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Upon the request of the Committee on Graduate Study the undersigned have examined a thesis entitled

A PRELIMINARY STUDY OF THE ECONOMICS OF THE STRAWBERRY

INDUSTRY IN TENNESSEE

presented by William Curtis Stone

candidate for the degree of Master of Science in Agriculture, and hereby certify that it is worthy of acceptance.

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Aug 26/30

A PRELIMINARY STUDY OF THE
ECONOMICS OF THE STRAWBERRY INDUSTRY IN TENNESSEE

A THESIS

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of the

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Partial Fulfillment of the Requirements

for the degree of

Master of Science in Agriculture

WILLIAM CURTIS STONE.

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PREFACE

This preliminary report, written under the supervision of the Experiment Station Staff of the Department of Agricultural Economics, is a preliminary report on the Economics of the Strawberry Industry in Tennessee, one of the major projects of that department.

It is devoted largely to such production phases as trends in acreage and production in both the United States and Tennessee, production costs in this state, and the relation of some production practices to the quality and appearance of the fruit. Due to lack of time the strictly marketing phases included in this report have been confined to a statistical study of carload shipments in Tennessee and competing states. This, it is hoped, will furnish the necessary background for a further study of the marketing systems in this state, the objects of which are set forth in the Introduction to this report.

Seventeen phases of the study have been outlined for the entire project, of which time has permitted only the first seven to be written up and included in this preliminary report. These seventeen phases are as follows:

- I. Introduction.
- II. Brief History of the Development of the Strawberry Industry in the United States.
- III. Trends in Strawberry Production in the United States, 1899 to 1930.
- IV. Trends of Strawberry Production in Tennessee as a Whole and by Counties, 1899 to 1924.
- V. Cost of Production.
- VI. Influence of Some Production and Harvesting Practices on the Quality and Appearance of Strawberries.
- VII. Origin of and Total Carlot Shipments of Strawberries.
- VIII. Distribution of Carlot Shipments of Tennessee Strawberries.
- IX. Transportation and Refrigeration of Strawberries.
- X. Prices of Strawberries.
- XI. Demand for Strawberries.
- XII. Processing of Strawberries.
- XIII. Marketing Through Independent Dealers.
- XIV. Legal Phases of Cooperation.
- XV. Marketing Through Cooperative Associations.
- XVI. Study of Inactive Cooperative Associations.
- XVII. Summary and Conclusions.

Considerable data have been collected on the unfinished phases, from VIII to XVI inclusive. This includes the field data on marketing obtained in the East Tennessee producing area in the spring of 1930.

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The study is to be continued by the Department of Agricultural Economics during the fiscal year 1930 - 1931. The field data now available on East Tennessee will be supplemented by data to be obtained from the Middle Tennessee and the West Tennessee producing areas.

Special acknowledgements are due to Professor C. E. Allred, Head of the Department of Agricultural Economics, under whose supervision the data have been collected and analyzed. Assistance has also been rendered by S. W. Atkins and E. J. Hopkins, Assistant Economists in this department, and by B. F. Lucas, Research Assistant. Without the aid of these men and the assistance of Miss Mildred Gallaher, office secretary, this report could not have been prepared in its present form.

Acknowledgements are also due some members of other departments of the University of Tennessee; especially to A. L. Jordan, Extension Marketing Specialist, and to Professors N. D. Peacock and A. B. Strand of the Horticultural Department, for their helpful suggestions.

Many farmers, railroad officials, and agricultural workers have contributed information. I take this means of expressing my appreciation to them for their hearty cooperation, without which some of the data would not have been available for this report.

W. Curtis Stone.

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Chapter I.

INTRODUCTION

Importance of the Strawberry Industry.

The following quotation from an early report of the U. S. Patent Office indicates the wide range of climatic conditions to which the strawberry plant is adapted:

There is perhaps no fruit that grows so universally in every part of the world as the strawberry. It is found in the snowy regions of the North and on the sunny plains of the South. It grows in the valley and creeps to the summit of the hill. It is a universal favorite with all races of men. (1)

Strawberries have been of commercial importance in Tennessee since about 1890, the first car-load having been shipped in 1881 from Greenfield in West Tennessee. However, some strawberries were being produced for sale as early as 1848.

The strawberry produced in Tennessee from 1918 to 1927 had an average annual farm value of \$3,379,000.00 (2). In 1924 this value was \$3,414,000 or about 2% of the value of all farm crops. Although this represents a small percentage of the value of all farm crops grown in the state, strawberries is one of the leading commercial fruit crops. In acreage it exceeded that of tobacco, peanuts and barley; about equalled that of sweet potatoes; but was only about two-thirds as large as that of potatoes.

In 1919 and 1924 strawberries were grown on 3.9% and 3.3% respectively of Tennessee farms (3). While they are produced commercially by a comparatively

(1) Report of U. S. Patent Office in 1853.

(2) Compiled from reports of the U. S. D. A.

(3) Special tabulation by Census Bureau.

small percentage of farmers and in less than one-half of the Tennessee counties, they constitute a crop which is of vital importance in some areas. The following extracts from letters from officials of some Chambers of Commerce in this state will give some idea of the significance of this crop.

