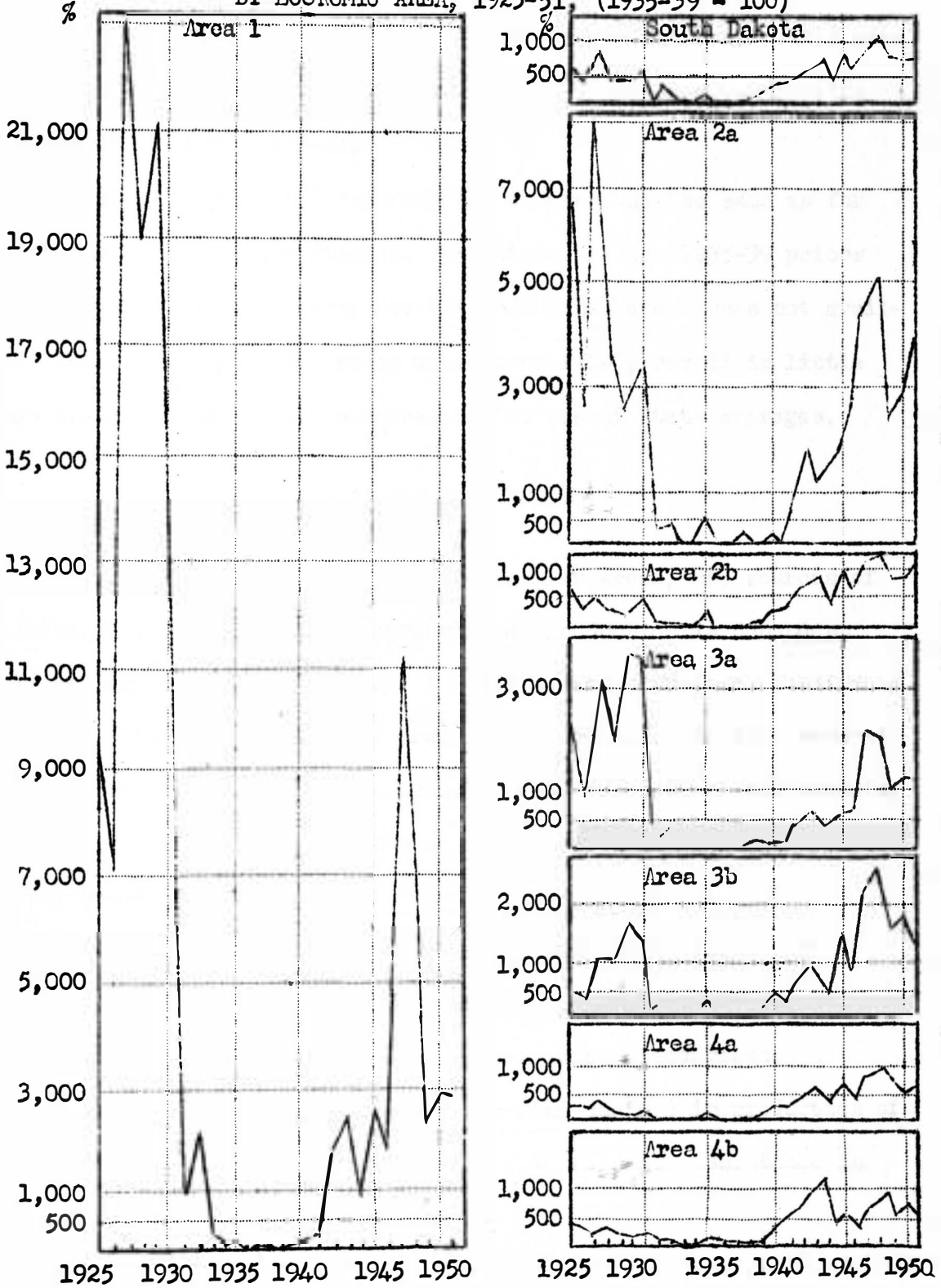
FIGURE 13. INDEX NUMBERS OF PRODUCTION OF ALL HAY, BY ECONOMIC AREA, 1925-51 (1935-39 = 100)



Data for 1950-51 are preliminary.

Source: Tables B2-9

FIGURE 14. INDEX NUMBERS OF PRODUCTION OF FLAXSEED, BY ECONOMIC AREA, 1925-51, (1935-39 = 100)



Data for 1950-51 are preliminary.

Source: Tables B2-9

available was limited to major crops, a new index of crop production for South Dakota was made including only the crops for which estimates were available for all of the areas. Thus the index obtained was exactly comparable to the area indexes.

The general method of preparing the indexes was the same as for construction of the State indexes. The State average 1935-39 prices were used since average prices for the individual areas were not available. Use of average area prices would very likely result in little change in the index numbers obtained by the use of State averages.

USES AND LIMITATIONS

By breaking down State totals into smaller areas, the sources of change begin to appear. Total agricultural production is dependent mainly upon crop production except in those areas where some feeding is practiced. Thus area indexes of crop production indicate in a general way the variability of total production. Feed production, and pasture, have a decided effect upon the number of livestock units that will be kept for breeding purposes.

The use of these indexes in the development of research and educational programs can indicate in which areas the production of certain crops should be stressed or certain crops discouraged. A knowledge of the basic trends and year-to-year changes in production of various crops, and groups of crops, can be of valuable assistance in the formulation of agricultural policies.

Indexes are the most accurate when larger figures are used and

thus show much less variability in production when larger areas are concerned. When the base period for a series is chosen that happens to have been a particularly poor period for one of the smaller areas, the resulting indexes are very likely to be out of all proportion to the other indexes. Care should be taken in analysis that undue weight is not given to such erratic behavior.

