AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

THE CONTRACTILITY OF WHEAT ACREAGE IN THE UNITED STATES

INTRODUCTION

The Federal Farm Board has recently recommended to wheat growers the reduction of wheat acreage in the United States. This is urged in the commercial interest of the producer class. Students of the agricultural problem and commentators on the wheat market have on occasions taken the same position. The recommendation of the Federal Farm Board, however, carries weight of an official character, and comes in a period when the area of land planted to wheat has tended to increase.

Chairman Legge is quoted in the *United States Daily* of December 28, 1929, as follows:

> . . . . but it is reasonable to suppose that in time he [the farmer]may grasp the simple problem that if he can get more money for four bushels of wheat than he can get for five bushels, perhaps he will raise four bushels of wheat instead of raising five bushels, and that is a typical illustration of where we stand today.
>
> A 20 per cent reduction on an average of what he produces would make the tariff on grain effective, and give him a higher level of prices. I think it is conservative to say that 20 per cent less production would bring him 20 per cent more money than he is now getting for what he produces.

Vice-Chairman Stone is also quoted in the *United States Daily* of January 8, 1930, as follows:

> From the best information that I can obtain the wheat farmers of this country are producing about 20 per cent more wheat than is used in the domestic trade, which makes it necessary for the 20 per cent to be sold on the basis of the world's price, and it is my opinion that if farmers growing wheat would reduce acreage 20 per cent they would sell the production of the reduced acreage for more money than they are getting for the larger acreage and production.

Accepting the relation of 5 to 4 as having been purposely chosen, wheat growers will probably infer that what is in contemplation by the Farm Board corresponds to contraction of wheat acreage and production to the level of domestic requirements.

The policy of acreage reduction represents an attempt to put to practical application in agriculture a basic economic principle, the adjustment of supply to demand. Few doubt the principle, but many doubt or fear the application. Agriculture has been conducted largely on the assumption that supply could precede demand and count on the price. This is now to be reversed; demand is to precede supply and count on the price. The position of the Farm Board is in conformity with a recent statement of J. S. Lawrence:

> The unsatisfactory state of average farm income is due chiefly to the existence of uncontrolled surpluses in two dominant farm crops, wheat and cotton.[1]

CONTENTS

	PAGE
Introduction	151
The Eastern Soft Red Winter-Wheat Region	153
The Hard Winter-Wheat Region	159
The Hard Spring-Wheat Region	164
The Pacific States	169
Summary and Conclusions	171
Appendix	177

An official policy to contract wheat acreage in such a manner that production will tend to approximate domestic requirements at once brings forth large collateral problems. Contractions of wheat acreage and cotton acreage directly involve the planting of wheat and cotton and the acreages to be employed for supplementary and competing crops. Involved in the still larger sense is the utilization of the total land in farms for plant crops and animal husbandry. Nor are the relations and consequences of a policy of acreage restriction confined to agriculture. The national utility of gross exports of agricultural products, the relations of such exports to the exports of industrial goods, and the influence of volume of exports on the dimensions of the agricultural plant and the industrial plant respectively, are included. These broad relations have not yet been developed by the Farm Board and remain

[1] "Stabilization of Prices and the Farmer's Income," *The Annals*, March 1929, CXLII, 168.

for future examination and appraisal by proponents and opponents.

Acreage contraction applied to wheat alone, and considered solely from the standpoint of wheat growers, similarly provokes large questions. What is to be understood as the commercial interest of the producers? The statements quoted above are advance formulations of the proposition. The yardstick remains to be defined. Shall one employ the gross return on the wheat crop? Is the individual grower to set up gross returns and net returns per planted acre? Is the wheat grower to judge of the effect on wheat acreage by an estimate of net returns per farm, attempting to evaluate the wheat crop not merely as a cash crop but also as a large factor in the conduct of the farm and in the use of other land than that planted to wheat? Or are long-term considerations of land values and soil fertility to be applied? Obviously the appraisal of wheat acreage is quite different on the one-crop wheat farms in the West from what it is on farms east of the Missouri River, where wheat is raised in crop rotation in a more or less highly diversified agriculture. Doubtless no one is more keenly alive than the members of the Farm Board to the internal questions of farm management that are brought to the fore by a proposal to reduce wheat acreage. We may be sure that when the policy comes to be specifically applied to the several wheat regions, both proponents and opponents of the policy of contraction will bring before the agricultural public pertinent arguments drawn from farm management.

At the moment it seems to us important to appraise the present wheat acreage from the standpoint of the traditional and accustomed incentives which have brought the wheat acreage to its present position. The acreage planted to wheat was forced to an artificial maximum for the 1919 crop, by taking land from other crops, bringing in new wheat land, and by the inclusion also of poor land. Following decontrol of wheat in 1919–20, and the world-wide deflation of wheat and commodity prices, the wheat acreage of the country declined, reaching the lowest post-war level in 1924. After a period of uncertainty an upward trend in wheat acreage reappeared. We shall later point out that this may reasonably be ascribed in part to the widespread application of new devices for reduction of cost; but certainly other influences were also operative.

Farmers are strongly influenced by tradition as well as experience; even when they shift acreage in direct response to price, there is tradition in the decision. The incentives determining wheat acreage are several; there is not the same choice or compulsion from region to region or from farm to farm; and where the incentives are identical they are not always effective in the same proportion. On what basis of individual reasoning should the farmer relinquish his traditional and accustomed incentives except for newer incentives that carry the personal appeal? It is perhaps fair to say that for wheat growing as a whole the producer class has at present a more definite set of motives founded on accepted commercial incentives than at any time since the war. And looking backward over five years, one misses indications of powerful incentives, in the management of farms on which wheat is grown, that operate in the direction of contraction of wheat acreage.

In the course of its energetic organization of wheat growers' co-operative associations, the Farm Board recommends the policy of contraction. This runs counter to the current views which have determined the recent trend of expansion. Wheat growers in a more or less formal way will open their books, review their problems, and reappraise their management in the light of the new policy. To use the vernacular, the grower will try to see "where he gets on" and "how he gets off." The farmer will listen to the Federal Farm Board with respect; but he will also consult his county agent, representatives of the extension service, and possibly specialists in the state college of agriculture. The grower will ask himself whether his individual circumstances are such as to lead him to conform to the rule, or to make him an exception. For the most part, limited by his horizon, the wheat grower will be inclined to take the regional view, not the country-wide view. Still more, he will be inclined to take the local and personal view, based on the particular experiences from which his individual incentives have been drawn.

In what follows we undertake a general appraisal of the circumstances of wheat growing in the different wheat-producing regions, the circumstances determining wheat acreages, and the commercial incentives that have influenced wheat growers in fixing their individual wheat acreage. Such an appraisal is largely descriptive. Our objective is the delineation of the factual position of wheat growers and their reactions to acreage contraction springing from the traditional and accustomed incentives of the class, as exemplified in recent years.

We shall employ in a stated sense two terms, "submarginal" and "contractility." "Submarginal" we use to correspond to what in the Agricultural Marketing Act is termed "unprofitable marginal lands in cultivation." The concept of "submarginal" includes social attributes of growers, technical characteristics of methods, circumstances of soil, climate, and infestations, and considerations of quality of product; also it includes consideration of price level. The term "contractility" we use instead of "contractability," because it seems to carry a connotation of importance in the discussion. Contractility carries with it an implication of internal power. A muscle contracts while a tendon does not. What we seek to appraise is the relation and scope of incentives of wheat growers toward premeditated reduction of wheat acreage. The possibility and practicability of reduction of wheat acreage is not to be appraised wholly through static consideration of the relations of the lands lying within farms and employed for various purposes. If the wheat acreage of the country is to be reduced, this is to be done because wheat growers *will* to reduce it, choosing to do so in consideration of what they are brought to believe to be their interests. Because we seek to appraise the trend in wheat acreage from within the body of wheat growers, we employ the term "contractility" instead of "contractability." Our study does not include any consideration of the nature, extent, or utility of the surplus (or export) of wheat.

What we seek, in short, is an understanding of the accustomed practices in agriculture in their relations to wheat growing, and in addition an appraisal of the trends during the past two decades. A good deal of light is thrown on the prospects for future changes in wheat acreage by a study of trends in the past. Such a study, pursued in detail by regions essentially homogeneous in their climatic, topographical, and other important determining features, throws into relief the important static conditions and other influences affecting choice of crops in these regions and the characteristic reaction under these conditions to the changing economic situation. In such description as follows of the trends by regions, the situation in four different years, 1910, 1914, 1924, and 1929, is taken as the chief basis for judging these trends. The changes from 1910 to 1914 indicate the immediate pre-war trend. During the war period acreage changes in many cases were so irregular and violent that they cannot properly be described as showing a true trend; but the situation in 1914 represented a position of temporary equilibrium and so likewise did the situation in 1924; by 1924 the oscillations of the war and immediate post-war period had ceased, and it appears reasonable to accept the situation in that year as one of a temporary equilibrium, quite as stable as is ordinarily reached at any time. The 1924–29 changes reflect the most recent trend of acreages.

Three maps shown in the Appendix provide a convenient basis for studying the changes from period to period, subject to the limitation that some of the states, especially many of the west north central states and all the Pacific Coast states, are not agriculturally homogeneous and include areas showing sharply divergent trends. In these cases the reader will find it convenient to refer to "dot maps" published in the *Agriculture Yearbooks* for 1915, 1921, and 1928 and also in the paper on "The Wheat Situation" in the *Agriculture Yearbook, 1923*. The acreage data by states are given in the Appendix.

I. THE EASTERN SOFT RED WINTER-WHEAT REGION

The soft red winter-wheat belt in the United States lies for the most part east of a line drawn directly north and south between the southernmost extremity of Texas

and the northern extremity of the boundary between Minnesota and North Dakota. It does not include, however, the states of Minnesota and Wisconsin, where hard red spring wheat predominates. In Iowa hard red spring and hard red winter wheats (tending to be semi-hard) are grown, with little soft red winter wheat. Of the remaining states, some grow little wheat of any description — the New England states on the north, and Arkansas, Louisiana, Alabama, Mississippi, Georgia, and Florida on the south. Others like Michigan and New York grow soft white wheat as well as soft red winter wheat.

Little soft red winter wheat is grown west of the line mentioned above; the acreage is fairly heavy west of this line only in Washington, Texas, and Oklahoma. Not all of the territory lying east of the line produces soft red winter wheat to the exclusion of hard red winter. Thus the acreage of hard red winter wheat is prominent in eastern Nebraska, eastern Kansas, northwestern Missouri, southern Iowa, and central Illinois. The boundaries between the soft red-winter wheat and the hard red-winter regions overlap more or less in the states of Texas, Oklahoma, Kansas, and Missouri. Kansas and Oklahoma, however, are clearly to be classed as states in which hard red winter predominates; Missouri and Texas outside of the Panhandle, as states where soft red winter predominates. In subsequent pages, however, we treat both Oklahoma and Texas as lying within the hard red winter-wheat belt.

Trends in Crop Acreage

The soft red winter-wheat region is on the whole well adapted to hay, and, outside of the main corn belt, has much land suited best to pasture. These characteristics extend to Iowa, with the result that this state shows crop acreage changes similar to those in the soft winter-wheat area, and for present purposes is best included in that area, despite the preference for hard red winter wheat. The existence of much pasture land favors cattle raising and especially dairying. In the main corn belt,[1] however, the great productivity of corn throws the balance in favor of beef cattle and hogs, a combination that makes good use of the pasture and at the same time provides an outlet for the corn. When corn prices rise, acreage tends to go from small grains to corn; but when corn prices are low, there is a tendency for acreage to go to small grains. This difference exists because corn is the crop of premier choice.

In that portion of the soft winter-wheat area occupied by the central corn belt, wheat long ago ceased to be a crop of dominant importance, and changes in crop acreages since 1910 have been relatively small. The more important changes have occurred south and east of the main corn belt. The dominant influence back of these changes has been the expansion of dairying, partly at the expense of beef-cattle production and partly a net expansion in livestock; it has been most conspicuous in the market-milk areas tributary to large cities, but has spread generally throughout the region. An expansion of dairying may have varying results on crop acreages, depending on its character. Part of the milk comes from cows of beef-cattle strains. If dairy cows merely replace beef cattle, hay and corn acreage tend to be reduced, pasture acreage increased, and cash crops substituted in part. If dairying increases where beef cattle have not been raised, or with little displacement of beef cattle, both hay and pasture acreage tend to increase at the expense of acreage in other crops.

Between 1910 and 1914 the principal effect on crop acreage practically throughout the soft red winter-wheat area was in the direction of decline in hay acreage, hay land going into pasture. Over most of the area, the tendency has been for dairy cattle to replace beef cattle. In Ohio, however, where market-milk production was expanding rapidly without corresponding reduction in beef cattle, acreage of all the principal field crops declined, including wheat, while in Missouri there was some expansion of wheat acreage with decline in hay and corn acreage, probably reflecting a more rapid change from beef to dairy cattle than elsewhere.

Between 1914 and 1924 the expansion of

[1] That part of the main corn belt which lies within the soft red winter-wheat region includes practically all of Iowa; the northeastern corner of Kansas; the northern half of Missouri; Illinois and Indiana except the southern portions; and the western half of Ohio.

dairying continued south of the main corn belt, but more rapidly than beef-cattle production declined, with the consequence that hay acreage was everywhere increased and both corn and wheat acreage declined. In Missouri and southern Indiana and Illinois there was also a shift from wheat to oats, probably a consequence of the increased use of oats as a nurse crop with hay, while in east central Illinois (in the corn belt) wheat acreage partly replaced oats.

Between 1924 and 1929 the expansion of dairying south of the main corn belt continued, but less rapidly. The expansion of hay acreage and the decline of corn acreage was smaller except for another large decline in corn acreage in Missouri. Wheat acreage changed little except in Ohio, where it decreased 3 per cent.

In respect to current practices in wheat growing, the soft red winter-wheat region may be further subdivided into the Atlantic states, the main soft red winter-wheat region, and the southern red winter-wheat region.

The Atlantic States

In the long coastal belt extending from the Adirondacks to Florida, consisting largely of the eastern Appalachian watershed though including some western watershed, wheat has been grown more or less widely since colonial times. It is largely winter wheat; except for the companionship of corn, the wheat culture of this area resembles that of western Europe. The wheats grown in the Atlantic states shade all the way from white to red winter wheat, all being soft, and some almost as starchy as rice, most of them nondescript. That the soft winter wheats east of the Allegheny Mountains should be so much poorer than the soft winter wheats west of the Allegheny Mountains is probably due to the lesser importance of wheat as a cash crop in the Atlantic states. The varieties of winter wheat here grown are exceedingly numerous, running into the hundreds. To grow any variety pure is the exception rather than the rule; thus mixed wheats predominate. Wheat improvement has been neglected on most farms, if not in agricultural colleges and experiment stations, though since the war efforts have been made to push production of better milling varieties. As a class, the wheats of this region are substandard, according to current milling specifications; much of the crop is veritably of poultry-feed quality. Weeds, especially garlic, are widespread. Indeed, on many farms in these states wheat ought to be called a feed crop rather than a food crop. The straw is in most states important, and where dairying is intensively practiced the straw is sometimes regarded as almost as valuable as the grain. A considerable fraction of the wheat is fed on the farm, or sold to local poultrymen; and local mills, though declining in number and output, grind a considerable proportion of the crop. In the merchant mills the wheat is blended with harder western wheats to make a stronger flour. Milled straight, the average winter wheat of this region will not produce a bread flour meeting the specifications of large-scale American bakeries, though it does meet the requirements of small bakeries making bread for the immigrant populations in the cities. Also, it is employed in the rye-flour blend used in the making of the cheaper grade of rye bread. A fair grade of self-rising flour and a substandard grade of pastry flour are made. The flour of the region meeting modern specifications of bakers and householders is either imported from the West or is ground from blends of wheat in which western wheats predominate. The largest group of mills in this region, those at Buffalo, operate largely on wheats drawn from westward. Proceeding southward, the mills use more and more local wheat proportionately. The wheat of New York (mostly white) tends to flow not to Buffalo but eastward; that of Pennsylvania goes to local mills; that of Maryland tends to flow southward. In some years amounts surprising, in view of the general deficiency of the region, pass to export, favored by contiguity to ports.