(No industry has benefitted any community more than strawberry growing has this community. This industry brings to this community in cash each season not less than one half million dollars, when conditions are normal. Berries are profitable to grow and many homes have been purchased outright from the sale of berries. Children are given employment during the picking season and the nature of this work makes it so the little tots can earn good money picking berries. No crop that we know of scatters money so evenly throughout a section than berries. This crop helps to school many a girl and boy who would be unable to get an education otherwise. We are of the opinion that the standards of living have been raised fifty per cent in this section on account of this industry (4).)

Several hundred car loads of strawberries are shipped from West Tennessee annually. This results in realizing returns on a cash crop several months before cotton is put on the market by farmers. The result is obvious. It increases the income of farmers in the strawberry sections and this increase raises their economic and social standards. In addition to the income from the sale of berries, employment is given to a number of laborers during the picking and packing season. (5)

It is my belief that in Ripley, Covington, Dyersburg, and other small communities in West Tennessee the economic and social condition, employment of labor, and standards of living are vitally affected by the strawberry industry. (6)

The effect of the strawberry industry from a social standpoint has been to give dignity to labor that appeals to all classes. From its attractiveness in the picking and packing of the berries, from a standpoint of their beauty as well as food value, and from an economical standpoint, it gives a wide distribution of benefits, as women and children, as well as men, can have a part in the benefits. It gives encouragement to diversification, and when properly looked after in quality and in marketing, the crop is profitable. These benefits are mutual with the landlord and tenants. The strawberry industry raises standards of living and labor conditions. (7)

(4) H. L. W. Hill, Portland, Tennessee.

(5) Hugh Harvey, Jackson, Tennessee.

(6) C. M. Anderson, Memphis, Tennessee.

(7) A. D. Hassell, Humboldt, Tennessee.

These quotations indicate the importance of the strawberry industry in some producing areas of East, Middle, and West Tennessee. It is indicated that growing strawberries commercially utilizes surplus labor, brings wealth into the community and in general improves the economic and social conditions, thus tending to raise the standards of living.

The strawberry industry gives the producer an income early in the summer which may be used in the production of the more important crops.

It is claimed that the general character of a whole community has been changed as a result of the introduction of strawberries as a farm enterprise. (8)

The Marketing Problem.

The strawberry marketing problem began with the commercial production of strawberries and has continued until the present time. However, it has been more conspicuous at times when the producers were not satisfied with returns from sales. Commercial agriculture has affected strawberries in the same way that it has affected many other phases of the agricultural industry. With commercial production have come additional middle men's services with time, place, and form utility.

The first strawberries grown in Tennessee for market were doubtless sold locally for cash or barter. Nevertheless a marketing problem arose at that time. Then, as at present, consumers demanded certain characteristics in market products.

The problem of successful marketing has become more outstanding and of more significance in recent years due to more complicated marketing conditions. This report proposes to point out some of the causes, and insofar as possible, offer remedies for the undesirable conditions.

Producers Objections to Marketing Systems and Practices. The results of questionnaire studies and limited field investigations show that some improvements are probably needed. Producers' objections stated in the returned questionnaires are given in this connection as indicative of the trend of their thinking as to what is wrong with the marketing phases of the industry. They are not presented as being conclusions based on thorough investigations. It is evident, from an examination of these objections as presented in Table I, that they are based to some extent on incoherent thinking and are stated in very general terms. Regarding the latter, reference is made particularly to the objections relative to the "poor marketing system" and "no profit to growers", that were mentioned the most frequently by those that replied to inquiries.

Fifty-nine of the growers listed their objections. These are presented in Table I in the order of their greatest frequency of occurrence. Those with the same meaning were grouped together and stated in words as near those of the producers as possible and yet have this grouping.

Table I.
Strawberry Producers' Objections to the Present Marketing Conditions
and Practices.

Rank	Objections	Number of Farmers Objecting			Total
		Those who market through co-operatives.	Those who market through independents.	Those who do not state method of marketing	
1.	There is a poor marketing system	10	3	6	19
2.	There is no profit for growers	5	8	2	15
3.	The coop. is of no help	10			10
4.	The berries are poorly graded	4	1	1	6
5.	Dealers are dishonest		6		6
6.	Cooperative marketing is needed		5		5
7.	The coop. manager is dishonest	4			4
8.	There are too many middle men	1	2	1	4

continued

Table I (continued)

Rank	Objections	Number of Farmers Objecting			Total
		Those who market through co-operatives.	Those who market through independents.	Those who do not state method of marketing.	
9.	The berries are poorly inspected	2	1	1	4
10.	There is no premium for quality		1	2	3
11.	We need a cash buyer	2		1	3
12.	The berries are of poor quality	1	1		2
13.	The marketing is too expensive	2			2
	Total	41	28	14	83
	Number Growers Reporting	28	22	8	58

This table shows 13 objections. The first two, referring to poor marketing systems and no profits, are the results of the others. In voicing their objections some have generalized while others have been more specific. Of the more specific objections about one-fifth referred to quality, grading, and inspection; about one-fifth to marketing through independent dealers; approximately the same percentage referred to objections to cooperative associations.