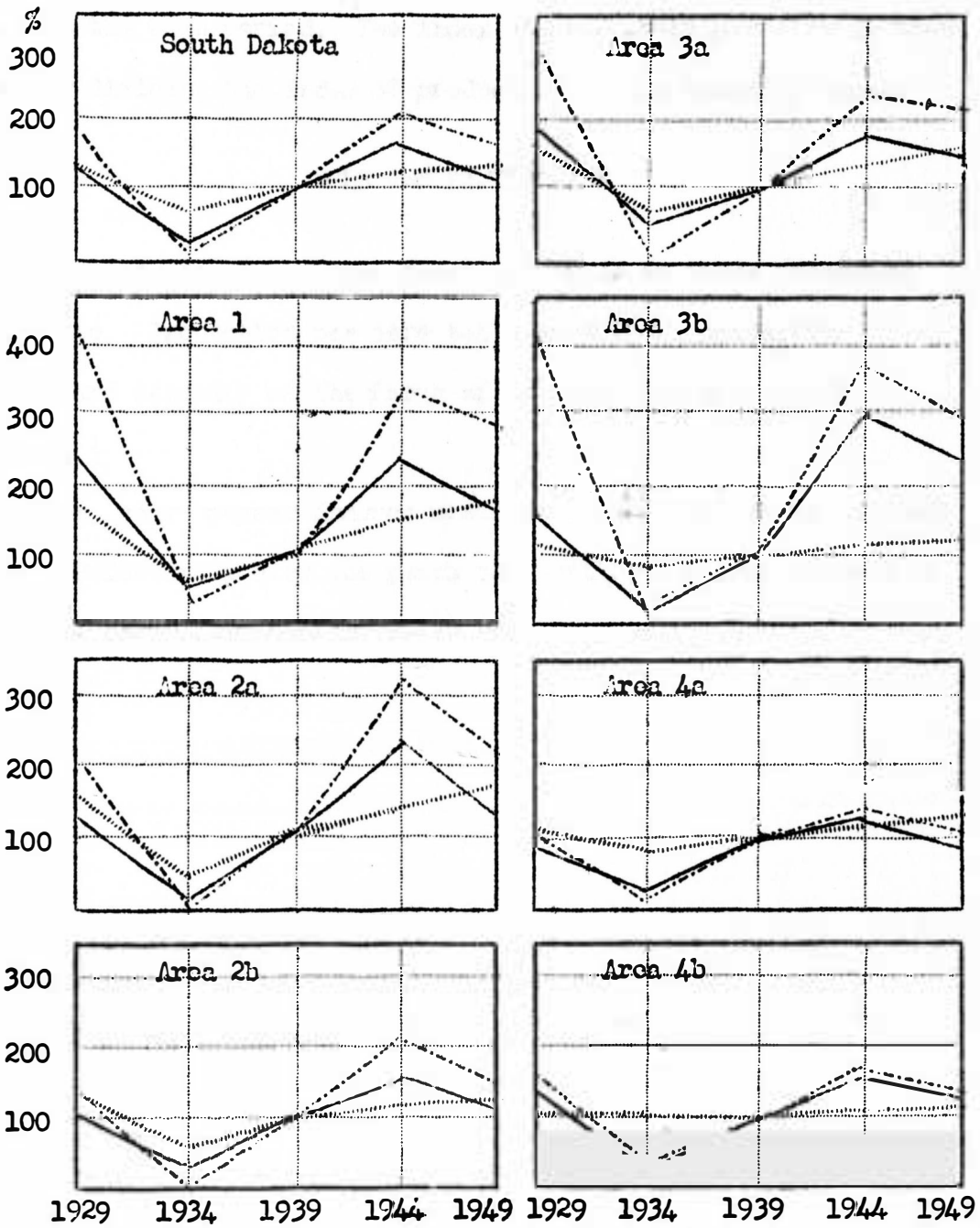
B. PER ACRE PRODUCTIVITY

Trends in acreage and production per acre can be noted in most of the economic areas that are similar to those for the state as a whole, though percentage changes in some of the areas are much greater than for others. Again, the changes are relatively greater in the western sections of the State. The changes have been the greatest in Area 1 followed by Areas 3b, 2a, and 3a, in that order. Cropland in Areas 3b, 4a, and 4b has changed relatively little during the period covered, although it has had a slight upward trend since 1939 in all of the areas. Due to a relatively stable acreage of cropland since 1939 in all of the areas, the trend of production per acre has quite closely followed the trend of crop production. The same areas thus demonstrate the most erratic behavior as was shown for crop production.

METHOD OF CONSTRUCTING THE INDEXES

Total cropland as used for this index is defined in Chapter II, Section D. The index of cropland is a straight "unweighted" relative of the various years shown with 1939 as base. The index of production

FIGURE 15. INDEX NUMBERS OF CROPLAND, CROP PRODUCTION, AND PRODUCTION PER ACRE, ECONOMIC AREA, 5-YEAR PERIODS, (1939 = 100)



Source: Tables B10-12

Cropland
Production
Production Per Acre

is derived in the same way as for the State indexes of production. However, while the 1935-39 average prices were used as weights, 1939 was used as the base period. The index of production per acre is then obtained by dividing the index of production by the index of acres.

USES AND LIMITATIONS

The indexes are of the same practical value as those presented for the State. Production per acre tells more about productive efficiency and capacity of the farms of an area than does total production.

However, year-by-year indexes would serve much better to indicate trends in productivity over the years than will the 5-year periods to which these indexes are confined.

CHAPTER IV

SUMMARY

Index numbers are one of the easiest and most understandable methods of handling large masses of data and noting relative trends, especially when various types of products must be added together. In the making of index numbers much depends on the selection of the base period to be used and on the method of combining the units. The indexes presented here use the same base and system of weighting that have been employed in other indexes with which they will be used for comparison purposes.

The gross-farm-production index is the best measure of total production for each calendar year because it measures the total output of farm land and farm labor. The index of farm output is the best measure of yearly output for eventual human consumption because it does not contain the feed and pasture consumed by horses and mules.

Both of the indexes have shown a steadily-rising trend since the base period, but with the farm-output index rising faster due to the elimination of horses and mules from the aggregates. The years 1943, 1947, and 1949 were low periods in production.

The displacement of horses and mules has brought about expansion of food production by diverting feed and pasture from horse-and-mule production to producing a greater volume of livestock and livestock products for human consumption.

Production of crops has increased steadily since 1939 with feed grains constituting about one-half of all crop production and food grains about one-half of the remainder. Hay and pasture output has remained relatively steady throughout the whole period while the production of oil crops has had extremely erratic fluctuations. The trend of oil-crop production was downward until the end of the 1930's and has been upward at a rapid rate since 1936. Oil crops consisted of flaxseed production only until 1940, however.

The product added by livestock has also contributed to increased production, except in the case of sheep. Beef cattle account for about one-third of all livestock production at the present time, with poultry products having the next largest share.

Production per breeding unit has declined somewhat since 1941 and since 1946 has been below 100 except for 1949, due mostly to the high proportion of beef cattle to other livestock. Beef cattle have had a downward trend and since 1942 have been below 100 at all times. Each of the other groups has had a slight increase in production per breeding unit.

Production per farm has increased in total and for all individual groups except farm-produced power. Crop production per farm has had the highest percentage change.

Production of crops per acre is well above the 1939 average with all groups except oil crops contributing to the rise. The production per acre of oil crops has remained relatively steady over the period.

In the economic areas the production of crops has varied to a

much greater extent than for the State as a whole. For the most part the variation has been the greatest in Areas 1, 2a, 2b, and 3a, although Area 3b has had wide variation for some groups of crops. The remaining two areas, 4a and 4b in the western part of the State, have shown relatively little fluctuation in total crop production and within the various crop groups. For some commodities such as hay and flax Area 2b has had relatively little fluctuation.

Since total cropland has remained relatively constant, though with a recent slight upswing, crop production per acre has followed the upward and downward swings of total production. Areas 2b, 4a, and 4b have shown the least tendency to fluctuate.

In conjunction with the United States and Regional indexes published by the Department of Agriculture, the series of State and Economic Area indexes presented here give a picture of what is changing and where the changes come from. The tendency toward gradual change over a period of years for the State as a whole should not be taken as a measure of the situation in any particular area. There may be a failure in one area that is offset by a bumper crop in another. Despite the fact that the greatest crop production for the State was in 1948, only Areas 4a and 4b had their greatest production in that year. Some of the areas were highest in 1927, others in 1932, and in 1945. The relative weight of one type of product within an area has much to do with how the index of total production for the area fluctuations, and the amount of total production within the area may indicate how much influence that production will have on the State index.