Over this extended region, wheat growing is fixed quite rigidly in schemes of rotation which vary from state to state and within a state from county to county. Wheat is rotated with spring-sown grains—rye, oats, barley, and corn—and with hay. Legumes are sometimes used in rotation. In some localities wheat is planted two years in six, in others two years in five, and

in some places two years in four. Quite generally over the region, wheat growing is supported with the use of chemical fertilizers: under such management, the yield per bushel is well above the average. The scheme of rotation depends to a considerable extent upon the type of animal husbandry employed—whether predominantly of sheep, hogs, or cattle or combinations of them—and especially upon the extent and specialization of dairying. In addition to considerations of cash income, the superior farmer strives to improve the fertility of his soil, the average farmer endeavors to maintain it, while the poor farmer tries merely to get along. Considerable wheat growing in the region deserves the name submarginal.

As stated, this region exports low-grade wheat, replacing it with superior wheat from the West. Some straight flour passes to export. If the crop in the Atlantic states were large, this need not result in an increase in export but might instead effectuate a reduction of shipments from the West. If the crop in the Atlantic states were short, this need not mean that less wheat and flour from the area went overseas but instead would enforce larger shipments from the West. A reduction of the acreage, howsoever secured, would, therefore, tend to have not a direct but only an indirect effect upon the exportable surplus of the United States: the less wheat raised in the Atlantic states, the larger the volume of wheat to be brought in from the West and in consequence the smaller the surplus of wheat to the west of the Alleghenies available for export.

Considered from the internal standpoint of farm management, there is some leeway in wheat acreage. The total acreage planted to wheat in the states of New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, and the Carolinas has since 1922 varied from 3.23 million acres in 1925 to 4.26 million in 1922.

Considered merely from the standpoint of self-interest, the farmer here has increased his wheat acreage within the leeway regarded as optional in his scheme of rotation whenever the (to him) prospective price of wheat seemed to offer an increase in cash income or the prices of the alternative crops appeared unfavorable. He has been less inclined to reduce the acreage of wheat when the (to him) prospective price of wheat suggested a reduction of cash income, unless the prospects for the other crops appeared unusually favorable. In the Atlantic states, quite probably the accustomed incentives to increase wheat acreage, within the optional limits of the scheme of rotation, would about as often prove effective as those tending to restrict the acreage. If wheat acreage were reduced, the land would probably go into grass. Increase of yield might be secured by added application of fertilizer; but reduction of yield would hardly be made acceptable by restriction of application of fertilizer. To the extent, however, that application of fertilizer were conditioned on credit facilities, hard times on the farm might invoke a saving in fertilizer and a consequent reduction in the crop.

In the Atlantic region the trend in crop acreage since 1910 was on the whole slightly away from wheat and toward hay and pasture, in furtherance of a general expansion of dairying. But the changes have not been striking, and the historical evidence is not conclusive. In any event, expansion or contraction of wheat acreage would almost inevitably proceed slowly, and would be of little significance to the wheat situation for the country as a whole. The Atlantic states, on the average for the years 1924–29, contained only 5.9 per cent of the total wheat area of the United States.

The Southern Soft Wheat Region

The southern soft red winter-wheat area includes Kentucky, Tennessee, Arkansas, Alabama, and Mississippi, of which only the first two are of any importance.

Wheat is grown in these two states largely for local use, and considerable of it is ground in customs mills. The merchant mills make a soft flour for household and pastry shops, prepare a considerable amount of self-rising flour, and, with the admixture of hard winter wheat brought in from the West, make a stronger bread flour for bakers. To some extent, high-grade pastry flour is exported from this region to the cities of the North and East. The place of wheat growing in the agriculture of Tennessee and Kentucky is quite

similar to the situation in Virginia and North Carolina; wheat is planted in rotation, requires fertilizer, is a cash crop of importance, and represents a subsistence crop for the region. Relatively little is to be classed as submarginal. Practically none of the wheat of these states passes to export; if less wheat were raised in the region, more would need to be brought in from the North and West. This would indirectly reduce the exportable surplus of the country as a whole, but it would increase the price of flour in the region.

Animal husbandry is in a period of transition in the South. The natural utility of grassland, which is of high quality in many southern states, has been reduced by the quarantine against cattle tick; an effective reorganization of cattle husbandry in the South can only become completed after the tick is exterminated. The South has a low intake of dairy products and the nutrition of the poorer classes has suffered in consequence. Small cotton growers ought to diversify their operations in order to secure a more effective subsistence, nutritionally and economically. Only a very large expansion in dairy cows would have an effect on the national situation, since local consumption could be greatly expanded. These considerations bear to some extent on the wheat acreage of Kentucky and Tennessee, but they bear far more on the cotton acreage of the southeastern states. Of all the states in the southern central region, only Kentucky and Tennessee raise wheat of any consequence and, by reason of distance from other regions whence import supplies would be drawn, the wheat prices incline to be good enough to be regarded as relatively remunerative. Since 1922, the acreage sown to wheat in these two states had varied from 654 thousand acres in 1924 and 1925 to 1,162 thousand in 1922. There is accordingly some leeway for expansion or contraction. Over the past two decades, the wheat acreage has tended on the whole to decline, being replaced largely by hay and pasture, and some further reduction is not impossible. As in the Atlantic states, however, even a drastic reduction would have little effect upon the general situation; for the five states of the southern soft red winter-wheat area contained in 1924–29 only 1.3 per cent of the total area sown to wheat in the United States.

The Main Soft Winter-Wheat Region

The main soft wheat region comprises Ohio, Indiana, Michigan, Illinois, and Missouri, with a small adjacent portion of Kansas; a tongue extends toward the southwest into eastern Oklahoma and Texas. With the adjacent parts of Iowa, Wisconsin, Minnesota, South Dakota, Nebraska, and Kansas, this is the corn and hog belt. The other small grains more or less freely grown throughout the region are oats, rye, and barley.

With certain climatic restrictions and regional variations, diversified agriculture in all of these states of the north central region tends to conform to a common type. The agriculture of eastern Ohio resembles that of western Pennsylvania; that of western Iowa resembles the agriculture of eastern Nebraska. In other words, traversing this region westward, one observes the gradual transition from farming of the type of the Atlantic states to that of the Great Plains, the agriculture of Ohio being 50 years older than that of Iowa. Sheep husbandry is highly developed in Ohio, there is sugar beet culture in Michigan, dairying is unusually well developed in Wisconsin, and there is an advanced horticulture in southern Illinois. But otherwise the diversified agriculture of the area consists in the rotation of small grains, corn, hay, legumes, and fodder crops. In some sections wheat does well and is highly esteemed and the tendency is to plant wheat one year in three, or two in five, in the scheme of rotation. In other sections, wheat is less highly esteemed and is planted, if at all, one year in four or in five. Corn is a prominent cash crop, especially in Indiana, Illinois, and Iowa. Rye and barley are specialties, of a sort, in Wisconsin. In all the states, animals and milk constitute prominent cash crops. The number of joint products of large importance as cash crops is so numerous as to introduce considerable flexibility in the scheme of rotation. But the usual rule, or at least the preferred practice, is a rotation of a grain, a grass or legume crop, and a cultivated crop.

Under appropriate incentives the farm-

ers in the five states of the main soft winter-wheat region have felt themselves in position to expand or contract wheat acreage to a considerable extent. Since 1922, the wheat acreage in Ohio, Illinois, Indiana, Missouri, and Michigan has varied from 8.54 million acres in 1926 to 12.47 million in 1923, a difference of 3.93 million acres. These states contained 15 per cent of the total United States wheat acreage in 1924–29, and are therefore far more important than the Atlantic or the southern states. When conditions have been especially favorable at the time of seeding, the acreage here planted to wheat has tended to rise irrespective of price; when conditions at the time of seeding were unfavorable, the acreage has tended to decline irrespective of price. Poor crops of corn, oats, and barley tended to increase the acreage subsequently planted to winter wheat if conditions at seeding time were favorable. If prices of hogs and cattle were low, or the count of these animals reduced, farmers have tended to plant less corn, which has tended to increase the wheat acreage; conversely, attractive prices for hogs and cattle have tended to stimulate the planting of corn, which has tended to restrain the acreage of small grains, including wheat. Reduction in the count of animals and the low price of oats has tended indirectly to increase the wheat acreage, despite the fact that oats are spring sown and the wheat is fall sown. When condition and climate are favorable, the stand of wheat is cropped as a green feed; after harvest, the stubble is pastured. The factors that have influenced the wheat acreage positively or negatively, actively or passively, are, therefore, numerous. Also they vary from season to season, from state to state, and even from county to county. Farmers who operated on the long view reacted somewhat differently from farmers who operated on the short view; the former type has been prominent in this region. There is, however, considerable wheat growing to be termed sub-marginal.

The soft winter wheats of this area are much superior to those of the Atlantic states. Improved varieties have been introduced, mixed varieties are less in evidence; some are quite hard. But for climatic reasons, a wide range exists in the qualities of soft winter wheats and a large part of the crop is often substandard. This leads to premiums for quality, and since the war the wheat prices in this region have been frequently characterized by surprisingly high premiums for high-grade milling wheats of the soft winter type. The best of these wheats are employed to make pastry flour for the home and bakeshop, and cracker flour for the manufacturer. With selected soft winter wheats, a fairly satisfactory grade of all-purpose flour for the home is manufactured. As a bread flour for city bakers, however, the wheat is too soft, a defect readily remedied by appropriate addition of hard spring or hard winter wheat. Both low-grade and high-grade self-rising flours are being made in increasing quantities, some of which goes to the South. A small part of the crop is ground in customs mills.

In some years considerable wheat from this area is exported to Europe; likewise flour (ground in the area or in New York), which goes also to the West Indies and South America. The exports of wheat represent largely the culls of the crop; they are soft, of low protein content, with a low yield of flour. They are quite similar to the winter wheat of Europe in type, but not ranking with the better fraction of the European crop. In the European milling program the export soft red American wheat occupies the position of a filler. The high-grade soft red winter wheats are needed at home, and, particularly in years when premium is paid for quality, the prices stand far above the export basis and none of such wheat goes abroad.

Since in this region conditions are fairly mobile and numerous alternatives in diversification are readily available, there is considerable leeway for shifting of crops. In these circumstances the relative stability of acreage of the principal competing crops in these states, as shown by the maps in the Appendix, is noteworthy. Some expansion in sheep husbandry is in evidence over the region and there has been steady increase in dairying.

As we have seen,[1] the changes in crop areas since 1910 were relatively unimportant in the main soft red winter-wheat belt,

[1] See above, pp. 154–55.

where corn is the dominant crop. On the whole, wheat lost ground between 1914 and 1924, especially in Indiana and Missouri; and between 1924 and 1929, it tended about to maintain its position, except for some loss in Ohio. The acreage changes thus suggest a slight downward tendency in wheat cultivation, but not a marked one. Such evidence on trend as the figures on acreage may provide is, however, obscured by a new factor, the advent of the corn borer. This factor also has a direct bearing on the prospects for changes in wheat acreage in other wheat-producing regions, and consideration of it is deferred to a later page.[1]

II. THE HARD WINTER-WHEAT REGION

Most of the hard winter wheat grown in the United States is produced in Nebraska, Kansas, Oklahoma, Texas, and Colorado. Other states such as Iowa, Missouri, and Illinois produce appreciable quantities; and this type is found in small quantity in almost every state where wheat is grown. The main belt may be said to include the southern half of Nebraska, eastern (particularly northeastern) Colorado, all of Kansas except some of the southwestern and the eastern counties, the western half of Oklahoma, the Panhandle of Texas, and the northeastern corner of New Mexico. In some respects the hard winter-wheat area represents the crux of the American wheat problem during the next decade. The six states which we treat as the main hard winter-wheat belt contained, on the average of 1924–29, some 38.8 per cent of the total wheat acreage of the United States; this area is thus the most important wheat-producing region.

Historical Development and Current Practices

The original development of winter-wheat culture in the Southwest was in southeastern Nebraska and the eastern part of Kansas. Winter wheat from southern Russia was introduced into Kansas and became a commercial crop some fifty years ago. From the so-called "Turkey" wheat, new varieties have been developed, supposedly better suited to American conditions, of which Kanred is perhaps the best illustration. A recent new variety called Blackhull possesses cultural advantages but milling disadvantages. In the beginning, millers outside of Kansas were loath to recognize the qualities of Turkey wheat. Gradually, however, hard winter wheat made its way into milling circles, as the mills learned how to handle it; today, representative hard winter-wheat flour is a standard high-grade flour for household and bakery use. Also, in the East hard winter wheat is widely used in milling blends to strengthen soft red winter wheat. The best wheats now come from new lands in Kansas, Oklahoma, and Texas.

Southwestern hard winter wheat is rich in protein, but on the average not so rich as Marquis wheat grown in the newer parts of the hard spring-wheat belt; the hardness, or protein content, varies in each variety from year to year. But on the average, hard spring wheat tends to contain more protein than hard winter wheat; hard spring-wheat flour consequently tends to be richer in protein and somewhat stronger than hard winter-wheat flour. If both wheats are otherwise of representative quality, the difference in protein implies a varying commercial superiority in favor of hard spring wheat. This superiority, however, is not obtained by the mills for nothing, since on account of the differences in the crops of the two varieties, premiums for proteins are more frequent and higher in the case of hard spring wheat than in the case of hard winter wheat. Premium prices for hard wheat represent quality: to some extent premiums also represent relative shortage.

In the original hard winter-wheat area, wheat was for a time the principal crop. Gradually, however, diversified agriculture was developed, aided by the millfeed made available to farmers by the operations of the southwestern mills. Corn was found to be adaptable to the soil and climate over a wide area; especially in the northern reaches of the belt; and sorghum grains were introduced and are now widely employed as fodder crops, especially in the

[1] See below, pp. 171–72.

southern reaches. Ensilage, made of corn or sorghum plants, has become a widely popular feeding stuff. Oats, barley, and rye have been much less important than in the states to the north and the east. Finally, the introduction of alfalfa was an accomplishment of outstanding importance. The cumulative result has been, not the contraction of wheat growing in the original winter-wheat area, but the development of diversified farming with wheat as the outstanding cash crop. The raising of cattle and hogs now compares favorably with that in the main corn belt, sheep are coming more and more into use on farms, and dairying is being intensively developed. Considering the area as a whole, these various agricultural activities have been in addition to, rather than in substitution for, wheat growing.

Trends in Crop Acreages

In the hard winter-wheat area, as in the soft winter-wheat area, conditions differ markedly in that portion lying within the main corn belt from conditions outside. The portion of the hard winter-wheat area lying within the corn belt comprises roughly the southern half of Nebraska, except the extreme western counties, and most of the northern tier of counties of Kansas. In this part of the corn belt as elsewhere, corn is the preferred crop, and a small grain is combined with it because of advantages of rotation and diversification. Winter wheat is chosen here rather than oats, the dominant small grain elsewhere in the belt, because it withstands better the hot dry summers and, perhaps more important, because, the climate being unsuited to tame grass for hay, there is not the necessity prevailing elsewhere in the belt for growing a small grain which will serve also as a nurse crop for hay.

In this portion of the hard winter-wheat area there occurred between 1910 and 1914 some contraction in corn and oat acreage, a small expansion in hay acreage, and a large expansion in wheat acreage. So far as these changes represent shifts from corn and oats to wheat, they may be attributed largely to the decline during this period in the supply of feeder cattle available from the western ranges. The expansion in wheat acreage was in part also a reflection of the breaking up of new land.