Thus, in analysis of agricultural production it is important to have available factual information as to what changes are taking place and where the changes originate. These indexes do provide a basis from which to work for those interested in research, educational programs, and the drafting of farm policy.

A glance at Figure 2 will show that in the periods when the gross-farm-production index and the farm-output index are going down, the farm-output index descends more rapidly than the index of gross farm production, with the reverse being true during the periods when the indexes are rising. It will also be noted that since the base period, or about 1935, the farm-output index has been consistently above the gross-farm-production index and getting ever farther from it. The reason is the smaller base and the decline in numbers of horses and mules.

So long as the rate of decline of horses and mules remains constant the rate of divergence between the two indexes will also remain constant. This fact caused the present writer much concern. Since by definition, the index of farm output is the index of gross farm production minus the horse-and-mule aggregate, it appeared from one point of view that eventually the two indexes must come together when horse-and-mule numbers neared zero. From that point on the two indexes, however, will instead run some distance apart. The farm-output index, to be more exact, will run about 30 percent higher than the index of gross farm production because that is the relation of the horse-and-mule aggregate to the farm-output aggregate in the base period.

From the definition of the two indexes, one would be permitted to assume that with the horses and mules extinct, all production would then be for human consumption and thus equivalent to the farm-output index. And, conversely, that when horses and mules were no longer in the indexes, that the farm-output index would thus represent all farm production; i.e., be equivalent to the gross-farm-production index.

It would appear that some method needs to be worked out so that the two indexes will tend to come together as the horse-and-mule numbers decline. Otherwise, the gross farm production index will be in the position of purporting to show something that the index of farm output does not, when in reality both are composed of exactly the same figures (for the years beyond the time that horses and mules become extinct).

One way of rectifying the two indexes, though it would be of no avail for the present, would be to shift the base period to the time when horses and mules cease to be a factor and then work forward and backward from there. Another possibility is the use of a different formula, perhaps with relative current prices being used as weights, so that as the number and relative value of horses and mules declines, they will be gradually edged out of the index with other commodities taking over the position assigned to farm-produced power during the base period.

One may question the advisability of using the 1935-39 average as a suitable base for indexes for South Dakota. It does not appear to have been a "normal" period in that the depression and drought years

were the only ones that have been below "normal" during the period covered. An average of the index numbers based on 1935-39 is about 150 for gross farm production and near 190 for farm output. The farm-output index presented in F. M. 53 on page 70 indicates that except for the years 1932-37 there has been a steady upward trend to farm output for the United States. South Dakota farm output (Figure 1 in this paper) indicates a downward trend until the depression-drought years and a rising trend since then. This is borne out by a glance at the trends in individual crops and within the Economic Areas. By changing the base period from 1935-39 to 1940-44 (but still using the 1935-39 average prices) by multiplying the 1940-44 average of 184 by the index number for each of the years, an index of farm output is obtained which more nearly approximates the over-all trend shown for the United States--i.e., a rising trend for the whole period, with the years just before and just after the depression-drought period above 100.

Whether or not a shift of the base would make analysis any easier may be debatable insofar as the South Dakota indexes are concerned since the shifts are relative. In comparison with the U. S. indexes, however, while the bases are the same years, they apparently are not similar to the degree that the base is considered as "normal".

Need for further work on the area indexes is indicated to get a farm-output index. This will require compilation of figures on production of meat animals and animal products and estimates on production of minor crops that are not now available.

All of the indexes of productivity lack detailed information on number of workers, number of hours worked, and completion of present

of average prices for each of the economic areas may be desirable if and when it should be found advisable to move the base period to a sufficiently recent date so that estimates of average prices are available.

At the present time, the indexes presented here, while not perfect, are the best available and would appear to be of assistance to those interested in analyzing agricultural production trends.

production-per-acre and production-per-farm indexes by inclusion of estimates of number of acres and number of farms between census years so that a complete picture of productivity can be gained.

Although the gain in accuracy may be of doubtful value, a series of average prices for each of the economic areas may be desirable if and when it should be found advisable to move the base period to a sufficiently recent date so that estimates of average prices are available.

At the present time, the indexes presented here, while not perfect, are the best available and would appear to be of assistance to those interested in analyzing agricultural production trends.

APPENDIX A

INDEXES OF AGRICULTURAL PRODUCTION FOR THE STATE

TABLE A1. INDEX NUMBERS OF GROSS FARM PRODUCTION, FARM OUTPUT AND PRODUCTION BY GROUPS OF PRODUCTS FOR SOUTH DAKOTA, 1925-51 (1935-39 = 100) 1/

Year	Gross Farm Production 2/	Farm Output 3/	Farm-Produced Power 4/	Product-Added by Meat Animals 5/	Total Livestock Product. 6/	Total Crops and Pasture 7/	Total Major Crops 8/	Food Grains, Hay, Pasture 9/	Feed Grains 10/	Hay 11/	Pasture 12/	Food Grains 13/	Oil Crops 14/	Misc. Crops 15/
1925	162	156	183	141	152	167	173	166	187	124	137	150	598	143
1926	132	119	178	143	150	121	119	133	144	96	131	65	348	137
1927	206	215	173	141	150	236	255	229	278	177	125	224	811	300
1928	172	173	168	147	159	182	188	176	208	110	134	177	490	294
1929	178	182	163	150	161	191	200	192	231	124	134	165	497	223
1930	174	178	159	159	172	182	190	168	192	117	140	211	522	185
1931	112	100	152	163	179	86	75	85	70	75	140	86	84	106
1932	168	175	146	132	139	186	195	167	190	127	130	253	123	223
1933	89	75	138	130	133	65	53	77	64	62	129	24	18	114
1934	62	43	128	105	98	34	21	43	22	45	102	4	6	78
1935	121	123	114	86	84	135	141	133	151	114	97	136	165	178
1936	64	52	105	104	102	42	31	48	27	55	104	23	21	43
1937	92	90	100	88	87	93	94	96	98	99	90	87	35	72
1938	111	116	92	101	103	117	121	107	107	113	100	158	61	101
1939	112	119	89	121	124	113	113	116	117	119	109	95	217	107
1940	123	133	89	123	127	129	132	125	130	119	116	134	316	105
1941	140	155	89	137	141	149	154	138	142	135	129	179	362	99
1942	191	221	88	160	166	219	236	214	249	176	140	227	581	140
1943	166	190	86	182	195	173	178	171	186	143	149	150	775	161
1944	187	219	82	167	169	213	228	221	260	180	140	180	414	119
1945	201	237	77	168	172	233	253	227	274	160	141	237	753	136
1946	192	228	70	165	169	223	241	211	260	131	135	249	576	140
1947	176	210	60	163	167	200	215	174	195	151	129	256	991	99
1948	201	244	54	155	158	242	266	229	282	159	128	242	1,296	123
1949	154	185	50	170	169	165	174	160	177	139	128	156	774	67
1950*	167	204	45	167	162	188	202	186	214	163	121	166	816	97
1951*	187	231	38	172	176	217	236	194	210	206	132	277	825	78

(Table A1 continued on next page)

1. (CONTINUED) INDEX NUMBERS OF GROSS FARM PRODUCTION, FARM OUTPUT AND P
BY GROUPS OF PRODUCTS FOR SOUTH DAKOTA, 1925-51 (1935-39 = 100) 1/