Between 1914 and 1924 the changes reflect general extension of the crop area and expansion of livestock production and feeding, hog production expanding more, apparently, than cattle production. Despite the breaking up of new land in the western portion of the area, wheat acreage declined substantially while corn acreage expanded. There was also some expansion in acreage in oats, rye, and barley. The expansion of barley acreage, chiefly in the extreme western portion of the area, is notable as reflecting the choice of a small grain for feed in the region where light rainfall renders the corn crop uncertain.

In the period 1924–29 expansion of livestock raising continued, reflected in the increase in corn acreage and the sharp increase in barley acreage in the dry western portion of the area. At the same time there was also a substantial expansion of wheat acreage with the breaking up of new land.

In central and western Kansas, south of the northern tier of counties and extending southward through Oklahoma and into Texas and northeast to the southwest corner of Nebraska and the southeast corner of Wyoming lies an irregular area in which one-crop farming still prevails as in no other large area of the United States, except the wheat areas of Washington and Oregon and a few newer western portions of the spring-wheat area. The eastern portion of the area is rather dry and the rainfall becomes progressively lighter toward the west. Some corn is raised, and, in the drier portions, a considerable amount of sorghums for grain and ensilage. These, with alfalfa raised for hay, provide the feed for a moderate number of beef and dairy cattle and horses raised on most farms. These cattle make use also of the grass on the dry pasture land of the region. Hog raising is relatively unimportant. The dominant cash crop is wheat.

In 1910 corn was quite as important a crop as wheat in much of this region, but between 1910 and 1914 the corn acreage was sharply reduced, giving way to wheat. In Kansas and Oklahoma corn acreage reached its lowest level in 1919, but in Texas the acreage was still lower in 1924. Corn acreage in Kansas in 1924 had risen

to slightly above the 1914 level, but in Oklahoma the increase between 1919 and 1924 was slight. The only other important acreage changes in this region involved wheat and other small grains.[1] In each of the periods, 1910–14, 1914–24, and 1924–29, wheat acreage showed large increases in the main hard winter-wheat region south of the corn belt. Between 1910 and 1914 the increase was almost entirely at the expense of corn. Little new land was broken up for wheat, but there was a strong trend toward more specialized wheat production and decline in corn and hog production. In Oklahoma and Texas the acreage of other small grains increased with wheat, at the expense of corn. In 1924 crop acreages in Kansas stood about at the positions reached in 1914, except for the expansion of wheat on new lands, which developed as a strong tendency in this period. Between 1924 and 1929 there was also little change except for the continued westward expansion of wheat acreage on new land. In eastern and central Kansas, apparently a stable crop adjustment had been reached by 1914. In the agriculturally newer region farther south, however, wheat continued to gain at the expense of corn until 1919 or later, and other small grains, chiefly oats, shared in the encroachment on corn. The trend toward specialization in small grains, chiefly wheat, and the decline in corn and hog production continued longer and went farther than in Kansas. Much new land was put into wheat, but this was a less important factor in the expansion of wheat acreage here than in Kansas. By 1924, Texas and Oklahoma appear to have reduced corn acreage in the winter-wheat area approximately to the economical minimum, as had Kansas by about 1914, and little further change has occurred. The subsequent increase in winter-wheat acreage has come as in Kansas since 1914, chiefly from the breaking up of new land and, in Oklahoma between 1924 and 1929, also by the substitution of wheat for oats.

[1] In Texas hay acreage increased sharply between 1914 and 1924, but chiefly outside the winter-wheat area. Much of the change in corn acreage in Texas was also outside the winter-wheat area. It is probable also that there was a considerable increase in acreage in sorghum grains in the main winter-wheat area between 1910 and 1924. Changes in the character of the data on sorghum grain acreage, however, render it difficult to determine the facts with confidence.

West of the original hard winter-wheat belt lie the vast stretches of the Great Plains that were once devoted to grazing. The earlier attempts to raise wheat on these prairies with limited rainfall took the form of so-called "dry farming." The early attempts at dry farming were for the most part a practical failure; but they were an educational success. Upon the experiences of dry farming, in relation to handling of the soil in conservation of moisture, rests the successful power farming of the Great Plains. It is now clear that in the region between 98 and 104 degrees of longitude and 33 and 43 degrees of latitude are large tracts, not continuous but more or less scattered, adapted to the raising of wheat under power farming. The possibilities in Montana and New Mexico are less well known, though obviously considerable. In this area (to some extent adapted also to the sugar beet) there is little diversified farming and still considerable grazing.

In the older parts of the hard winter-wheat belt, most farmers have grown wheat in a fairly fixed scheme of rotation; the best farmers grew wheat not oftener than once in three years but many farmers planted it every other year. Probably the best rotation is over three years: wheat, then a cultivated crop, and then a grass, legume, or sod crop. Wheat has been in most counties the outstanding cash crop; the importance of the wheat crop is made evident by the fact that Kansas is the leading wheat state in the Union. Kansas used to ship work animals and hay to the cotton states, which interstate trade has declined in recent years and this has tended to increase the acreage planted in wheat. In every season in this belt the seeding of wheat is modified by condition of the soil, moisture, and in a minor way by the position of the Hessian fly. The wheat is by no means all high grade but the average is of much higher quality than in the soft winter-wheat region.

In the western belt of the Great Plains region, the growing of wheat is now in an era of expansion due to relatively cheap land, large-scale machinery, selected varieties, and improved methods of wheat culture. Expansion has been particularly prominent in western Kansas, Oklahoma, and the Panhandle of Texas. This is for the

most part large-scale, one-crop wheat growing. Up to the present, rotation with other crops is not conspicuous and diversified agriculture not much in evidence. The new type of wheat farming is essentially a tractor operation and on many of these farms no work animals are to be found. The soil is prepared and seeded with tractor power. The wheat is harvested and threshed in one operation with the combine, and the stubble is plowed or disked for the next seeding as soon as possible after the harvest. Under favorable circumstances, the labor cost per acre is relatively low, far below the costs with other methods in the older portions of the winter-wheat belt.

Increasingly, the use of the combine represents a highly efficient operation. Unfavorable circumstances exist, in some years and regions more than in others; but these are being gradually surmounted. There is a diurnal variation in the water content of wheat ready for harvest; therefore the cutting should not begin too early in the day; also the dew must receive consideration. If the stand is weedy, the green weeds and weed seeds increase the moisture of the wheat and render it prone to heating. It is now being recognized as advantageous to clean the wheat at the time of harvest and to store it in self-ventilating bins. Under some circumstances it is not advisable to combine cutting with threshing; in such cases, a windrow attachment is used on the harvester and after one or several days the windrowed wheat that has dried out is picked up and threshed. With the use of windrowing, cleaning, and self-ventilating storage, the advantages of combine harvesting become available to winter wheat under practically all circumstances, though naturally at some increase in cost over the operation under the most favorable conditions. When the field can be plowed directly after the harvest, this constitutes an excellent method of controlling weeds and conserving soil moisture.

Infestation with weeds, though everywhere a problem, is less serious in the hard winter-wheat region than in the hard spring-wheat region.[1] In the older sections, under systematic rotation of a small grain crop with a cultivated crop like corn and a grass or hay crop, weeds are held in check. To the extent that they persist, however, they complicate harvesting with the combine, because for the most part in this region the weeds do not mature before the wheat, so that green weed seeds are mixed with the wheat and weed juice raises the moisture content of the wheat. In the newer parts of the hard winter-wheat area, weeds can be held in check by early plowing, that is, directly after the harvest. Also, where fallowing is used, this has the same effect. Taking the crop as a whole, dockage is a much less deleterious factor with hard winter wheat than with hard spring wheat.

The wheat raised in the newer areas is hard, high-grade, fairly high protein winter wheat, representative of the Russian variety. The yields are not so large, on the whole, as in older parts of the winter-wheat belt. The costs are low: firstly, because the investment in land is low; and secondly, because the expenses per acre are low. Few hands are required; the machines are highly efficient and cover the ground rapidly. At present, country storage facilities are inadequate, but this is only a temporary condition.

Outlook for Acreage Changes

Since the wheat acreage lying within the hard red winter-wheat belt constitutes so large a proportion of the total United States wheat acreage, the prospects for expansion or contraction in this region are of outstanding importance. That the leeway is considerable is evidenced by the fact that the area sown in the six states of the hard winter-wheat area has ranged, since 1922, from 20.9 to 26.6 million acres, a difference of 5.8 million acres.

In two somewhat overlapping portions of the hard winter-wheat belt—the older portion, including southeastern Nebraska and most of eastern Kansas, and that portion of the belt lying within the main corn belt—the traditional and accustomed incentives are apparently not in the direction of notable expansion of wheat acreage; but neither are they in the direction of sharp contraction. In the area lying within the corn belt, some additional new land will probably be broken up and put into

[1] See below, p. 166.

wheat; but the raising of corn and barley for feeding to hogs and cattle will presumably continue the dominant farm enterprise and may be expected to extend to the outlying areas where new land is broken up and at first put chiefly into wheat. Hence no large further expansion of wheat cultivation seems likely here. On the other hand, wheat cultivation can hardly be expected, on internal grounds, to decline much; for wheat is likely to remain in this area the best small grain for combination with corn.

Much has been said in support of contraction of wheat acreage in the older part of the hard winter-wheat belt. The wheats of this section have been declining in quality and since it is for the most part the substandard hard winter wheats that go to export, the average quality of exported hard winter wheat since the war has been substantially lower than that ground in American mills. Since export wheats are mixed just to make the federal grade, during recent years No. 2 Hard Winter wheat has stood in poor esteem (price considered) in western Europe, compared with the wheats of Canada and Argentina. To the extent that one considers contraction of wheat acreage indicated wherever the wheats are substandard, wheat acreage in the older parts of the hard winter-wheat belt ought to be contracted. In this section the practicabilities and difficulties of contraction are probably not far different from those noted for the main soft red winter-wheat region. Whatever contraction — if any—may be anticipated in the older parts of the hard winter-wheat region, it seems quite likely that this will be overbalanced by the expansion that has been anticipated to occur in the newer areas now under development.

In the newer portions of the hard winter-wheat belt, lying to the south and west of the older region and the region lying within the main corn belt, there has beeen a striking increase in wheat acreage in recent years. One may reasonably expect further expansion, though probably not at so rapid a rate, because further substantial replacement of other crops by wheat seems hardly in prospect. The increase in acreage during recent years has been largely due to lower costs of production; and with continuation of lowering of costs, contraction of acreage becomes more difficult in prospect of increasing profits. Also, there is no evident tendency toward replacement of wheat by other crops.

Dominantly one-crop farming appears in this region to be a stable and relatively profitable type of agriculture. There can be no question that this type of wheat growing is expanding; the only question is how rapidly the expansion will proceed and how many acres are open to this type of agriculture. At present, some of the districts are inadequately served by railroads and the highways are not as yet developed for trucking wheat out. So far as we are aware, no one has carefully surveyed the Great Plains region involved, county by county, to determine the area already taken up, the land fitted to the operation but not yet taken up, and the distance of new land from railways. To whatever extent the possibilities may be exaggerated, they are impressively extensive when realistically appraised. In a recent publication of H. R. Tolley and C. L. Holmes of the Bureau of Agricultural Economics of the United States Department of Agriculture the prospective large-unit farming and its import for future wheat growing have been discerningly examined. There is no clear prospect of checking this development; nor does the region recognize any purpose in doing so. This area produces a high-grade wheat, adapted to the making of superior flour conforming to modern bakery specifications. It can be produced profitably at the average prices since the war, represents perhaps the last widespread agricultural effort worthy to be called a pioneer development, proceeds on the initiative of men who are frontier-minded, and is supported by banks and implement manufacturers who have faith in the continuing improvement of power farming. It seems destined to continue to expand as a promising commercial venture, irrespective of considerations advanced from outside the locality. To a pronounced extent, the farmers are "wheat-minded."

It is objected that this is another form of extensive and extractive exploitation, a "mining of the land," which will lead to deterioration of fertility and erosion of the soil. This may be true; but such farming

will last for a generation and possibly much longer and during this time it promises to be operatively remunerative to an extent substantially exceeding that customary in agriculture in the older areas of the Mississippi Valley. The exhaustion of the soil may be minimized by fallowing, as is done with the spring-wheat crop in Canada, also by pasturing animals on the stubble and after plowing. It is the hope of men engaged in the development of this wheat culture that some grass may be found adaptable to the soil and climate, which may be employed as a rotation crop. These possibilities remain to be explored in the future; for the present, the current returns are large enough to make continuing expansion commercially attractive.

Therefore, when we regard the hard winter-wheat belt as a unit, some expansion is clearly under way, marked in the newer areas, and not offset by contraction in the older. Such expansion is considered sound, on technical grounds, from the regional standpoint; it is questionable, if at all, only from the extra-regional standpoint of the exaggeration of the national surplus. There is no accustomed incentive for wheat growers in this belt to contract their planting of wheat and expand their operations in other directions except through necessarily slow processes of crop diversification and the even slower establishment of a mixed animal husbandry. With respect to the national surplus of wheat, the answer of the hard winter-wheat belt has been that there is no large amount of submarginal land now being devoted to wheat, that the total area planted to wheat is not excessive, that additional alternative crops are not available except at a loss, and that if the growing of wheat is to be curtailed in the national interest of the class, this should be done by the farmers east of the hard wheat belts, producing wheats that fail to meet American specifications and are thus compelled to seek markets abroad. The growers of hard winter wheat concede that since a considerable expansion of wheat acreage is to be anticipated in the hard winter-wheat region, the largest single producing region of the United States, reduction in other areas must be decidedly heavy if the total area in the country is to be contracted. In the Southwest especially, the incentives for expansion have been strong, and countervailing incentives for contraction are not recognized on internal grounds.

These conclusions, as was true of the soft red winter-wheat belt, need to be qualified by the possible spread of the corn borer to the hard winter-wheat belt.[1]

III. THE HARD SPRING-WHEAT REGION

The hard spring-wheat region lies within the states of Wisconsin, Minnesota, the Dakotas, Montana, and Wyoming, though Wisconsin and Wyoming are of little importance, and Minnesota of considerably less importance than the three premier spring-wheat states, the Dakotas and Montana. These six states contained 18.51 million acres of the area planted to wheat in 1924–29, or some 29.7 per cent of the total wheat acreage of the United States. The region is therefore the second in importance in the country as a whole.

Trends in Crop Acreages

For purposes of considering trends in crop acreages, the hard spring-wheat belt may be said to include only Minnesota (except the forested and cut-over northeastern portion of the state), all of North Dakota, most of South Dakota, and that major portion of Montana lying east of the Rocky Mountains.

Throughout this region wheat is, or has been at some time during the present century, the dominant cultivated crop. In Montana, a considerable fraction of the wheat raised is winter wheat, but elsewhere there is no appreciable amount of winter wheat. Other small grains have been raised extensively in the area, marked differences in the other small grain preferred appearing between different sections.

In respect to the main trends of crop acreages, the region may be divided into three parts: (1) the drier western area, beyond a north-and-south line drawn a hundred miles west of the eastern border of the Dakotas, an area in which the average

[1] See below, pp. 171–72.

warm-season (April to September) precipitation is under 15 inches; (2) the northern portion of the moister area east of this line and north of what is now the corn belt; and (3) the southern portion of the moister area—southwestern Minnesota and the central and southern portion of eastern South Dakota—formerly a region important in the production of spring wheat, but now devoted heavily to corn.