2/	Farm Output 3/	Farm-Produced Power 4/	Product-Added by Meat Animals 5/	Total Livestock Product. 6/	Total Crops and Pasture 7/	Total Major Crops 8/	Feed Grains, Hay, Pasture 9/	Feed Grains 10/	Hay 11/	Pasture 12/	Food Grains 13/
)	169	173	145	154	179	187	179	210	126	132	156
L	114	144	138	144	111	107	108	108	85	128	116
)	100	100	100	100	100	100	100	100	100	100	100
L	184	87	153	159	177	186	174	193	150	135	174
5	221	62	164	167	213	230	200	237	148	132	228

—

ıinary.
ılly comparable to U.S.D.A. National and Regional indexes.
farm output including product added by Horses and Mules.
farm production minus Horse and Mule aggregate.
of total quantity-price aggregate, not product added.
roduct added is production aggregate of meat animals and animal products m
ich is already included in crops.
aggregates of total production, not product added.
les corn, oats, barley, grain sorghums, hay, pasture, wheat, rye, soybeans
ıckwheat, potatoes, sweet corn, cucumbers, sugar beets, and apples.
les feed grains, hay, food grains, oil crops.
ɔtes 10, 11, and 12.
grains include corn, oats, barley, grain sorghums.
ıcludes forage and silage.
re is a derived figure.
grains include all wheat and rye.
ıns (1940 to date) and flaxseed.
les all other crops reported - buckwheat, potatoes, sweet corn, cucumbers
· beets, and apples (1925-1944 only).

TABLE A1. (CONTINUED) INDEX NUMBERS OF GROSS FARM PRODUCTION, FARM OUTPUT AND PRODUCTION BY GROUPS OF PRODUCTS FOR SOUTH DAKOTA, 1925-51 (1935-39 = 100) 1/

Year	Gross Farm Production 2/	Farm Output 3/	Farm-Produced Power 4/	Product-Added by Meat Animals 5/	Total Livestock Product. 6/	Total Crops and Pasture 7/	Total Major Crops 8/	Feed Grains, Hay, Pasture 9/	Feed Grains 10/	Hay 11/	Pasture 12/	Food Grains 13/	Oil Crops 14/	Misc. Crops 15/
1925-29	170	169	173	145	154	179	187	179	210	126	132	156	549	219
1930-34	121	114	144	138	144	111	107	108	108	85	128	116	150	141
1935-39	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1940-44	161	184	87	153	159	177	186	174	193	150	135	174	489	125
1945-49	185	221	62	164	167	213	230	200	237	148	132	228	878	113

* Preliminary.

1/ Generally comparable to U.S.D.A. National and Regional indexes.

2/ Total farm output including product added by Horses and Mules.

3/ Gross farm production minus Horse and Mule aggregate.

4/ Index of total quantity-price aggregate, not product added.

5/ The product added is production aggregate of meat animals and animal products minus feed consumed which is already included in crops.

6/ Value aggregates of total production, not product added.

7/ Includes corn, oats, barley, grain sorghums, hay, pasture, wheat, rye, soybeans (1940 to date), flaxseed, buckwheat, potatoes, sweet corn, cucumbers, sugar beets, and apples.

8/ Includes feed grains, hay, food grains, oil crops.

9/ See notes 10, 11, and 12.

10/ Feed grains include corn, oats, barley, grain sorghums.

11/ Hay includes forage and silage.

12/ Pasture is a derived figure.

13/ Food grains include all wheat and rye.

14/ Soybeans (1940 to date) and flaxseed.

15/ Includes all other crops reported - buckwheat, potatoes, sweet corn, cucumbers (1925-1949 only), sugar beets, and apples (1925-1944 only).

TABLE A2. INDEX NUMBERS OF PRODUCT ADDED BY LIVESTOCK, SOUTH DAKOTA, 1925-51, (1935-39 = 100) 1/

Year	All Meat Animals and Animal Products	Beef Cattle	Sheep, Lambs, Wool	Hogs	Dairy Products and Veal	Chickens, Eggs, Turkeys	Horses and Mules
1925	141	152	46	244	109	117	183
1926	143	135	51	238	126	124	178
1927	141	112	52	256	128	128	173
1928	147	129	64	265	120	135	168
1929	150	124	75	262	132	141	163
1925-29	145	130	59	253	123	129	173
1930	159	134	76	293	127	146	159
1931	163	129	86	330	133	134	152
1932	132	129	91	188	119	120	146
1933	130	133	96	152	124	125	138
1934	105	90	99	88	141	94	128
1930-34	138	123	89	210	130	124	144
1935	86	92	96	56	95	89	114
1936	104	101	109	100	115	96	105
1937	88	91	75	81	93	87	100
1938	101	99	107	110	95	102	92
1939	121	117	112	153	102	126	89
1935-39	100	100	100	100	100	100	100
1940	123	125	131	149	104	122	89
1941	137	139	165	160	112	140	89
1942	160	156	177	212	114	176	88
1943	182	175	171	298	109	195	86
1944	167	184	138	204	119	185	82
1940-44	153	156	156	205	112	164	87
1945	168	194	130	208	113	188	78
1946	165	192	110	215	109	180	70
1947	163	192	95	212	103	183	60
1948	155	204	80	187	96	166	54
1949	170	209	69	211	127	174	50
1945-49	164	198	97	207	109	178	62
1950*	167	195	67	195	138	174	45
1951*	172	220	83	225	107	183	38

* Preliminary.

1/ Price-quantity aggregate minus value of feed consumed.

TABLE A3. INDEX OF GROSS PRODUCTION OF LIVESTOCK, BY CLASSES, SOUTH DAKOTA, 1925-51, (1935-39 = 100) 1/

Year	All Livestock Except Power	Beef Cattle	Sheep, Lambs, Wool	Hogs	Dairy Products and Veal	Chickens and Eggs	Turkeys
1925	152	151	46	244	109	128	46
1926	150	135	51	238	119	135	48
1927	150	111	53	256	125	140	49
1928	159	129	64	265	124	148	51
1929	161	124	75	262	133	154	53
1925-29	154	130	58	253	122	141	49
1930	172	134	76	293	133	161	52
1931	179	129	86	330	135	145	55
1932	139	129	91	188	125	126	87
1933	133	133	96	152	128	129	104
1934	98	90	99	88	121	98	62
1930-34	144	123	89	210	129	132	72
1935	84	92	96	56	98	94	58
1936	102	101	109	100	109	97	94
1937	87	90	75	81	93	88	79
1938	103	99	107	110	97	101	113
1939	124	117	112	153	103	121	156
1935-39	100	100	100	100	100	100	100
1940	127	125	131	149	107	113	165
1941	141	139	165	160	114	137	156
1942	166	156	177	212	117	185	119
1943	195	175	171	298	112	215	68
1944	169	184	138	204	113	204	54
1940-44	159	156	156	205	112	171	112
1945	172	194	130	208	108	207	59
1946	169	192	110	215	104	196	60
1947	167	192	95	212	98	203	43
1948	158	204	80	187	92	184	30
1949	169	209	69	211	104	192	42
1945-49	167	198	97	207	101	196	47
1950*	162	195	67	195	111	191	46
1951*	176	220	83	225	96	201	52

* Preliminary.