A conspicuous feature of the situation in the spring-wheat area is the generally narrow margin of advantage which wheat holds over other crops (chiefly other small grains and flax) and the generally narrow margin of advantage which any one of these other crops holds over the other alternatives. These narrow margins, coupled with the ease of shift from one crop to another incident on the fact that all but rye are spring sown and all grains are harvested with the same machinery, have resulted in sudden and extreme changes in acreage of the various alternative crops as price changes or damage from weather or disease have indicated that a different crop selection might prove more profitable. As a rule, such changes have not been uniform over the whole region or even over the major part of any one state within the region, but restricted to small areas. Certain broad tendencies appear clearly, however.

In the southern portion of the moister eastern part of the area (southwestern Minnesota and southeastern South Dakota), corn and hog raising increased rapidly up to about 1924, when the maximum economical extension of corn acreage was apparently reached. Even in 1910 this was no longer an important wheat-raising section, and by 1924 it had become a part of the corn belt; it is not to be expected that wheat will be significantly revived in this region.

In the more northerly portions of the eastern part of the spring-wheat area the general tendency since 1910 has been for extension of dairying and hog raising, the former chiefly in south-central Minnesota, the latter becoming more important farther west. Feed for the additional livestock has been provided in part by additional corn acreage (including ensilage) and more largely, especially in the Red River Valley, by increased barley acreage. With increased dairying, acreage in tame hay has also increased. Between 1910 and 1914 the increase in corn and barley acreage was at the expense of flax, oats, and rye more than of wheat.

In the drier western portion of the spring-wheat area the most conspicuous change has been the expansion of wheat acreage on new land, an expansion that has been as striking as in the hard winter-wheat area. On the newer lands flax acreage increased sharply between 1910 and 1914, but has since failed to gain with wheat. While the new land has gone first to wheat, there has been a persistent tendency toward introduction of hog raising and some dairying with expansion in barley, corn, and tame hay acreage, the preference since 1924 having gone to barley rather than to corn.

Current Practices

The typical variety of hard wheat grown in the hard spring-wheat belt is Marquis, which has largely replaced older varieties, though many older wheats and newer hybrids are also planted. Latterly, durum wheats have been taken up, especially in North Dakota. The Marquis wheat grown in these states is not as good, on the average, as that grown in Canada, being lower in protein and less vitreous. In certain parts of North Dakota and Montana, however, Marquis wheat of the very highest grade is grown. The best hard spring wheat now comes from Montana. Durum wheat was taken up because it was more resistant to rust and drought and therefore offered a slightly higher yield. The wheat lands of the spring-wheat belt have become badly infested with weeds and the average dockage is heavy.

Judged by exports, we have practically ceased to be active in the world trade in hard spring wheat. Nevertheless, No. 1 Northern Spring wheat, just meeting the grade, is often the cheapest wheat deliverable on contract in Chicago. Under these circumstances some of it slips abroad. The hard spring wheat passing to export via Duluth or Chicago is usually substandard of the type and variety, representing largely the culls of the crop after the mills have taken out the representative wheat. In occasional years a small amount of repre-

sentative hard spring wheat goes to export. A system of premiums for protein content has become definitely established since the war, varying from season to season; commonly the larger proportion of the crop sells at a substantial premium above the price of the contract grade. The existence of premiums suffices to place the price of representative hard spring wheat above the export basis; it is this wheat which profits most from the tariff on wheat.

Of durum wheat there are two classes, red and amber; the first is naturally low grade and the second naturally high grade, as of the type. Quality varies widely in different years and in some years good grades of amber durum carry considerable premium. There is a futures market for durum in Duluth, which is the port of export. We raise far more durum wheat than we consume and it is really an export crop. Since durum wheat passes largely to export, the price of the contract grade for durum wheat, and especially red durum wheat, is usually on the export basis except in the event of a crop failure. A shift from durum back toward Marquis wheat was in evidence during 1928 and 1929.

Hard spring-wheat flour represents, at its best, the strongest flour made in the United States and thus is highly prized by bakers because the dough stands rapid fermentation, responds to rapid, mechanical kneading, and gives a large yield of loaves per barrel. East of the Mississippi, hard spring wheat is also widely used in blends of wheat in the manufacture of flour, contributing the strength lacking in the soft red winter wheat. Durum wheat is not adapted to the making of flour for household or bakery use. It is milled into a product called semolina, not a true flour, the semolina being used in the manufacture of macaroni and other alimentary pastes. To some small extent, however, durum wheat is blended with other wheat in the manufacture of flour of ordinary grade.

Going westward in the belt, the rainfall declines. As a consequence of prolonged one-crop farming, fertility of the land has been depleted; in some sections west of Minnesota the soil has suffered widespread and heavy erosion and in some parts has been injured by blowing. With decline in fertility, the yield of wheat has declined and there has also been deterioration in quality. Quite consistently, but not invariably, the higher-protein wheats come from the newer land.

In a very particular sense, the outstanding difficulty in wheat growing in the hard spring-wheat belt is infestation with weeds.[1] In a peculiar manner in this region the circumstances of climate and soil favor weeds, both annuals and perennials. The annual weeds—such as wild oats, pigeon grass, mustard, and others—have a shorter period of maturity than wheat and for the most part ripen several weeks before the wheat is cut. Some of the weed seeds are collected in the dockage, but some are scattered on the soil before and during harvest. These weed seeds appear capable, to a surprising extent, of overliving one summer without germination; that is, they sprout one or more years after the season in which they were grown, a circumstance that makes extirpation by fallowing inadequate. The perennial weeds — such as thistles and quack grass—root deeply in the soil and may be propagated rather than injured by plowing. Fallowing has little effect on the perennial weeds, which must be combated with cultivated crops, hay or cover or sod crops, and by grazing with animals. When wild oats and thistles are together, the campaign against the one tends to favor the other.

In consequence of the luxuriant growth of annual and perennial weeds, the badly infested fields in the Dakotas produce almost or as much weeds as wheat. The elements of the soil and the rain go to weeds instead of wheat, the yield of wheat is heavily reduced, and the harvested crop contains dockage to a surprising extent, sometimes even equal to half the weight. If the wheat is marketed with the dockage, that finds derogatory expression in the price. The dockage ought to be removed on the farm and fed to animals; but when the weed seeds are fed without being ground, they are again returned to the soil in the manure.

From the standpoint of internal management, the proportion of land in farms in the Dakotas planted to wheat, especially

[1] The same infestation with weeds is in progress in the Prairie Provinces of Canada.

in the central and eastern counties, ought to be heavily reduced, as part of the program of extirpation of weeds. Fallowing cannot be relied upon, except in some of the newer western districts. What is required is planting of wheat in a three-year rotation, with a cultivated crop like corn and a grass or legume (sweet clover, arctic clover, rye grass, and alfalfa are being increasingly planted, also broom grass) or a cover crop. But since these are, for the most part, not cash crops but feed crops, this implies the possession of domesticated animals in numbers sufficient to maintain the diversification. Because Minnesota, being an older wheat state, has already been forced into effective diversification and Montana, being a newer wheat state, has not yet become heavily infested with weeds, it is particularly in the Dakotas that diversification is enjoined in order to save the future wheat crop from further inroads. In the western parts of the spring-wheat belt, cultivated crops are for the most part not yet feasible, but hay and pasture are practicable. In short, without reference to the wheat acreage from the national viewpoint, the wheat acreage of the spring-wheat belt, especially in the Dakotas, ought to be reduced.

Again, wheat in the spring-wheat belt, especially in the Dakotas, is particularly subject to parasitic diseases, such as rust, to a greater extent than is the case with hard winter wheat. Under one-crop wheat farming, these infestations tend to become worse; and in some cases, susceptibility is increased rather than resistance developed with time. The campaign against the barberry is reducing the incidence of rust; but it remains that rusts are best combated in a diversified system of crop rotation.

Wheat growing in Minnesota is now firmly established in a rotation of crops in a diversified agriculture, in which dairying and corn assume an increasingly important position. Nevertheless, wheat is still the most important cash crop in the scheme of rotation. Spring-wheat acreage has been declining and that of winter wheat increasing. In the Dakotas, wheat has been largely grown in a cereal rotation, sometimes alternating with flax, rye, oats, or barley, but often repeated without rotation year after year. Attempts to secure diversification of agriculture in these states have encountered unusual difficulties, because it has been hard to establish pasture and because good grades of domesticated animals, especially dairy cows, cannot be secured in numbers except at high prices. Nevertheless, diversification has progressed and with increasing numbers of hogs, cattle, sheep, and poultry, the dependence of farmers on the returns from wheat crops has declined. The wheat grower of the extractive type is depleting the land; the wheat grower of the intensive type is trying to build a farm. Montana has less diversification. In 1915 there were around 35,000 wheat farms in Montana, whereas now there are around 15,000; but the state has more land in wheat and raises more wheat, because the farms are larger.

Under these circumstances, and in view of the narrow margins of advantage which wheat holds over other crops, there has been wide leeway for expansion and contraction of the spring-wheat acreage, especially west of Minnesota. Since 1922, the area sown to wheat in the six states which include the spring-wheat region has varied from 16.14 to 20.22 million acres, a difference of some 4.08 million.

Wheat has been the chief source of farm income in the region. The wheat acreage has been readily expanded under incentive of immediate profit. There has been little tendency to contract it unless an incentive of immediate profit became apparent; but for the most part this has been difficult to find. One of the reasons advanced in favor of a higher tariff on flaxseed has been the desire to make flax an attractive alternative to wheat. In the light of the premiums on protein current since the war, it has now become clear that the shift from Marquis wheat to durum wheat was a commercial mistake for the region, though often profitable to individual growers. There is in most years a shortage of high-grade, high-protein Marquis wheat, or other varieties adapted to making high-grade spring-wheat flour. This wheat does not directly contribute to the exportable surplus. In some of the western parts of the spring-wheat belt, the conditions are as favorable for power farming as in the western hard winter-wheat region. It has been difficult to urge the growers of high-grade hard

wheats (especially in the western part of the region) of which we have a shortage, to contract their wheat acreage in order to improve the national price level of wheat, which price level is especially depressed by an excessive outturn of low-grade types and varieties for which we have little domestic use. Diversification has not been found a near-time operation, and is no short cut to prosperity; but it represents the only way out in the long run.

The abandoned farms, the farms foreclosed by creditors, and farms operated by tenants represent a rather pressing problem in the spring-wheat belt. It is being solved to some extent by an operation termed group farming or chain farming. If sufficient numbers of such farms are located not too far apart, they can be operated as a unit under a manager and a trained work gang. The buildings are abandoned or dismantled and the several pieces farmed with tractors. Weeds are combated by fallowing, cover crop, and grazing with sheep; probably the best method is to plant wheat two years in succession and then fallow with a cover crop which is plowed under. Wheat remains the principal cash crop, in rotation with fallowing, cover crop, grass crop, or cultivated crop, as the case may be. This means definite abandonment of diversified agriculture on such lands and the application of power farming instead. Properly executed, this type of operation conserves rather than displaces soil fertility, reduces infestation with weeds, and tends to be directly profitable. It is particularly in the eastern half of the spring-wheat belt that this scheme of operations has found application, and the experiences of recent years would seem to indicate that during the coming decade it will have a definite place in the spring-wheat belt. Obviously, to the extent that reclamation of abandoned farms may be made profitable after this fashion, the wheat acreage of the region is being increased. The chain farming of abandoned wheat lands may be expected to extend. The reaction of the owners of these chain farms to a policy of acreage contraction remains to be determined; since these operations were to a considerable extent undertaken in the desire of assisting the local communities, a suggestion to shut down their operations (usually one-crop farming) might be locally regarded as incongruous.

Adjustment in wheat acreage is commonly advised, namely, from durum wheat to Marquis wheat or to some later improvement. This would reduce directly the exportable surplus of the region, since the durum wheat is an export wheat; but it would tend to place hard spring wheat more often on an export basis. It would not produce directly an exportable surplus, since such expansion in spring wheat as may be anticipated would be absorbed (if of good grade) by the mills of the country, though with some consequent reduction in protein premiums. But an increased outturn of high-grade spring wheat would release elsewhere lower-grade wheat for export. What the spring-wheat belt feels it needs is not less wheat culture but better wheat culture. There is considerable wheat growing in the spring-wheat belt on soils and under climatic conditions demonstrably unfavorable to wheat growing, where the crop is a failure or a partial failure more often than a success. In fact, it is in the spring-wheat belt that submarginal wheat growing is especially conspicuous.

Outlook for Expansion or Contraction

The prospects for changes in the wheat acreage of the eastern section of the spring-wheat belt are not clear. In southwestern Minnesota and southeastern South Dakota, where wheat long ago yielded to corn and hogs, it is unlikely that wheat will be extensively revived; but any reduction would probably be of minor significance. Farther to the north, in Minnesota, if the recent tendency to expand dairying and hog raising is continued, this may involve further extension of the acreage in tame hay, corn, and especially barley. Such expansion might be accompanied either by a decrease in wheat acreage or a decrease in the acreage in rye and flax. Something would depend upon changes in the tariff on flaxseed, and on the effectiveness of price-raising measures for wheat; again, success in one direction or the other in the strenuous efforts to develop rust-resistant wheat and wilt-resistant flax might throw the balance one way or the other. Possibly wheat will share with oats and flax in the acreage loss

occasioned by the expansion of barley, corn, and hay acreage. On the other hand, many observers regard wheat as the most promising small grain for a scheme of rotation that is now fairly well established; and since diversification may be expected to become still more firmly established, it may tend to carry with it some increase in the wheat acreage. But the changes here, as in the more southerly section of the spring-wheat belt, seem unlikely to be of outstanding importance.

In the eastern Dakotas, the wheat acreage is excessive for internal reasons and bids fair to be substantially reduced, as part of the campaign against weeds and in connection with the furtherance of diversified agriculture. This reduction ought to apply predominantly to durum wheat.

In the western part of the spring-wheat belt, especially in Montana, agriculture is still in the extractive stage, large areas of new land are in process of being opened up, and the wheat acreage has been expanding as the expression of power farming. Livestock raising may also expand, but the low precipitation, with the consequent absence of good pasture, places a serious limitation on expansion of dairying, and it is doubtful whether barley and hog raising can now compete actively with wheat raising on any large scale over most of the drier western area. In view of the ease of expansion in the newer districts and the naturally slow pace of contraction in the Dakotas through the introduction of diversified agriculture, the net effect for the spring-wheat belt has been in the upward rather than the downward direction, despite the effective, internal, long-term motives for contraction that prevail in that part of the region where wheat cultivation is dense. All told, on the basis of accustomed incentives, it is difficult to envisage any sudden or widespread contraction of wheat acreage in the belt as a whole, for expansion under way in the western reaches may easily offset such tendency as there may be toward contraction in the eastern and central districts.

IV. THE PACIFIC STATES

The Pacific wheat region lies within the states of Arizona, Nevada, Utah, California, Idaho, Washington, and Oregon; from the point of view of climate and of direction of movement of wheat, it includes also the western portions of Montana.

Of these states only California, Oregon, Idaho, and Washington are important in respect to wheat acreage. The region as a whole is a heavy net exporter. The four states of the Pacific Northwest included, on the average of 1924–29, about 8.8 per cent of the wheat acreage of the United States.

The only important crop-acreage change in the four states of the Pacific Northwest wheat region since 1910 has been the progressive increase, especially since 1914, in wheat acreage with the extension of the cultivated area.[1] The general state figures show substantial acreage changes in other crops, but, with the exception of a decline in barley acreage between 1914 and 1927, these have occurred chiefly outside the principal wheat areas. In the principal wheat areas of this region, wheat has occupied since 1910 and earlier some 80 per cent or more of the total crop area.