1/ Quantity-price aggregates of total production, not product-added.

TABLE A4. INDEX OF BREEDING UNITS, SOUTH DAKOTA, 1925-51
(1935-39 = 100) 1/

Year	All Except Horses 2/	Beef Cattle 3/	Sheep 4/	Hogs 5/	Dairy Cows 6/	Chickens 7/	Turkeys 8/
1925	160	144	48	282	106	133	85 9/
1926	154	126	49	271	109	138	89 9/
1927	154	103	54	292	108	144	92 9/
1928	153	96	61	286	108	150	96
1929	155	98	70	289	108	151	100
1930	158	90	77	291	112	159	103
1931	165	106	85	313	114	150	96
1932	139	105	96	212	119	133	103
1933	151	117	97	235	126	134	149
1934	133	136	113	140	131	126	148
1935	94	109	101	61	112	93	87
1936	115	120	107	131	105	103	96
1937	91	92	94	79	97	100	92
1938	91	85	97	95	93	91	94
1939	108	94	100	134	94	113	131
1940	118	112	115	136	96	121	214
1941	123	124	141	132	101	124	184
1942	145	142	159	177	106	148	169
1943	180	182	166	255	106	179	154
1944	171	216	152	185	106	191	80
1945	169	246	125	170	103	166	66
1946	169	258	97	174	93	166	48
1947	172	281	83	175	87	161	39
1948	163	280	69	154	79	157	21
1949	166	294	63	166	74	143	18
1950*	177	323	59	174	74	153	20
1951*	184	342	64	186	72	147	29

(Table A4 continued on next page.)

* Preliminary.

TABLE 44. (CONTINUED) INDEX OF BREEDING UNITS, SOUTH DAKOTA, 1925-51 (1935-39 = 100) 1/

Year	All Except Horses 2/	Beef Cattle 3/	Sheep 4/	Hogs 5/	Dairy Cows 6/	Chickens 7/	Turkeys 8/
1925-29	155	113	56	284	108	143	92
1930-34	149	111	94	238	121	141	120
1935-39	100	100	100	100	100	100	100
1940-44	148	155	147	177	103	153	160
1945-49	168	272	87	168	87	158	38

1/ Method: Average numbers of each group for 1935-39 divided into 1935-39 average production value to get weighting factor. Weighting factor then multiplied through each the other years to give the Breeding Unit Value, to give index based on 1935-39.

2/ Total of all meat animals and animal products.

3/ Beef cows and heifers 2 / on farms January 1. Source: "South Dakota Livestock, 1867-1952", South Dakota Crop and Livestock Reporting Service.

4/ Ewes 1 / on farms January 1. Production figure used based on sheep, lambs and wool. Source: "South Dakota Livestock, 1867-1952", South Dakota Crop and Livestock Reporting Service.

5/ Sows farrowed in spring of given year and fall of preceding year. Source: "South Dakota Livestock, 1867-1952", South Dakota Crop and Livestock Reporting Service.

6/ Milk cows and heifers 2 / on farms January 1. Production figures for dairy production and veal calves. Source: "South Dakota Livestock, 1867-1952", South Dakota Crop and Livestock Reporting Service.

7/ Hens and pullets on farms January 1. Sources: "South Dakota Poultry", South Dakota Crop and Livestock Reporting Service, November 1951 and "South Dakota Agriculture 1952", South Dakota Crop and Livestock Reporting Service. Production figures for chickens and eggs.

8/ Turkeys on farms January 1. Sources: "South Dakota Poultry", South Dakota Crop and Livestock Reporting Service, November 1951, and "South Dakota Agriculture 1952", South Dakota Crop and Livestock Reporting Service.

9/ Numbers on farms before 1929 not available. To keep index from being pulled down too much, number in 1929 divided into gross production (pounds) for 1929 to get an average weight produced (32.4 pounds) in 1929. This weight then divided into total production figures for each of the preceding years to get an approximate number on farms for the years 1925 through 1928. The resulting figures then treated in the same manner.

TABLE A5. INDEX OF PRODUCTION PER BREEDING UNIT, SOUTH DAKOTA, 1925-51, (1935-39 = 100) 1/

Year	All Except Horses	Beef Cattle	Sheep, Lambs, Wool	Hogs	Dairy Products and Veal	Chickens and Eggs	Turkeys
1925	95	105	96	87	103	96	54
1926	97	107	104	88	109	98	54
1927	97	108	98	88	116	97	53
1928	104	132	105	91	115	99	53
1929	104	127	107	91	123	102	53
1925-29	99	115	104	89	113	99	53
1930	109	149	99	101	119	101	50
1931	108	122	101	105	118	97	57
1932	100	123	95	89	105	95	84
1933	88	114	99	65	102	96	70
1934	74	66	88	63	92	78	42
1930-34	97	111	95	88	107	94	60
1935	89	84	95	92	88	101	67
1936	87	84	102	76	104	94	98
1937	96	98	80	103	96	88	86
1938	113	116	110	116	104	111	120
1939	115	124	112	114	110	107	119
1935-39	100	100	100	100	100	100	100
1940	108	112	114	110	111	93	77
1941	115	112	117	121	113	110	85
1942	114	110	111	120	110	125	70
1943	108	96	103	117	106	120	44
1944	99	85	91	110	107	107	68
1940-44	108	101	106	116	109	112	70
1945	102	79	104	122	105	125	89
1946	100	74	113	124	112	118	125
1947	97	68	114	121	113	126	110
1948	97	73	116	121	116	117	143
1949	102	71	110	127	141	134	233
1945-49	99	73	111	123	116	124	124
1950*	92	60	114	112	150	125	230
1951*	96	64	130	121	133	137	179

* Preliminary.

1/ Obtained by dividing index of breeding units into index of gross production for each unit.

TABLE A6. INDEXES OF PRODUCTION PER FARM, SOUTH DAKOTA, 5-YEAR PERIOD, (1939 = 100) 1/

Year	Index Number Farms	Index G F P	Index G F P Per Farm	Index F. O.	Index F. O. Per Farm	Index Farm Power	Index Farm Power Per Opr. 2/	Index Lvstk. Prod. Except Horses	Index Lvstk. Prod. Per Farm 3/	Index Crop Prod.	Index Crop Prod. Per Farm 4/
1929	115	158	137	153	133	182	158	130	113	178	155
1934	115	55	48	36	32	143	124	79	69	20	17
1939	100	100	100	100	100	100	100	100	100	100	100
1944	95	167	176	184	194	91	96	137	144	199	209
1949	92	148	161	156	170	56	61	136	147	152	165

1/ To be comparable with production per acre index below, census figures for 1930, 1935, 1940, etc., used for the preceding years on assumption that since all census figures are not as as of same date, and thus not strictly comparable - most farmers move about March 1. Thus actually six years between some census years and only four for others.

2/ Total price-quantity aggregate number on farms.

3/ Production-value figures for all livestock and livestock products except horses (not product added). Again on 1939 basis.

4/ All crops minus pasture for the State but refigured on 1939 base rather than 1935-39. Value used.

TABLE A7. INDEX OF PRODUCTION PER ACRE BY CROP GROUPS, SOUTH DAKOTA, 5-YEAR PERIODS, (1939 = 100)

Year	All Minus Pasture	Total Major Crops	Food	Feed	Oil	Hay
			Index of Acres			
1929	112	136	116	142	371	139
1934	103	71	5	112	40	56
1939	100	100	100	100	100	100
1944	106	128	104	131	190	150
1949	112	140	132	123	457	175
			Index of Production			
1929	178	189	173	200	234	155
1934	20	18	4	19	3	43
1939	100	100	100	100	100	100
1944	199	211	189	225	188	197
1949	152	163	164	154	336	168
			Index of Production Per Acre			
1929	160	139	149	141	63	112
1934	19	25	80	17	75	77
1939	100	100	100	100	100	100
1944	188	165	182	172	99	198
1949	136	116	124	125	74	96

APPENDIX B

INDEX NUMBERS OF AGRICULTURAL PRODUCTION FOR ECONOMIC AREAS IN SOUTH DAKOTA

TABLE B1. INDEX OF MAJOR CROP PRODUCTION FOR SOUTH DAKOTA AND THE ECONOMIC AREAS, 1925-51. (1935-39 = 100) 1/

Year	The State 2/	Area 1	Area 2a	Area 2b	Area 3a	Area 3b	Area 4a	Area 4b
1925	179	168	260	143	169	132	89	106
1926	123	173	157	114	96	137	78	105
1927	264	354	555	306	393	309	108	151
1928	195	305	349	193	177	214	87	159
1929	208	319	272	185	297	251	98	167
1925-29	194	264	319	188	227	209	92	138
1930	196	315	404	224	291	175	90	117
1931	78	99	157	118	58	40	49	55
1932	202	383	452	180	241	168	94	127
1933	54	99	39	19	29	54	17	90
1934	20	30	2	3	4	15	6	46
1930-34	110	185	211	109	124	90	51	87
1935	143	189	196	143	142	155	79	129
1936	31	26	8	15	29	51	175	40
1937	95	103	70	76	72	103	65	114
1938	120	100	92	137	158	131	82	112
1939	110	82	134	129	102	61	99	106
1935-39	100	100	100	100	100	100	100	100
1940	128	97	173	137	83	113	94	136
1941	150	195	215	189	155	114	92	123
1942	236	294	441	271	279	224	120	179
1943	180	215	290	204	128	148	113	161
1944	231	271	414	263	242	225	125	185
1940-44	185	215	307	213	177	165	109	157
1945	258	312	459	308	290	280	143	175
1946	246	370	489	245	300	274	117	164
1947	221	341	449	252	262	200	115	137
1948	273	375	482	273	341	291	147	197
1949	179	231	269	182	204	179	107	144
1945-49	235	326	430	252	280	245	126	164
1950*	204	251	349	217	241	240	108	147
1951*	242	359	525	298	303	228	119	135

* Preliminary.

1/ Includes wheat, rye, corn, oats, barley, all hay, and flaxseed.

2/ Includes only those crops listed for individual areas and is thus somewhat different than crop indexes presented in Appendix A.

TABLE B2. INDEX OF MAJOR CROP PRODUCTION AND PRODUCTION BY GROUPS OF CROPS FOR SOUTH DAKOTA, 1925-51 (1935-39 = 100) 1/

Year	Total Major Crops 2/	Food Grains 3/	Feed Grains 4/	Wild and Tame Hay	Flaxseed
1925	179	150	188	153	598
1926	123	65	145	118	348
1927	264	224	279	218	811
1928	195	177	209	136	490
1929	208	165	233	153	497
1925-29	194	156	211	155	549
1930	196	211	193	143	522
1931	78	86	70	93	84
1932	202	253	191	152	123
1933	54	24	64	72	18
1934	20	4	23	42	6
1930-34	110	116	108	100	150
1935	143	136	151	122	165
1936	31	23	27	65	21
1937	95	87	98	108	35
1938	120	158	107	106	61
1939	110	95	116	98	217
1935-39	100	100	100	100	100
1940	128	134	128	96	314
1941	150	179	139	114	359
1942	236	227	247	170	557
1943	180	150	186	150	748
1944	231	180	260	194	397
1940-44	185	174	192	145	475
1945	258	237	275	178	732
1946	246	249	261	149	544
1947	221	256	196	178	925
1948	273	242	283	187	1,232
1949	179	156	178	165	730
1945-49	235	228	238	171	832
1950*	204	166	214	184	716
1951*	242	277	212	244	725

* Preliminary

1/ Includes only crops included in Economic Area Indexes.

2/ Includes all wheat, rye, corn, oats, barley, tame and wild hay, and flaxseed.

3/ Includes all wheat and rye.

4/ Includes corn, oats, and barley.

TABLE B3. INDEX OF MAJOR CROP PRODUCTION AND PRODUCTION BY GROUPS OF CROPS FOR AREA 1, 1925-51, (1935-39 = 100)

Year	All Major Crops 1/	Food Grains 2/	Feed Grains 3/	All Hay	Flaxseed
1925	168	11	320	222	9400
1926	173	83	289	167	7140
1927	354	208	535	278	23990
1928	305	275	347	204	19030
1929	319	236	406	244	22100
1925-29	264	163	379	223	16330
1930	315	265	429	200	15870
1931	99	80	118	106	970
1932	383	403	516	218	2260
1933	99	73	110	130	100
1934	30	15	27	55	10
1930-34	185	170	240	142	3840
1935	189	191	227	149	360
1936	26	20	9	52	—
1937	103	107	103	100	40
1938	100	110	86	96	20
1939	82	73	75	103	60
1935-39	100	100	100	100	100
1940	97	92	92	111	160
1941	195	223	208	140	250
1942	294	309	340	218	1700
1943	215	221	218	191	2490
1944	271	251	289	281	940
1940-44	215	219	229	188	1110
1945	312	340	326	241	2650
1946	370	450	377	225	1910
1947	341	415	282	251	4970
1948	375	416	358	264	11080
1949	231	261	159	240	2370
1945-49	326	376	300	244	4600
1950*	251	251	246	241	2950
1951*	359	453	253	293	2860

* Preliminary.
1/ Includes all wheat, rye, corn, oats, barley, all hay, and flaxseed.
2/ Includes all wheat and rye.
3/ Includes corn, oats, and barley.

TABLE B4. INDEX OF MAJOR CROP PRODUCTION AND PRODUCTION BY GROUPS OF CROPS FOR AREA 2a, 1925-51 (1935-39 = 100)

Year	All Major Crops 1/	Food Grains 2/	Feed Grains 3/	All Hay	Flaxseed
1925	260	17	510	182	6836
1926	157	95	222	126	2450
1927	555	571	673	242	8286
1928	349	399	420	126	3536
1929	272	323	299	124	2577
1925-29	319	281	425	160	4736
1930	404	479	474	150	3373
1931	157	205	132	116	309
1932	452	613	477	184	391
1933	39	28	42	53	27
1934	2	-	1	8	0
1930-34	211	265	225	103	818
1935	196	208	233	127	455
1936	8	2	3	23	0
1937	70	56	50	118	13
1938	92	100	75	104	23
1939	134	133	141	127	13
1935-39	100	100	100	100	100
1940	173	235	160	100	86
1941	215	299	191	125	86
1942	441	487	582	188	827
1943	290	303	334	184	1959
1944	414	425	536	231	1136
1940-44	307	350	360	166	818
1945	459	515	561	212	2455
1946	489	587	578	188	2845
1947	449	579	415	234	4250
1948	482	559	518	240	5196
1949	269	342	221	190	2186
1945-49	430	517	459	213	3386
1950*	349	384	364	231	2936
1951*	525	694	451	318	3486

* Preliminary.
1/ Includes all wheat, rye, corn, oats, barley, all hay, and flaxseed.
2/ Includes all wheat and rye.
3/ Includes corn, oats, and barley.