Both spring and winter wheat are raised in the four states under consideration, the choice depending on local circumstances of soil and climate. The soil and climate of the greater part of the area are not favorable to hardness of wheats; when hard wheats of the exceptional types are here planted, they tend to become yellow, less vitreous, starchy, and the protein content declines. Though some of the wheats are termed "red," the characteristic wheats of the region are white. According to trade nomenclature both "hard" and "soft" white wheats and "hard" and "soft" red wheats are to be found in the crop. But the so-called hard wheats, except in certain of the drier areas, are like those of Argentina, only semi-hard. In the dry-land section of Washington, Baart, a "hard" white wheat, is the preferred spring variety and usually commands a premium because of its gluten and is used by local mills for blending. Some other varieties in certain seasons also are hard. The soft wheats are typically soft

[1] The decrease shown in Washington between 1910 and 1914 resulted entirely from an abnormally low acreage in 1914, the cause of which is obscure.

and resemble the wheats of Australia, from which many of the varieties have been derived. Hard wheats are imported into the region from Montana and Kansas, to be blended in the mills with the Pacific wheats for the strengthening of the flour. Also it is common practice for bakers in the Pacific states to mix local flour with flour from Montana and Kansas in order to secure strength and yield.

Some Pacific wheat in occasional years is shipped eastward over the Rocky Mountains. But for the most part, the surplus of the region must find a market abroad. Large but varied amounts are annually exported to the Orient, going to countries all the way from Japan to the East Indies. There is always an important export to Europe, where the wheat is classed with the wheats of Australia and India. There is an important export of flour to the Orient, mostly clears and straights but also patents. Varied amounts of flour are sent to South America and to Europe, and there is a coastwise trade supplying high-grade pastry flour to the Atlantic states. In recent years the Pacific states have suffered severe competition in the export of wheat and flour to the Orient from Canadian millers, merchants, and the wheat pool, operating through Vancouver. Though the Oriental use of wheat is much less in the form of yeast-risen bread than in this country, hard spring wheat is found acceptable, and as the lower grades go at a heavy discount the American wheats have been forced to endure a severe competition.

In Oregon, Washington, and Idaho the wheats are largely raised on land with scanty rainfall. It has long been customary to practice rotation of wheat not with other grains but with fallowing. The usual rule over a considerable area has been two crops of wheat and one year of fallow; but alternating wheat and fallow is common in the drier parts. More recently, attempts have been made to substitute some form of cover crop for the fallow; and in some regions, rotation has been practiced with other grains and with legumes. Whenever sufficient water is present (in rainfall or irrigation) to support an established, diversified agriculture, the land is likely to be too valuable for other purposes to be used for wheat as a cash crop. The wheat grown in such areas has been fixed primarily by the convenient and logical place it holds in the rotation. For the most part, therefore, wheat is raised in one-crop farming with fallow, the stubble and the field in fallow being often grazed with sheep. In a sense, wheat growing on the Columbia plateau is a specialty, based on soil and rainfall.

Whether wheat growing in the Pacific states has been remunerative or not is a question which is complex in a different sense than in most areas east of the Rocky Mountains. The investments in land and improvements have tended to be minimum in the drier sections; the area in the hands of one grower has been large both in the drier and the more humid sections. It has usually not been associated with a subsistence form of agriculture but was a commercial type, resembling the power farming of the new winter-wheat area. The wheat acreage has not been suddenly expanded or contracted in the three Pacific states in which wheat growing is important and dominant. The acreage sown to wheat in the group of seven Pacific states in 1922–29 has ranged only from 5.16 to 6.64 million acres. If the wheat grower felt forced by low price to reduce his wheat acreage, in most places it was difficult to find an alternative crop. Doubtless the land would be improved if wheat were grown one year, followed by a year of fallow and this by a cover crop. But the wheat grower, dependent on his cash crop for income, has hardly considered the long-term advantages of such a practice.

The exportable surplus of the Pacific states is marketed separately from the exportable surplus grown east of the Rocky Mountains. The wheat growers of the Pacific states lack contacts with the wheat growers east of the Rocky Mountains and do not regard their price problem as being closely connected with the price problem of the growers east of the Rocky Mountains. Pacific wheat growers apparently feel that, since Pacific wheat is not dealt in on the central grain exchanges, their surplus does not depress the American wheat price. But this exculpation is overdrawn, since Pacific wheat competes in Asia with Canadian and Australian wheats and in Europe with Australian and American soft wheat. If the Pacific states exported less to the Orient,

then the Orient would buy from Canada and Australia and these countries would have less to sell to Europe, which might in consequence demand more wheat from eastern United States. Only in some such roundabout sense do wheat growers in the Pacific states recognize a relation of their exportable surplus to the wheat price of the country.

In view of the relative inability to ship wheat eastward over the Rocky Mountains, a considerable proportion of the Pacific crop of wheat may fairly be said to be raised primarily for export. In this respect, Pacific wheat resembles durum wheat. The Liverpool price of wheat has in some years even more meaning for the Pacific states than it has for the wheat areas east of the Rocky Mountains. The Orient makes its purchases from Canada, Australia, and the Pacific states, and all of them are at the same time selling wheat in Europe; the ex-European wheat price, over a period of years if not from month to month, moves with the European wheat price. Since a relatively large proportion of the Pacific wheat passes to export, the world price sometimes means more in a direct sense than in the case of wheats raised east of the Rocky Mountains.

If growers in the Pacific states do not find a local or regional incentive for contraction or expansion of the wheat acreage, it seems difficult to believe that an incentive would be found in considerations relating to the eastern price of wheat. Pacific wheat growers instead ask: "Why should we reduce acreage in order that Canada may grow more wheat?" In short, so many considerations are advanced to justify the Pacific wheat growers in considering their problem as one separate from the country-wide problem of the exportable surplus, that it will be very difficult to induce them to change their acreage in response to circumstances east of the Rocky Mountains. On the Pacific Coast the appeal of the Farm Board will receive the least consideration.

V. SUMMARY AND CONCLUSIONS

The inferences reached in the foregoing paragraphs regarding possible future trends of wheat acreage in the several wheat-producing sections of the United States rest in part upon the assumption of a continuation of recent trends in the changes in economic conditions, in population, in demand for the various products of agriculture, and the like—and upon the assumption of a continuation of recent trends in agricultural technique and in the incidence of damage from plant diseases and pests. A special examination of these conditions must therefore be added to supplement the indications suggested above.

The developments now in prospect which may favor acreage changes different from those suggested by past trends are two: the great improvements in machinery for power farming and the spread of the corn borer. The chief consequences of the improvements in power-farming machinery, so far as concerns the trend of wheat acreage, are likely to be observed in the spring- and winter-wheat regions. In the spring-wheat region the recent trend toward diversification and introduction of feed grains and hay, with more dairying and livestock raising, may be checked or even reversed. In the hard winter-wheat region the chief effect is likely to appear in facilitating the use for wheat growing of land still in prairie grass, thus continuing somewhat longer the extension of wheat raising on new land and with some reduction in the number of cattle and horses pastured on this range and in the feed grains and hay produced to feed them. In short, for the time being, power farming tends to favor expansion rather than contraction of wheat acreage.

The consequences of the spread of the corn borer cannot now be predicted with confidence. If the corn borer can everywhere be controlled,[1] as it has apparently been controlled in Michigan and Ohio, and especially in Ontario, with no significant change in crop rotations, with little increase in net cost that need be assigned to corn production, and with little or no reduction in yield of corn per acre, the effects on crop acreages from the introduction of the corn borer will be slight. If in other

[1] It has recently been announced that a strain of corn resistant to the corn borer has been evolved through a cross of South American maize and a domestic ensilage variety of corn.

sections the corn borer can be controlled without necessity of disturbing present cropping systems but only at considerably increased cost, the resulting acreage changes may be substantial. Other crops will tend to replace corn; what other crops will directly replace corn and in what areas and with what incidental repercussions, cannot easily be judged. If control of the corn borer should prove economically feasible only under a rotation in which corn does not follow corn or in which corn is never raised more than two years in succession, a profound change in cropping systems will be necessary in the central and western portions of the corn belt, and radical changes in acreages of other feed grains and of wheat may result. Until more information is available on the control methods likely to prove economically feasible in the various corn-raising regions and the effects on yields and costs of corn production, the probable effects of the corn borer on wheat acreage are perforce not easy to foresee.

Nevertheless the main effects may perhaps be anticipated in their broad outlines. Wherever the infested area extends, there is likely to be greater or less increase in cost per acre, greater or less decline in yield per acre. Reduction of yield is likely to be accompanied by some increase in price. The experience of Ontario and Michigan suggests that in the main corn belt, where the yield of corn per acre is high and corn is outstandingly the preferred crop, a radical shift of acreage from corn to other crops is not in prospect; here the cost disadvantage attendant upon infestation may tend to be offset by a price advantage, and by increased efficiency in tillage. In those portions of the wheat belt devoted to soft red winter, hard red winter, and hard red spring, and coextensive with the main corn belt, there is perhaps no strong reason for anticipating a noteworthy shift from corn to wheat acreage; and if the corn is reduced at all, it may go into other crops than wheat. Possibly the effect will be a tendency to change the practices of animal feeding in this region, in the direction of practices common in western Europe, especially since the hogging down of corn would be stopped.

In the outlying regions of the corn belt, where the yield per acre of corn is lower and corn is to a much less marked degree the crop of premier choice, the increased costs of corn production attendant upon the spread of the parasite may exceed any increase in corn prices. Here corn may lose ground; and possibly wheat, already a favored crop, will gain, though other crops may also share in the gain.

All told, the presence and probable spread of the corn borer, as judged by the scanty information now available, seem to entail no startling change in the United States wheat area. Such changes as they do entail, however, appear to be rather in the direction of favoring an increase than a decrease in the wheat area. The balance would be the more thrown in favor of an increase if the feeding uses of wheat should come to be better understood in the United States. Each year low-grade wheat is sold as a cash crop for less than its feed value on the farm. To a rather surprising extent in some years, low-grade wheat is shipped out and coarse grain or millfeed shipped in to various wheat-growing regions, especially the Southwest, at a price higher, as judged by feed value, than that received for the wheat. The question of the relative values of wheat and the coarse grains as feeding stuffs was given some attention by the national Department of Agriculture several years ago. Enlightenment in this direction is only to be expected through the efforts of state agricultural colleges and extension services. There is little question that in some years the exportable surplus of wheat would be substantially reduced if wheat were fed to animals whenever its price as feeding stuff approached its price as bread grain.

We may now summarize the tentative conclusions brought out in earlier sections. It would seem that in the Atlantic Coast states there seems to be prospect of profitable substitution of grass land for wheat land, using grass land to include fodder crops. Growth of urban population, rising per capita consumption of milk, and perfection of co-operative association of milk producers would seem to justify such a forecast. The outlook for dairying seems to us better (despite current low prices) than the outlook for replacement of nondescript winter wheat with superior selected varieties; and with the extension of grass lands,

equally good or better schemes of rotation than those now employed become available. But any reduction of the wheat area here would be of little moment; and so also with the southern soft winter-wheat states.

In the main soft winter-wheat area population is growing rapidly and expansion in dairying is indicated. Here the accustomed incentives are strong. Oats, rye, and barley are less attractive crops than before the war, even in the regions where they do well. If infestation with the corn borer makes the cost of raising corn higher, the acreage planted to corn may be somewhat restricted. Over this region as a whole there ought to be more grass land and less land planted to grain; but the prospect for hay and other fodders is reduced by the fact that one of the elements in the battle against the corn borer lies in the probably extended use of corn in ensilage. Substitute crops of a less traditional type are available from region to region, such as soy beans, peanuts, and sugar beets; but the introduction of these crops on a large scale in replacement of wheat involves far-reaching changes in crop rotation.

Nor is there definitive promise of reduction of wheat acreage in the hard spring-wheat region. Agriculture in the Dakotas follows that of Minnesota in the direction of diversified farming. Acreage in the Dakotas fluctuates widely, and while wheat may not be holding its own in the eastern halves of these states, it is expanding in the western halves. In Montana, without question, wheat growing tends to expand under the stimulus of tractor methods.

In the hard winter-wheat belt, expansion of wheat acreage is under way, since relatively large areas are suited to low-cost production with the use of tractor-drawn machinery. In eastern Nebraska and Kansas a recession of wheat acreage may be looked for unless, or until, the corn borer enters. In no region is commercial incentive to contraction of wheat acreage so difficult to uncover and commercial incentive to expansion of acreage so obvious as in the large western portion of the hard winter-wheat belt.

Wheat growing in the Pacific states is relatively stationary. The present acreage in Washington, Oregon, and Idaho takes practically full advantage of the existing rainfall in areas adapted to wheat rather than to more intensive forms of agriculture. If additional water supplies were developed for irrigation, this would be used for crops more valuable than wheat. On the other hand, on the lands now devoted to wheat growing this grain offers about the best relative prospect presented by any crop.

W. J. Spillman,[1] writing in 1926, made the following observation:

> We have recently had 22 million acres more in wheat than we are now growing. No small part of the 22 million acres formerly in wheat, but not now in that crop, is lying idle ready to come back into production if economic conditions justify.

Some of this idle wheat land has come back since then and with it also new land. This trend represents the cumulative response of individual wheat growers to accustomed incentives. Adverting to the farmer's reaction, Spillman[2] makes the following comment:

> . . . . It is true that different farmers will respond differently to the same incentive, but what limited experience is available indicates that, taking farmers as a class, their response will be in accordance with the incentive actuating them.

In summary, the gross wheat acreage of the United States has entered a process of expansion. For this there are positive and negative reasons—the desirability of wheat and the undesirability of other crops. The traditional and accustomed incentives of wheat growers have directed their course in this regard. It is the cumulative expression of individual commercial objectives. Short-term rather than long-term evaluations have been determinative. Recessions in some places have been more than counterbalanced by extensions in others. We have little evidence that wheat growers at this time show an inclination of their own accord and following their accustomed incentives to contract the wheat acreage. Quite certainly the rate of expansion of wheat growing is in excess of the rate of growth of the population of the country, so that the wheat surplus has been tending to increase.

[1] *Balancing the Farm Output* (New York, 1927), pp. 73–74.

[2] *Ibid.*, p. 118.

This trend the Farm Board now undertakes to reverse, under the conviction that an enlarged remuneration would accrue with a reduced acreage. An economic concept, a long-term view of agriculture, and a class policy are to be substituted for the traditional and accustomed incentives of wheat growers. Had the policy been launched in 1923, wheat growing would have been found in process of contraction; launched in 1930, wheat growing is encountered in the process of expansion.

Concluding Observations

This is the situation as we envisage it. The Federal Farm Board formulates a long-run policy, and seeks the support of public opinion for it, such that the wheat area may be contracted even in the face of the individual views of wheat growers toward expansion. It is desirable to consider briefly what this policy implies and how it might be applied.

The immediate requirement is that the organization of co-operative associations now in progress should proceed apace, so that the membership includes the bulk of the farmers. We assume that such will be the course of events. If the Federal Farm Board is actively to endeavor to bring about reduction of wheat acreage, working through the regional and local co-operative associations, the prospect of success seems to us much better if (1) the Board is in a position specifically to designate particular localities and farms where wheat growing is most strikingly and consistently unremunerative; and (2) the alternative uses of land are specified with some approach to approximate accuracy.

In every region there are fields of wheat which for reasons of soil, climatic, and geographical considerations are consistently unremunerative; there are others consistently unremunerative by reason of unenlightened or incompetent management by operators. It is obviously a difficult and extended task to distinguish such fields from the mass; so much is readily enough apparent from the work of farm-management specialists over a period of two or three decades. With yield per acre, costs of production, and price all fluctuating from year to year, with wheat often occupying a place in the rotation of crops, and with items of cost subject to uncertainties in the accounting valuations, the Federal Farm Board will necessarily be faced with a stupendous task if it seeks to determine with precision, for wheat, "the acreage of unprofitable marginal lands in cultivation."[1] A more or less comprehensive delimitation of unremunerative wheat-growing farms and localities can eventually be formulated, but only at the expenditure of great effort and considerable time. The determination ought also to include some consideration of areas that regularly produce substandard wheats, even if these are remunerative to individual growers. Certainly a more or less precise delimitation of unremunerative acreage would seem to provide a more cogent basis for reduction of acreage in wheat than would the terse statement that wheat growers in general ought to reduce their plantings. It seems fair to say that since the Federal Farm Board is prepared to advocate reduction of acreage, it needs also to be able to say, by way of direction, where the area ought to be reduced. The problem of "where" is possibly quite as important as the problem of "how much" in the aggregate, though current discussion seems to have centered about the latter.