TABLE B5. INDEX OF MAJOR CROP PRODUCTION AND PRODUCTION BY GROUPS OF CROPS FOR AREA 2h, 1925-51 (1935-39 = 100)

Year	All Major Crops 1/	Food Grains 2/	Feed Grains 3/	All Hay	Flaxseed
1925	143	8	293	134	569
1926	114	79	156	99	249
1927	306	295	358	180	487
1928	193	179	237	106	273
1929	185	154	247	111	262
1925-29	188	143	258	126	368
1930	224	211	267	121	402
1931	118	112	129	109	98
1932	180	174	218	113	90
1933	19	7	29	44	15
1934	3	0	1	20	2
1930-34	109	100	129	81	122
1935	143	130	173	95	185
1936	15	8	8	55	7
1937	76	72	63	128	39
1938	137	179	97	118	63
1939	129	110	161	103	205
1935-39	100	100	100	100	100
1940	137	144	137	94	271
1941	189	216	175	122	355
1942	271	233	349	144	599
1943	204	155	260	144	726
1944	263	205	369	146	401
1940-44	213	191	257	130	470
1945	308	268	394	144	845
1946	245	210	314	126	623
1947	252	243	261	149	1,044
1948	273	212	343	149	1,298
1949	182	155	192	141	938
1945-49	252	218	300	142	950
1950*	217	164	263	175	930
1951*	298	292	292	238	1,032

* Preliminary
1/ Includes all wheat, rye, corn, oats, barley, all hay, and flaxseed.
2/ Includes all wheat and rye.
3/ Includes corn, oats, and barley.

TABLE B6. INDEX OF MAJOR CROP PRODUCTION AND PRODUCTION BY GROUPS OF CROPS FOR AREA 3a, 1925-51 (1935-39 = 100)

Year	All Major Crops 1/	Food Grains 2/	Feed Grains 3/	All Hay	Flaxseed
1925	169	19	259	168	2300
1926	96	28	89	130	950
1927	393	166	574	261	3150
1928	177	126	218	143	2500
1929	297	196	404	160	3750
1925-29	227	107	309	172	2550
1930	291	233	358	189	3650
1931	58	49	53	86	50
1932	241	254	252	183	400
1933	29	12	35	40	0
1934	4	1	2	13	0
1930-34	124	110	140	102	800
1935	142	133	152	115	250
1936	29	23	19	67	0
1937	72	61	71	94	0
1938	158	184	149	136	100
1939	102	98	108	89	100
1935-39	100	100	100	100	100
1940	83	105	72	78	50
1941	155	171	164	99	100
1942	279	217	346	196	450
1943	128	126	153	60	650
1944	242	116	326	219	300
1940-44	177	147	212	130	300
1945	290	183	390	191	550
1946	300	216	408	139	650
1947	262	275	270	214	2100
1948	341	212	462	218	2050
1949	204	145	242	197	1050
1945-49	280	206	354	192	1250
1950*	241	148	249	227	1100
1951*	303	234	327	352	1150

* Preliminary.
1/ Includes all wheat, rye, corn, oats, barley, all hay, and flaxseed.
2/ Includes all wheat and rye.
3/ Includes corn, oats, and barley.

TABLE B7. INDEX OF MAJOR CROP PRODUCTION AND PRODUCTION BY GROUPS OF CROPS FOR AREA 3b, 1925-51 (1935-39 = 100)

Year	All Major Crops 1/	Food Grains 2/	Feed Grains 3/	All Hay	Flaxseed
1925	132	8	190	126	488
1926	137	34	186	125	413
1927	309	108	416	231	1113
1928	214	94	281	137	1088
1929	251	130	321	153	1888
1925-29	209	74	279	154	1000
1930	175	148	193	133	1350
1931	40	42	33	66	88
1932	168	151	184	120	238
1933	54	17	70	59	0
1934	15	1	16	42	0
1930-34	90	72	99	84	338
1935	155	133	169	133	288
1936	51	54	39	103	38
1937	103	99	104	98	13
1938	131	168	122	105	38
1939	61	46	68	62	113
1935-39	100	100	100	100	100
1940	113	104	121	84	375
1941	114	104	125	78	213
1942	224	130	280	146	488
1943	148	85	188	92	813
1944	225	63	313	148	413
1940-44	165	97	205	110	463
1945	280	116	379	139	1600
1946	274	104	382	99	800
1947	200	108	251	137	2238
1948	291	110	395	156	2775
1949	179	53	244	125	1550
1945-49	245	98	330	131	1788
1950*	240	73	330	157	1863
1951*	228	81	292	240	1413

* Preliminary.
1/ Includes all wheat, rye, corn, oats, barley, all hay, and flaxseed.
2/ Includes all wheat and rye.
3/ Includes corn, oats, and barley.

TABLE B8. INDEX OF MAJOR CROP PRODUCTION AND PRODUCTION BY GROUPS OF CROPS FOR AREA 4a, 1925-51 (1935-39 = 100)

Year	All Major Crops 1/	Food Grains 2/	Feed Grains 3/	All Hay	Flaxseed
1925	89	8	93	132	280
1926	78	69	73	80	207
1927	108	109	92	175	320
1928	87	86	82	102	164
1929	98	84	97	116	150
1925-29	92	71	87	121	224
1930	90	96	81	109	215
1931	49	54	44	90	50
1932	94	121	87	116	78
1933	17	15	14	54	15
1934	6	2	4	36	5
1930-34	51	58	46	81	73
1935	79	77	75	95	147
1936	175	24	225	73	20
1937	65	95	55	115	35
1938	82	189	58	108	63
1939	99	115	88	109	235
1935-39	100	100	100	100	100
1940	94	134	75	95	306
1941	92	118	73	116	341
1942	120	125	101	144	458
1943	113	86	94	147	586
1944	125	104	116	149	350
1940-44	109	113	92	130	408
1945	143	133	124	144	610
1946	117	118	100	130	476
1947	115	113	86	131	713
1948	147	118	117	144	934
1949	107	83	87	133	613
1945-49	126	113	103	136	666
1950*	108	88	89	141	544
1951*	119	114	93	207	551

* Preliminary.
1/ Includes all wheat, rye, corn, oats, barley, all hay, and flaxseed.
2/ Includes all wheat and rye,
3/ Includes corn, oats, and barley.