If the policy of reduction in wheat acreage is to succeed, it would seem clear that the Federal Farm Board and its agencies must be prepared, after having designated the localities where wheat growing is consistently unremunerative, also to indicate the alternatives. Perhaps a fraction of the acreage will be condemned for complete abandonment (as has already happened in foreclosures) and the alternative will be migration of the corresponding fraction of the farm population. It is unnecessary to enlarge upon the practical and theoretical difficulties that may reasonably be expected to emerge if or when the Board chooses to urge complete abandonment of any land in any area. Alternative uses of land can probably be found for the larger fraction of wheat acreage under consideration. The problem of finding them will inevitably be a complex one, and in advance one can

[1] The Board is directed by the Agricultural Marketing Act (Sec. 5, par. 5) to investigate and report on this subject.

hardly envisage the multiplicity of adaptations that may be suggested for different localities.

Certainly in any event it seems desirable that the general policy of contraction of wheat acreage should be supplemented by a positive policy tending toward the upbuilding of soil fertility. The outstanding direction in which such a policy might proceed is to encourage the planting of grass crops, and the use of some grass crops, without grazing or harvesting, as green manure to enhance farm fertility. It goes without saying that there would be significant difficulties in inducing farmers to adopt this procedure, and perceptible results would appear only after the passage of a considerable period of time; but the later returns would be substantial. There is a distinct trend toward larger farms in the hard wheat belts. We take it that larger farms will prove more amenable to acreage contraction than smaller farms (other things equal) because they have better management, are less dependent on immediate returns, and may be counted on to take the long-term plan. In view of the complexities of the problem of finding and bringing home to farmers the local and general reasons for reduction of wheat acreage and the opposition to be anticipated, immediate results seem hardly to be expected. In the long run the policy might achieve success, modified more or less by adventitious circumstances that find expression in relatively low or relatively high world prices of wheat. A certain degree of initial success also seems feasible.

It will be wise to count on opposition. The situation will not be one consisting of the Farm Board and its agencies, together with the national and state departments of agriculture and the state colleges of agriculture, engaged in converting individual wheat growers to the program, with all others standing detached as observers. Such farm leaders as feel inclined to resist the proposal will find support in a manner rather surprising both as to origin and extent. Railways, grain dealers, grain exchanges, export associations, bankers, and chambers of commerce are interested in the volume of business transactions. Affording an illustration of the view widely held in financial circles may be cited the recent declaration before the St. Louis Chamber of Commerce by B. M. Anderson, economist of the Chase National Bank of New York, that solution of the export problem depends on improvement in foreign markets and increase in export trade. It used to be an axiom of retail trade that large crops meant good business. The spirit of mercantilism is more or less prevalent over the country. The wheat grower has often been told that "the profit is in the export," and he will be told that wheat presents the particular illustration of a grain of which a large crop brings in a large gross income. The farmer will hear the call for proof that a small crop of wheat brings in more money than a large one. It will not be lost on American wheat growers that in the present season the wheat growers in Canada, Argentina, and Australia do not find their short crops rewarded with high prices. The interests outside of agriculture will be divided on the proposition; but there will also be division of opinion within agriculture.

Many agricultural economists favor an expanding, not a contracting agriculture. Opponents will cite J. D. Black, who testified before a Congressional hearing that wheat growers gain by large crops.[1] They will cite the graphs of G. M. Peterson[2] tending to indicate that wheat and cotton are different cases and that acreage contraction is indicated in the case of cotton but not in the case of wheat. Proponents of the equalization fee and the export debenture will appear as opponents of reduction of acreage, with a long record as defenders of the agricultural faith. This reaction appeared as soon as the policy of the Farm Board was announced.

All told, then, the outlook seems not to be for notable and immediate reduction in the United States wheat acreage; the existing and familiar economic incentives of

[1] "The larger the crop of wheat, the more money in the aggregate the farmers receive for it. The wheat farmers are prosperous when there is a large crop of wheat. On the average, the farmers are better off when they have a large crop of wheat in the United States. . . . . Large crops of wheat in the United States sell for more money than small crops of wheat." (Senate Committee on Agriculture, *Farm Relief Legislation Hearings*, March 26, 1929, p. 61.)

[2] "The Relation of Annual Weather Surpluses to Net Farm Incomes," *The Annals*, March 1929, CXLII, 391–401.

wheat growers seem not to be such as to induce contraction from within. Nor are we convinced that wheat farmers will forthwith adopt the program of contraction as the expression of individual self-interest. Success presupposes the development of a new set of incentives. The Federal Farm Board is faced with difficult and time-consuming tasks in ascertaining with some precision where wheat acreage ought to be reduced, and in determining what ought to be set forth as the desirable alternative uses of land. Seemingly, however, both tasks need to be embraced before appeals to producers through local co-operatives can become adequately effective. The position of the Farm Board is at present developmental, advisory, and educational. But it need not remain so. It would lie within the discretion of the Board to limit loans in event of non-reduction and extend loans in proportion to restriction of acreage. It may be pointed out, parenthetically, that if the loan policy of the Board were to be based on wheat acreage, in a sense this would represent an approach to the farm allotment plan of Spillman and Black.

Hope of concordance between farmers and the Federal Farm Board seems to us to lie in the development of co-operative associations and the concomitant growth of class solidarity, such that a program of acreage control can receive the strongest support throughout all the ramifications of the national organization. The Agricultural Marketing Act places wheat growers in a position, with the support of public funds, to effectuate horizontal integration. Adjustment of supply to demand is prerequisite to persistently successful integration. Growers cannot take the one and leave the other. It is thus from every point of view advantageous, as soon as possible, to have wheat growers brought squarely to face the choice between their accustomed individualism and the new collective policy. Co-operative organization is under way vigorously, but it necessarily takes time. With allowance for the time element, agricultural co-operative association is on trial.

This issue is the work of Alonzo E. Taylor with the assistance of Holbrook Working and M. K. Bennett

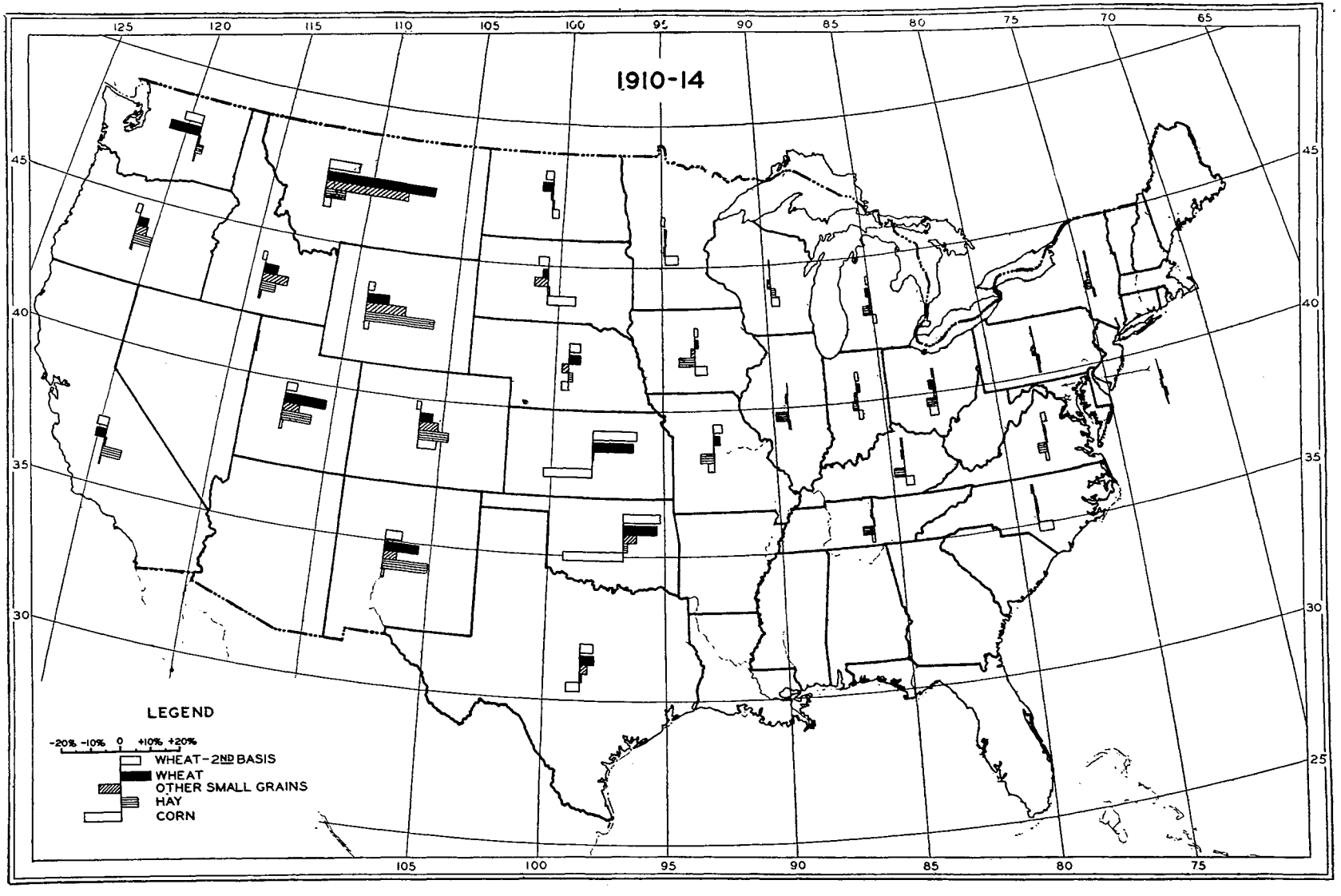
APPENDIX

The maps on the following three pages are designed to show, for the principal wheat-producing states, the changes in the acreage of wheat and of the principal competing crops that occurred between 1910 and 1914, 1914 and 1924, and 1924 and 1929.

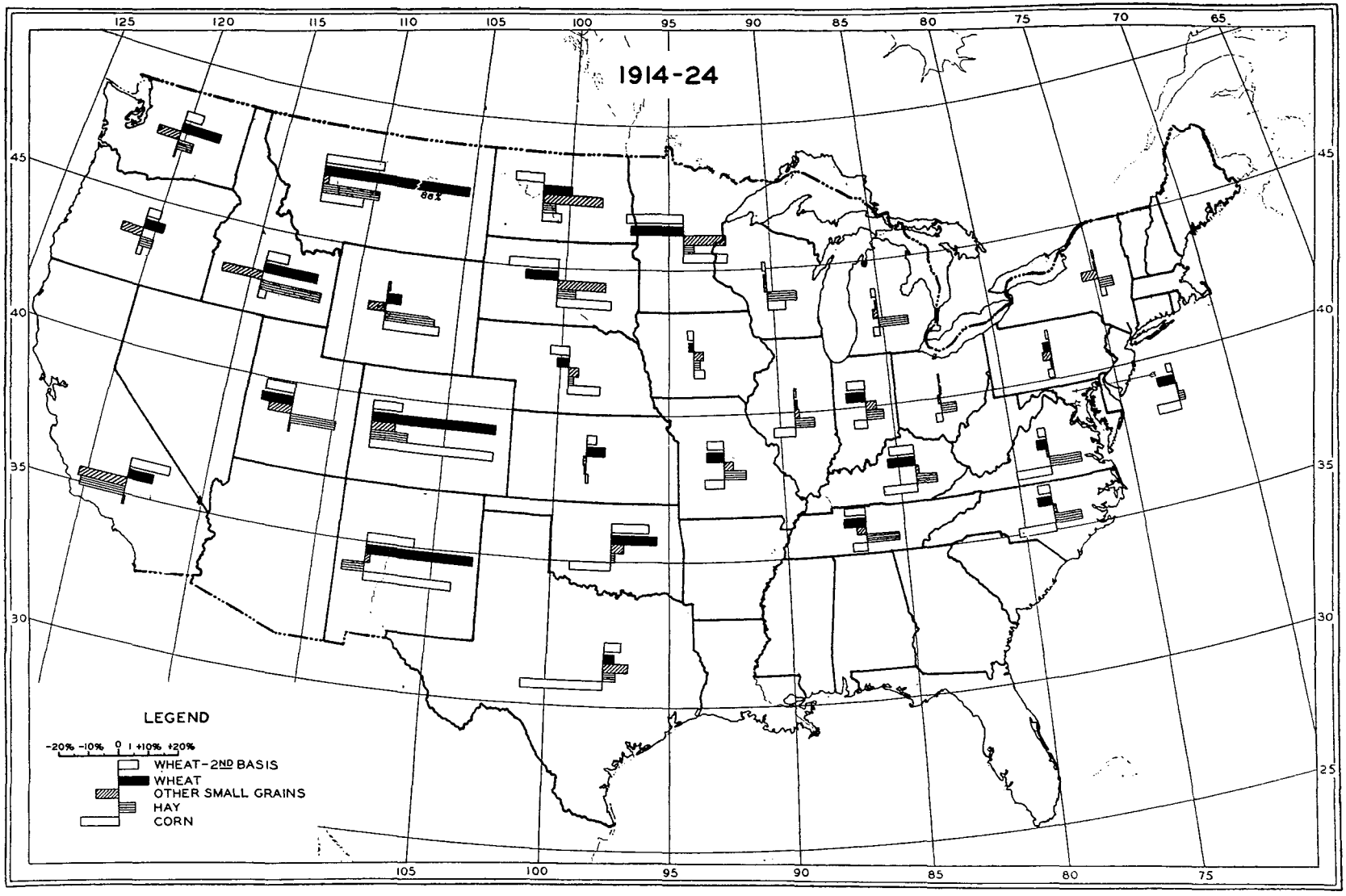
In each map, all bars except the top bar show changes in acreage expressed as a percentage of total acreage (in the crops considered) at the earlier date. Separate records are given for changes in the acreage of wheat, of corn, of tame hay, and of the four small grains combined—rye, barley, oats, and flax. The top bar shows the change between the percentage that wheat acreage was of total acreage (in all crops considered) at the earlier date, and the percentage that wheat acreage was of total acreage (in all crops considered) at the later date.

Increases in the relative prominence of any given crop are indicated by bars extending to the right of the vertical lines; decreases by bars extending to the left.