TABLE B9. INDEX OF MAJOR CROP PRODUCTION AND PRODUCTION BY GROUPS OF CROPS FOR AREA 4b, 1925-51 (1935-39 = 100)

Year	All Major Crops 1/	Food Grains 2/	Feed Grains 3/	All Hay	Flaxseed
1925	106	18	113	86	323
1926	105	22	113	90	238
1927	151	49	157	157	397
1928	159	54	171	109	283
1929	167	47	179	130	267
1925-29	138	38	147	114	302
1930	117	62	122	99	334
1931	55	29	56	64	119
1932	127	75	132	115	159
1933	90	31	96	81	34
1934	46	6	44	101	17
1930-34	87	41	90	92	133
1935	129	72	133	130	148
1936	40	47	34	95	51
1937	114	132	115	98	40
1938	112	161	109	94	63
1939	106	89	109	83	201
1935-39	100	100	100	100	100
1940	136	134	137	96	483
1941	123	71	127	96	533
1942	179	79	185	145	953
1943	161	53	163	129	1246
1944	185	33	199	159	453
1940-44	157	74	162	125	716
1945	175	56	183	150	657
1946	164	74	177	96	297
1947	137	93	138	112	770
1948	197	75	208	121	976
1949	144	45	153	113	536
1945-49	164	68	172	118	647
1950*	147	43	155	114	596
1951*	135	33	140	156	415

* Preliminary.
1/ Includes all wheat, rye, corn, oats, barley, all hay, and flaxseed.
2/ Includes all wheat and rye.
3/ Includes corn, oats, and barley.

TABLE B10. INDEX OF CROPLAND ACREAGE FOR SOUTH DAKOTA AND THE ECONOMIC AREAS, 5-YEAR PERIODS (1939 = 100) 1/

	Year	Major Crops	Food Grains	Feed Grains	Flaxseed	All Hay
State	1929	136	116	142	371	139
	1934	71	5	112	40	56
	1939	100	100	100	100	100
	1944	128	104	131	190	150
	1949	140	132	123	457	175
Area 1	1929	166	122	187	6225	159
	1934	60	14	108	200	52
	1939	100	100	100	100	100
	1944	150	134	119	275	196
	1949	176	177	103	1925	234
Area 2a	1929	155	159	174	5750	111
	1934	42	0	111	200	12
	1939	100	100	100	100	100
	1944	138	123	161	600	126
	1949	164	179	131	4850	167
Area 2b	1929	133	119	144	194	129
	1934	59	0	108	44	42
	1939	100	100	100	100	100
	1944	121	102	143	185	97
	1949	131	122	128	544	155
Area 3a	1929	152	104	159	900	179
	1934	71	1	111	0	27
	1939	100	100	100	100	100
	1944	139	118	135	100	169
	1949	150	131	135	400	211
Area 3b	1929	124	82	129	333	168
	1934	91	5	113	33	109
	1939	100	100	100	100	100
	1944	123	80	134	100	129
	1949	127	71	139	400	149
Area 4a	1929	120	72	134	147	129
	1934	80	8	115	34	74
	1939	100	100	100	100	100
	1944	103	62	123	18	120
	1949	122	75	116	357	130
Area 4b	1929	109	34	115	119	110
	1934	107	14	108	26	175
	1939	100	100	100	100	100
	1944	111	37	117	156	104
	1949	111	49	118	174	91

1/ Total cropland minus rotation or plowable pasture.

TABLE B11. INDEX OF MAJOR CROP PRODUCTION AND PRODUCTION BY GROUPS OF PRODUCTS FOR SOUTH DAKOTA AND THE ECONOMIC AREAS, 5-YEAR PERIODS (1939 = 100)

	Year	Major Crops 1/	Food Grains 2/	Feed Grains 3/	Flaxseed	All Hay
State	1929	189	173	200	234	155
	1934	18	4	19	3	43
	1939	100	100	100	100	100
	1944	211	189	225	188	197
	1949	163	164	154	336	168
Area 1	1929	390	325	544	36500	236
	1934	36	21	36	17	54
	1939	100	100	100	100	100
	1944	331	346	387	1566	272
	1949	283	359	213	3950	232
Area 2a	1929	204	242	212	18900	97
	1934	2	0	1	0	6
	1939	100	100	100	100	100
	1944	310	319	381	8333	181
	1949	202	257	158	16033	149
Area 2b	1929	143	139	156	128	107
	1934	2	0	1	1	20
	1939	100	100	100	100	100
	1944	203	186	232	196	142
	1949	140	141	121	457	137
Area 3a	1929	292	200	372	3750	180
	1934	4	0	2	0	14
	1939	100	100	100	100	100
	1944	238	118	300	300	247
	1949	201	148	223	1050	222
Area 3b	1929	410	282	475	1677	248
	1934	25	2	24	0	68
	1939	100	100	100	100	100
	1944	369	136	463	37	240
	1949	293	116	360	1378	204
Area 4a	1929	100	73	111	64	107
	1934	6	2	5	2	33
	1939	100	100	100	100	100
	1944	126	90	133	149	137
	1949	109	72	99	261	123
Area 4b	1929	157	53	165	133	157
	1934	43	6	121	9	122
	1939	100	100	100	100	100
	1944	175	37	183	225	191
	1949	136	51	140	267	112

1/ Includes all wheat, rye, corn, oats, barley, all hay, and flaxseed.
2/ Includes all wheat and rye.
3/ Includes corn, oats, and barley.

TABLE B12. INDEX OF PRODUCTION PER ACRE BY MAJOR CROPS AND GROUPS OF CROPS FOR SOUTH DAKOTA AND THE ECONOMIC AREAS, 5-YEAR PERIODS (1939 = 100)

	Year	Major Crops 1/	Food Grains 2/	Feed Grains 3/	Flaxseed	All Hay
State	1929	139	149	141	63	112
	1934	25	80	17	75	77
	1939	100	100	100	100	100
	1944	165	182	172	99	198
	1949	116	124	125	74	96
Area 1	1929	235	266	291	586	48
	1934	60	150	33	9	104
	1939	100	100	100	100	100
	1944	240	258	325	569	139
	1949	161	203	207	205	99
Area 2a	1929	132	152	122	329	87
	1934	5	0	1	0	50
	1939	100	100	100	100	100
	1944	225	259	237	1388	144
	1949	123	144	121	331	89
Area 2b	1929	108	117	108	66	83
	1934	34	0	1	3	48
	1939	100	100	100	100	100
	1944	167	182	162	106	146
	1949	107	116	95	84	88
Area 3a	1929	192	192	234	417	101
	1934	56	0	2	0	52
	1939	100	100	100	100	100
	1944	171	100	222	300	146
	1949	134	113	165	263	105
Area 3b	1929	331	344	368	504	148
	1934	27	40	21	0	72
	1939	100	100	100	100	100
	1944	300	170	346	37	186
	1949	230	163	259	345	137
Area 4a	1929	83	101	83	435	83
	1934	8	25	4	6	45
	1939	100	100	100	100	100
	1944	122	145	108	828	114
	1949	89	96	85	73	95
Area 4b	1929	144	156	143	112	143
	1934	40	43	112	35	70
	1939	100	100	100	100	100
	1944	158	100	156	144	184
	1949	123	104	119	153	123

1/ Includes all wheat, rye, corn, oats, barley, all hay, and flaxseed.
2/ Includes all wheat and rye.
3/ Includes corn, oats, and barley.

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