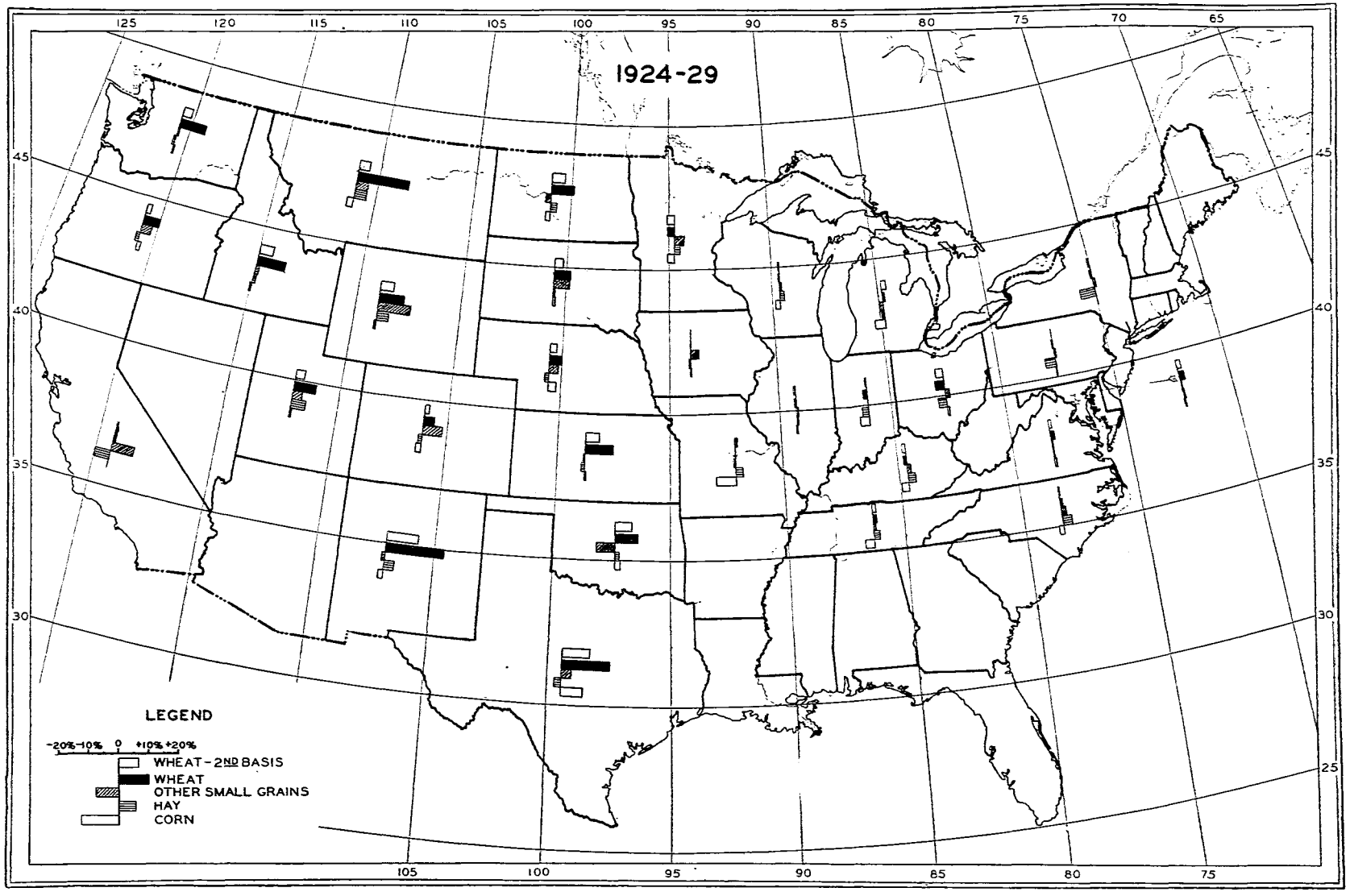
The sources of data used in maps are given in the footnotes to Appendix Tables I to VI, which include the figures from which the graphs in the maps were constructed. For purposes of reference, these tables include certain data not employed in constructing the graphs.


1910-14
LEGEND
-20% -10% 0 +10% +20%
WHEAT-2ND BASIS
WHEAT
OTHER SMALL GRAINS
HAY
CORN

MAP 1


1914-24
LEGEND
-20% -10% 0 +10% +20%
WHEAT-2ND BASIS
WHEAT
OTHER SMALL GRAINS
HAY
CORN

MAP 2


1924-29
LEGEND
-20% -10% 0 +10% +20%
WHEAT - 2ND BASIS
WHEAT
OTHER SMALL GRAINS
HAY
CORN

MAP 3

TABLE I.—ACREAGES OF WHEAT AND OTHER SMALL GRAINS IN PRINCIPAL WHEAT-PRODUCING STATES IN DESIGNATED YEARS, 1910–29*

(Thousand acres)

State	Wheat					Other small grains				
	1910	1914	1919	1924	1929	1910	1914	1919	1924	1929
New York	360	364	467	340	293	1,538	1,479	1,305	1,115	1,169
Pennsylvania	1,340	1,339	1,432	1,171	1,130	1,441	1,360	1,420	1,142	1,175
Ohio	2,251	2,001	2,925	2,063	1,749	1,866	1,780	1,682	1,710	1,849
Indiana	2,400	2,518	2,827	1,832	1,699	1,769	1,682	2,208	2,056	2,056
Illinois	2,657	2,551	4,139	2,710	2,648	4,413	4,404	4,718	4,699	4,767
Michigan	990	900	1,066	857	918	2,000	1,976	2,722	1,868	1,783
Wisconsin	190	188	563	118	106	3,474	3,395	3,395	3,321	3,369
Minnesota	4,000	4,054	3,796	1,723	1,377	4,990	5,012	5,195	6,883	7,341
Iowa	605	820	1,438	465	467	5,661	5,439	5,888	6,038	6,648
Missouri	2,280	2,585	4,592	1,805	1,802	1,240	1,230	1,781	1,655	1,576
North Dakota	7,700	7,285	9,098	8,500	9,918	4,787	4,739	6,310	7,325	7,022
South Dakota	3,650	3,480	3,903	2,420	3,119	3,248	2,836	3,384	4,417	5,108
Nebraska	3,235	3,807	4,395	3,212	3,880	2,736	2,417	2,763	2,904	3,420
Kansas	6,439	9,065	11,671	10,226	12,123	2,045	2,095	2,279	1,913	1,848
Maryland	611	621	667	521	549	77	73	84	74	76
Virginia	770	794	1,001	665	711	251	260	242	231	239
North Carolina	620	627	712	436	466	271	296	262	336	398
Kentucky	820	778	848	294	247	201	202	349	256	313
Tennessee	760	735	698	360	422	365	377	258	215	255
Oklahoma	1,649	2,603	4,723	3,838	4,506	740	1,113	1,676	1,446	878
Texas	724	1,139	2,510	1,437	2,710	694	910	1,948	1,638	1,902
Montana	380	935	4,044	3,232	4,258	508	930	1,139	980	1,221
Idaho	485	556	1,151	880	1,099	387	520	284	276	301
Wyoming	57	102	182	144	244	166	246	142	194	322
Colorado	420	497	1,372	1,484	1,658	331	451	447	641	955
New Mexico	41	79	146	235	371	43	57	65	64	57
Utah	205	298	277	208	270	103	140	97	74	100
Washington	2,171	1,825	2,531	2,250	2,564	467	487	315	255	267
Oregon	750	812	1,092	959	1,086	434	507	411	354	428
California	580	421	1,208	820	850	1,607	1,630	1,134	851	1,137

* Data from U.S. Department of Agriculture, successive *Yearbooks; Wheat and Rye Statistics* (Statistical Bulletin 12, January 1926); *Wheat Acreage, 1922–29* (mimeographed, October 9, 1929): *Crops and Markets*, December 1929; and unpublished official data showing winter-wheat sowings for 1910, 1914, and 1919. The wheat statistics for each year show spring-wheat areas harvested in the designated year, and winter-wheat areas sown in the preceding year. "Other small grains" are rye, barley, oats, and flax.

TABLE II.—ACREAGES OF CORN AND TAME HAY IN PRINCIPAL WHEAT-PRODUCING STATES IN DESIGNATED YEARS, 1910–29*

(Thousand acres)

State	Corn					Tame Hay				
	1910	1914	1919	1924	1929	1910	1914	1919	1924	1929
New York	525	550	762	677	676	4,780	4,653	4,922	5,000	4,629
Pennsylvania	1,430	1,463	1,581	1,316	1,309	3,083	3,141	2,881	3,100	2,872
Ohio	3,960	3,650	3,943	3,432	3,518	3,200	2,812	3,024	3,331	3,056
Indiana	4,800	4,949	4,882	4,450	4,124	1,925	1,764	2,100	2,372	2,163
Illinois	10,250	10,346	8,579	8,946	8,900	3,060	2,250	2,951	3,518	3,557
Michigan	1,670	1,750	1,641	1,610	1,344	2,560	2,352	2,817	3,050	2,989
Wisconsin	1,520	1,725	1,882	2,185	2,036	2,430	2,550	2,946	3,317	3,442
Minnesota	2,040	2,600	2,998	4,595	4,253	1,797	1,743	1,894	2,230	2,499
Iowa	9,470	10,248	9,959	10,912	10,944	3,970	2,950	3,086	3,362	3,286
Missouri	7,500	7,200	5,962	6,300	5,384	3,249	2,600	2,720	3,596	3,899
North Dakota	210	500	432	1,320	1,057	350	400	896	939	1,304
South Dakota	2,100	3,000	3,288	4,814	4,916	442	500	868	1,102	1,151
Nebraska	7,425	7,100	7,030	8,716	9,144	1,291	1,500	1,769	1,751	1,532
Kansas	8,950	5,850	4,188	6,021	6,103	1,650	1,650	1,722	1,570	1,382
Maryland	660	663	645	527	525	375	390	380	426	420
Virginia	1,960	1,921	1,868	1,499	1,522	759	650	940	1,035	1,037
North Carolina	2,650	2,835	2,531	2,317	2,259	315	320	682	695	813
Kentucky	3,500	3,650	3,454	3,048	2,938	940	750	1,051	1,120	1,243
Tennessee	3,400	3,350	3,446	3,100	2,944	1,004	800	1,329	1,372	1,472
Oklahoma	5,735	4,000	2,611	2,862	3,020	334	450	867	545	668
Texas	6,800	6,400	5,016	3,943	4,533	386	450	550	828	658
Montana	16	50	133	420	301	595	700	1,158	1,206	1,446
Idaho	10	19	40	66	54	630	705	1,049	1,073	1,095
Wyoming	11	21	44	180	177	360	500	568	646	693
Colorado	346	462	1,021	1,450	1,366	781	970	1,227	1,263	1,203
New Mexico	89	92	254	220	209	156	206	189	174	197
Utah	7	12	20	15	19	340	406	457	537	578
Washington	28	36	61	43	48	717	796	979	970	945
Oregon	18	22	72	59	86	739	858	951	953	931
California	50	60	149	82	82	2,400	2,700	2,150	1,974	1,783

* Data from U.S. Department of Agriculture, successive *Yearbooks; Hay and Feed Statistics* (Statistical Bulletin 11, April 1925); and *Crops and Markets*, December 1929.

TABLE III.—ACREAGES OF WHEAT, RYE, BARLEY, OATS, FLAX, CORN, AND TAME HAY COMBINED IN PRINCIPAL WHEAT-PRODUCING STATES IN DESIGNATED YEARS, 1910–29*

(Thousand acres)

State	1910	1914	1919	1924	1929
New York	7,203	7,046	7,456	7,132	6,767
Pennsylvania	7,294	7,303	7,314	6,729	6,486
Ohio	11,277	10,243	11,574	10,536	10,172
Indiana	10,894	10,913	12,017	10,710	10,042
Illinois	20,380	19,551	20,387	19,873	19,872
Michigan	7,220	6,978	8,246	7,385	7,034
Wisconsin	7,614	7,858	8,786	8,941	8,953
Minnesota	12,827	13,409	13,883	15,431	15,470
Iowa	19,706	19,457	20,371	20,777	21,345
Missouri	14,269	13,615	15,055	13,356	12,661
North Dakota	13,047	12,924	16,736	18,084	19,301
South Dakota	9,440	9,816	11,443	12,753	14,294
Nebraska	14,687	14,824	15,957	16,583	17,976
Kansas	19,084	18,660	19,860	19,730	21,456
Maryland	1,723	1,747	1,776	1,548	1,570
Virginia	3,740	3,625	4,051	3,430	3,509
North Carolina	3,856	4,078	4,187	3,784	3,936
Kentucky	5,461	5,380	5,702	4,718	4,741
Tennessee	5,529	5,262	5,731	5,047	5,093
Oklahoma	8,458	8,166	9,877	8,691	9,072
Texas	8,604	8,899	10,024	7,846	9,803
Montana	1,499	2,615	6,474	5,838	7,226
Idaho	1,512	1,800	2,524	2,295	2,549
Wyoming	594	869	936	1,164	1,436
Colorado	1,878	2,380	4,067	4,838	5,182
New Mexico	329	434	654	693	834
Utah	655	856	851	834	967
Washington	3,383	3,144	3,886	3,518	3,824
Oregon	1,941	2,199	2,526	2,325	2,531
California	4,637	4,811	4,641	3,727	3,852

* Totals compiled from data in Appendix Tables I and II.

TABLE IV.—PERCENTAGE CHANGES IN THE ACREAGE OF WHEAT AND OF OTHER SMALL GRAINS IN PRINCIPAL WHEAT-PRODUCING STATES BETWEEN DESIGNATED YEARS IN 1910–29*

(Percentages)

State	Wheat					Other small grains				
	1910 to 1914	1914 to 1919	1919 to 1924	1924 to 1929	1914 to 1924	1910 to 1914	1914 to 1919	1919 to 1924	1924 to 1929	1914 to 1924
New York	+ .06	+ 1.46	— 1.70	— .66	— .34	— .82	— 2.47	— 2.55	+ .76	— 5.16
Pennsylvania	— .01	+ 1.27	— 3.57	— .61	— 2.30	— 1.11	+ .82	— 3.80	+ .49	— 2.98
Ohio	— 2.22	+ 9.02	— 7.45	— 2.98	+ .61	— .76	— .96	+ .24	+ 1.32	— .68
Indiana	+ 1.08	+ 2.83	— 8.28	— 1.24	— 6.29	— .80	+ 4.82	— 1.26	0	+ 3.43
Illinois	— .52	+ 8.12	— 7.01	— .31	+ .81	— .04	+ 1.61	— .09	+ .34	+ 1.51
Michigan	— 1.25	+ 2.38	— 2.53	+ .83	— .62	— .33	+10.69	—10.36	— 1.15	— 1.55
Wisconsin	— .03	+ 4.77	— 5.06	— .13	— .89	— 1.04	0	— .84	+ .54	— .94
Minnesota	+ .42	— 1.92	—14.93	— 2.24	—17.38	+ .17	+ 1.36	+12.16	+ 2.97	+13.96
Iowa	+ 1.09	+ 3.18	— 4.78	+ .01	— 1.82	— 1.13	+ 2.31	+ .74	+ 2.94	+ 3.08
Missouri	+ 2.14	+14.74	—18.51	— .02	— 5.73	— .07	+ 4.05	— .84	— .59	+ 3.12
North Dakota	— 3.18	+14.03	— 3.57	+ 7.84	+ 9.40	— .37	+12.16	+ 6.06	— 1.68	+20.01
South Dakota	— 1.80	+ 4.31	—12.96	+ 5.48	—10.80	— 4.36	+ 5.58	+ 9.03	+ 5.42	+16.11
Nebraska	+ 3.89	+ 3.97	— 7.41	+ 4.03	— 4.01	— 2.17	+ 2.33	+ .88	+ 3.11	+ 3.29
Kansas	+13.76	+13.97	— 7.28	+ 9.62	+ 6.22	+ .26	+ .99	— 1.84	— .33	— .98
Maryland	+ .58	+ 2.63	— 8.22	+ 1.81	— 5.72	— .23	+ .63	— .56	+ .13	+ .06
Virginia	+ .64	+ 5.71	— 8.30	+ 1.34	— 3.56	+ .24	— .50	— .27	+ .23	— .80
North Carolina	+ .18	+ 2.08	— 6.59	+ .79	— 4.68	+ .65	— .83	+ 1.77	+ 1.64	+ .98
Kentucky	— .77	+ 1.30	— 9.72	— 1.00	— 9.00	+ .02	+ 2.73	— 1.63	+ 1.21	+ 1.00
Tennessee	— .45	— .70	— 5.90	+ 1.23	— 7.12	+ .22	— 2.26	— .75	+ .79	— 3.08
Oklahoma	+11.28	+25.97	— 8.96	+ 7.69	+15.13	+ 4.41	+ 6.90	— 2.33	— 6.54	+ 4.08
Texas	+ 4.82	+15.41	—10.70	+16.23	+ 3.36	+ 2.51	+11.67	— 3.09	+ 3.37	+ 8.18
Montana	+37.02	+118.89	—12.55	+17.58	+87.84	+28.15	+ 7.99	— 2.46	+ 4.13	+ 1.91
Idaho	+ 4.70	+33.06	—10.74	+ 9.55	+18.00	+ 8.80	—13.11	— .32	+ 1.09	—13.56
Wyoming	+ 7.58	+ 9.21	— 4.06	+ 8.59	+ 4.83	+13.47	—11.97	+ 5.56	+11.00	— 5.99
Colorado	+ 4.10	+36.76	+ 2.75	+ 3.60	+41.47	+ 6.39	— .17	+ 4.77	+ 6.49	+ 7.98
New Mexico	+11.55	+15.44	+13.61	+19.62	+35.94	+ 4.26	+ 1.84	— .15	— 1.01	+ 1.61
Utah	+14.20	— 2.45	— 8.11	+ 7.43	—10.51	+ 5.65	— 5.02	— 2.70	+ 3.12	— 7.71
Washington	—10.23	+22.46	— 7.23	+ 8.93	+13.52	+ .59	— 5.47	— 1.54	+ .34	— 7.38
Oregon	+ 3.19	+12.73	— 5.27	+ 5.46	+ 6.69	+ 3.76	— 4.37	— 2.26	+ 3.18	— 6.96
California	— 3.43	+16.36	— 8.36	+ .80	+ 8.30	+ .50	—10.31	— 6.10	+ 7.67	—16.21

* The figures above show the percentage increase or decrease that occurred in the acreage of wheat and of other small grains between the earlier and the later year of each period. Calculated from data in Appendix Table I.

TABLE V.—PERCENTAGE CHANGES IN THE ACREAGE OF CORN AND TAME HAY IN PRINCIPAL WHEAT-PRODUCING STATES BETWEEN DESIGNATED YEARS IN 1910–29*

(Percentages)

State	Corn					Tame Hay				
	1910 to 1914	1914 to 1919	1919 to 1924	1924 to 1929	1914 to 1924	1910 to 1914	1914 to 1919	1919 to 1924	1924 to 1929	1914 to 1924
New York	+ .35	+ 3.01	— 1.14	— .01	+ 1.80	— 1.76	+ 3.82	+ 1.05	— 5.20	+ 4.92
Pennsylvania	+ .45	+ 1.62	— 3.62	— .10	— 2.01	+ .80	— 3.56	+ 2.99	— 3.39	— .56
Ohio	— 2.75	+ 2.86	— 4.42	+ .82	— 2.13	— 3.44	+ 2.07	+ 2.65	— 2.61	+ 5.07
Indiana	+ 1.37	— .61	— 3.60	— 3.04	— 4.57	— 1.48	+ 3.08	+ 2.26	— 1.95	+ 5.57
Illinois	+ .47	— 9.04	+ 1.80	— .23	— 7.16	— 3.98	+ 3.59	+ 2.78	+ .20	+ 6.49
Michigan	+ 1.11	— 1.56	— .38	— 3.60	— 2.01	— 2.88	+ 6.66	+ 2.83	— .83	+10.00
Wisconsin	+ 2.69	+ 2.00	+ 3.45	— 1.67	+ 5.86	+ 1.58	+ 5.04	+ 4.22	+ 1.40	+ 9.76
Minnesota	+ 4.37	+ 2.97	+11.50	— 2.22	+14.88	— .42	+ 1.13	+ 2.42	+ 1.74	+ 3.63
Iowa	+ 3.95	— 1.49	+ 4.68	+ .15	+ 3.41	— 5.18	+ .70	+ 1.35	— .37	+ 2.12
Missouri	— 2.10	— 9.09	+ 2.24	— 6.85	— 6.61	— 4.55	+ .88	+ 5.82	+ 2.27	+ 7.32
North Dakota	+ 2.22	— .53	+ 5.31	— 1.45	+ 6.35	+ .38	+ 3.84	+ .26	+ 2.02	+ 4.17
South Dakota	+ 9.53	+ 2.93	+13.33	+ .79	+18.48	+ .61	+ 3.75	+ 2.05	+ .38	+ 6.13
Nebraska	— 2.21	— .47	+10.57	+ 2.58	+10.90	+ 1.42	+ 1.81	— .11	— 1.32	+ 1.69
Kansas	—16.24	— 8.91	+ 9.23	+ .42	+ .92	0	+ .39	— .77	— .95	— .43
Maryland	+ .17	— 1.03	— 6.64	— .13	— 7.78	+ .87	— .57	+ 2.59	— .39	+ 2.06
Virginia	— 1.04	— 1.46	— 9.11	+ .67	—11.64	— 2.91	+ 8.00	+ 2.35	+ .06	+10.62
North Carolina	+ 4.79	— 7.45	— 5.11	— 1.53	—12.70	+ .13	+ 8.88	+ .31	+ 3.12	+ 9.20
Kentucky	+ 2.75	— 3.64	— 7.12	— 2.33	—11.19	— 3.48	+ 5.59	+ 1.21	+ 2.61	+ 6.88
Tennessee	— .90	+ 1.82	— 6.04	— 3.09	— 4.75	— 3.69	+10.05	+ .75	+ 1.98	+10.87
Oklahoma	—20.51	—17.02	+ 2.54	+ 1.82	—13.94	+ 1.37	+ 5.11	— 3.26	+ 1.42	+ 1.16
Texas	— 4.65	—15.56	—10.70	+ 7.52	—27.62	+ .74	+ 1.12	+ 2.77	— 2.17	+ 4.25
Montana	+ 2.27	+ 3.17	+ 4.43	— 2.04	+14.15	+ 7.00	+17.51	+ .74	+ 4.11	+19.35
Idaho	+ .60	+ 1.17	+ 1.03	— .52	+ 2.61	+ 4.96	+19.11	+ .95	+ .96	+20.45
Wyoming	+ 1.68	+ 2.65	+14.53	— .26	+18.30	+23.58	+ 7.83	+ 8.33	+ 4.04	+16.80
Colorado	+ 6.18	+23.49	+10.55	— 1.74	+41.52	+10.06	+10.80	+ .89	— 1.24	+12.31
New Mexico	+ .91	+37.32	— 5.20	— 1.59	+29.49	+15.20	— 3.92	— 2.29	+ 3.32	— 7.37
Utah	+ .76	+ .93	— .59	+ .48	+ .35	+10.08	+ 5.96	+ 9.40	+ 4.92	+15.30
Washington	+ .24	+ .80	— .46	+ .14	+ .22	+ 2.34	+ 5.82	— .23	— .71	+ 5.53
Oregon	+ .21	+ 2.27	— .51	+ 1.16	+ 1.68	+ 6.13	+ 4.23	+ .08	— .95	+ 4.32
California	+ .22	+ 1.85	— 1.44	0	+ .46	+ 6.47	—11.43	— 3.79	— 5.12	—15.09

* See note to Appendix Table IV. Calculated from data in Appendix Table II.

TABLE VI.—PERCENTAGE OF THE TOTAL CROP AREA THAT WAS IN WHEAT IN PRINCIPAL WHEAT-PRODUCING STATES IN DESIGNATED YEARS, 1910–29; AND CHANGES IN THESE PERCENTAGES BETWEEN DESIGNATED YEARS*

(*Percentages*)

State	Percentage of total crop acreage that was in wheat					Change of percentage between				
	1910	1914	1919	1924	1929	1910 and 1914	1914 and 1919	1919 and 1924	1924 and 1929	1914 and 1929
New York	5.0	5.2	6.3	4.8	4.3	+ .2	+ 1.1	— 1.5	— .5	— .9
Pennsylvania	18.4	18.3	19.6	17.4	17.4	— .1	+ 1.3	— 2.2	0	— .9
Ohio	20.0	19.5	25.3	19.6	17.2	— .5	+ 5.8	— 5.7	— 2.4	— 2.3
Indiana	22.0	23.1	23.5	17.1	16.9	+ 1.1	+ .4	— 6.4	— .2	— 6.2
Illinois	13.0	13.0	20.3	13.6	13.3	0	+ 7.3	— 6.7	— .3	+ .3
Michigan	13.7	12.9	12.9	11.6	13.1	— .8	0	— 1.3	+ 1.5	+ .2
Wisconsin	2.5	2.4	6.4	1.3	1.2	— .1	+ 4.0	— 5.1	— .1	— 1.2
Minnesota	31.2	30.2	27.3	11.2	8.9	— 1.0	— 2.9	—16.1	— 2.3	—21.3
Iowa	3.1	4.2	7.1	2.2	2.2	+ 1.1	+ 2.9	— 4.9	0	— 2.0
Missouri	16.0	19.0	30.5	13.5	14.2	+ 3.0	+11.5	—17.0	+ .7	— 4.8
North Dakota	59.0	56.4	54.4	47.0	51.4	— 2.6	— 2.0	— 7.4	+ 4.4	— 5.0
South Dakota	38.7	35.5	34.1	19.0	21.8	— 3.2	— 1.4	—15.1	+ 2.8	—13.7
Nebraska	22.0	25.7	27.5	19.4	21.6	+ 3.7	+ 1.8	— 8.1	+ 2.2	— 4.1
Kansas	33.7	48.6	58.8	51.8	56.5	+14.9	+10.2	— 7.0	+ 4.7	+ 7.9
Maryland	35.5	35.5	37.6	33.6	35.0	0	+ 2.1	— 4.0	+ 1.4	— .5
Virginia	20.6	21.9	24.7	19.4	20.3	+ 1.3	+ 2.8	— 5.3	+ .9	— 1.6
North Carolina	16.1	15.4	17.0	11.5	11.8	— .7	+ 1.6	— 5.5	+ .3	— 3.6
Kentucky	15.0	14.5	14.9	6.2	5.2	— .5	+ .4	— 8.7	— 1.0	— 9.3
Tennessee	13.7	14.0	12.2	7.1	8.3	+ .3	— 1.8	— 5.1	+ 1.2	— 5.7
Oklahoma	19.5	31.9	47.8	44.2	49.7	+12.4	+15.9	— 3.6	+ 5.5	+17.8
Texas	8.4	12.8	25.0	18.3	27.6	+ 4.4	+12.2	— 6.7	+ 9.3	+14.8
Montana	25.3	35.8	62.5	55.4	58.9	+10.5	+26.7	— 7.1	+ 3.5	+23.1
Idaho	32.1	30.9	45.6	38.3	43.1	— 1.2	+14.7	— 7.3	+ 4.8	+12.2
Wyoming	9.6	11.7	19.4	12.4	17.0	+ 2.1	+ 7.7	— 7.0	+ 4.6	+ 5.3
Colorado	22.4	20.9	33.7	30.7	32.0	— 1.5	+12.8	— 3.0	+ 1.3	+11.1
New Mexico	12.5	18.2	22.3	33.9	44.5	+ 5.7	+ 4.1	+11.6	+10.6	+26.3
Utah	31.3	34.8	32.5	24.9	27.9	+ 3.5	— 2.3	— 7.6	+ 3.0	— 6.9
Washington	64.2	58.0	65.1	64.0	67.0	— 6.2	+ 7.1	— 1.1	+ 3.0	+ 9.0
Oregon	38.6	36.9	43.2	41.2	42.9	— 1.7	+ 6.3	— 2.0	+ 1.7	+ 6.0
California	12.5	8.8	26.0	22.0	22.1	— 3.7	+17.2	— 4.0	+ .1	+13.3

* The "total crop acreage" includes the acreage in wheat, other small grains, corn, and tame hay, as shown in Appendix Table III; calculated from these data and wheat acreage statistics shown in Appendix Table I.

TABLE VII.—TOTAL WHEAT ACREAGE SOWN, BY STATES AND GROUPS OF STATES, 1922–29*

(Thousand acres)

State and region	1922	1923	1924	1925	1926	1927	1928	1929
Maine	4	5	4	7	6	4	4	4
Vermont	4	4	1	2	2	1	1	1
New York	474	416	340	316	302	304	336	293
New Jersey	79	76	56	57	62	61	63	63
Pennsylvania	1,366	1,316	1,171	1,148	1,201	1,126	1,217	1,130
Delaware	112	109	105	104	105	99	103	102
Maryland	590	620	521	503	528	533	546	549
Virginia	843	859	665	643	697	701	716	711
West Virginia	244	236	133	149	148	137	144	136
North Carolina	609	555	436	412	456	498	477	466
South Carolina	183	179	60	48	51	85	73	67
Georgia	209	199	131	104	107	136	111	90
Total, Atlantic states	4,717	4,574	3,623	3,493	3,665	3,685	3,791	3,612
Kentucky	670	642	294	264	265	305	348	247
Tennessee	492	454	360	390	448	556	584	422
Alabama	22	16	8	7	7	8	5	4
Mississippi	6	4	10	8	5	7	5	4
Arkansas	81	73	35	33	31	35	31	29
Total, southern states	1,271	1,189	707	702	756	911	973	706
Ohio	2,577	2,684	2,063	2,098	1,850	1,665	2,408	1,749
Indiana	2,079	2,208	1,832	1,977	1,755	1,845	2,270	1,699
Illinois	3,355	3,675	2,710	2,359	2,397	2,642	3,620	2,648
Michigan	1,044	1,022	857	869	1,058	915	985	918
Missouri	3,234	2,882	1,805	1,775	1,484	1,761	2,205	1,802
Total, main soft winter-wheat belt	12,289	12,471	9,267	9,078	8,544	8,828	11,488	8,816
Grand total, eastern soft winter-wheat belt	18,277	18,234	13,597	13,273	12,965	13,424	16,252	13,134
Iowa	745	767	465	423	392	451	568	467
Nebraska	4,384	4,115	3,212	3,261	3,470	3,774	4,060	3,880
Kansas	12,299	11,521	10,226	10,749	11,400	12,430	12,336	12,123
Oklahoma	3,929	3,791	3,838	4,145	4,300	4,635	4,745	4,506
Texas	1,784	1,695	1,437	1,780	1,858	2,434	2,629	2,710
Colorado	2,151	1,929	1,484	1,700	1,787	1,884	1,954	1,658
New Mexico	180	155	235	288	256	257	309	371
Total, hard winter-wheat belt	25,472	23,973	20,897	22,346	23,463	25,865	26,601	25,715
Wisconsin	191	122	118	136	135	147	124	106
Minnesota	1,995	1,859	1,723	2,295	1,940	1,766	1,734	1,377
North Dakota	8,980	9,650	8,500	9,605	9,653	10,246	10,367	9,918
South Dakota	2,995	2,937	2,420	2,743	1,936	3,049	3,332	3,119
Montana	3,787	3,411	3,232	3,773	3,700	3,938	4,413	4,258
Wyoming	181	178	144	161	200	233	250	244
Total, hard spring-wheat belt	18,129	18,157	16,137	18,713	17,564	19,379	20,220	19,022
Idaho	1,144	1,068	880	998	1,074	1,192	1,184	1,099
Arizona	54	46	33	33	39	59	47	43
Utah	297	276	208	236	240	247	260	270
Nevada	21	20	14	15	17	18	18	16
Washington	2,593	2,517	2,250	2,940	2,142	2,339	2,362	2,564
Oregon	1,128	1,138	959	1,614	1,053	1,074	1,063	1,086
California	774	813	820	804	702	837	857	850
Total, Pacific Coast region	6,011	5,878	5,164	6,640	5,267	5,766	5,791	5,928
Grand total, United States	67,889	66,242	55,795	60,972	59,259	64,434	68,864	63,799

* Data for 1922–28 from U.S. Department of Agriculture, *Wheat Acreage, 1922–29* (mimeographed, October 9, 1929); for 1929, from *Crops and Markets*, December 1929.