The Status of Cooperative Marketing of Strawberries. As will be shown in the chapter on cooperative marketing, many strawberry cooperative associations have become inactive during the last decade. Others have been inactive only a part of the time. At the present time only a very few of the active associations are functioning successfully.

Those who oppose cooperative marketing will probably cite the above condition as proof that there is something wrong with cooperative marketing in general. In doing this they possibly fail to see that many of the cooperatives came into existence under adverse conditions, and that growers who have marketed through independent dealers have been confronted with these same conditions. Some cooperative failures were probably caused by economic conditions rather than to any faults of the cooperatives themselves. It is

hoped that in this report the true causes of failures and successes of cooperatives will be presented, an understanding of which should be helpful in the operation of such associations in this state in the future.

Tennessee's Rank in Acreage, Production, and Price. Tennessee has had a relative decline in both acreage and production among the other producing states since 1918. From that time until 1926 this state ranked first except in 1921 when the rank in acreage was second and in 1925 when the rank in production was third. Beginning in 1926 the rank in acreage has declined, at first to third, and then to fourth. The rank in production has followed fairly closely that of acreage.

Of the six second early states Tennessee has ranked lowest in price per quart three years during the period from 1918 to 1929 - in 1922, 1923, and 1929 with a price of 10¢, 9¢, and 8¢ respectively. This also represents the lowest price among the other producing states for those three years, with the exception of 1923 when Oregon ranked lowest with a price of 7¢ per quart.(9) Tennessee has never ranked first among the second early states during this eleven-year period. Its rank was second during two years; third for two years; fourth for three years; and fifth for one year. During the past three seasons, 1927, 1928, and 1929, it has been fourth, fifth, and sixth respectively.

Specific Statements of Objects of This Study

The importance of the industry and some of its more important needs have been indicated in the foregoing paragraphs. The principal objects of this study are as follows:

(1) To determine the present status and methods of operation of strawberry cooperative marketing associations.

(9) These are prices paid to farmers, taken from reports of the United States Department of Agriculture.

(2) To study the associations from a historical standpoint largely to determine causes for their successes and failures.

(3) To determine methods and cost of marketing through both independent dealers and cooperative associations.

(4) To determine the factors affecting the prices of Tennessee strawberries, which have been relatively low as indicated previously.

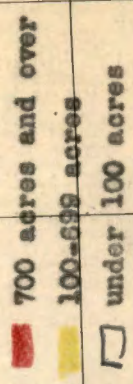
(5) In general to determine, insofar as is possible in the limited time, in what ways the producers can be helped in the economics of both production and marketing of this crop.

It is not the object of this report to solve nor attempt investigation of all of the problems relative to this industry in Tennessee. The investigations have thus far been somewhat preliminary in nature, in most cases, in comparison with the more detailed investigations which should later be made in connection with a study of this kind. An attempt has been made to pave the way for later investigations of a more detailed nature, and to point out some of the more important problems yet in need of investigation.

Commercial Producing Areas in Tennessee

Commercial production of strawberries in this state is confined principally to three areas - the south central part of East Tennessee; the north central part of Middle Tennessee, commonly referred to as the Portland area; and the central part of West Tennessee. As shown by Map I the principal producing counties in East Tennessee were Rhea, Meigs, and Hamilton in 1924. This still held true in 1930. Sumner County is the only one of commercial importance in the Middle Tennessee area. Lauderdale, Crockett, Gibson were the leading West Tennessee counties in 1924. Madison, Weakley, and Haywood, while in the larger group of important commercial producing counties, ranked lower.

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TENNESSEE

SCALE

Since 1924 there may have been considerable changes in the rank of the counties within these producing areas. But this cannot be determined since no county data are available since the 1925 census. It is known, however, that the producing areas are in the same parts of the state now as in 1924.

Method of Study.

This report is based on data collected on field trips, from questionnaires, and from various publications and reports. Field trips have been made to the principal strawberry sections in East Tennessee, and to some of the counties of the southern part of Middle Tennessee, in which the commercial production of this crop is relatively of small importance as compared with the principal producing areas. The data were obtained from various people interested in the production and marketing of this crop, such as growers, officials of cooperative associations, county agents, agricultural teachers, independent dealers, and from others who are interested in the success of the industry, principally bankers and merchants.

The organization and operation of cooperative marketing associations was emphasized in these field investigations. For this purpose special field blanks were used covering, among others, such phases as the early history, and organizational structure of cooperative associations, methods and costs of marketing, distribution of shipments, membership and membership contracts, grading and packing, prices, pooling, volume of shipments, relationship of independent dealers to the association, and the success factors. Both active and inactive associations were investigated. Such data were secured largely from the officials and members of the respective associations. It was realized by the investigators that information collected from these sources alone would probably not represent the true condition, especially in regard to the degree of success enjoyed by the associations and the causes for their success or

failure. Consequently some non-member growers, business men, and agricultural workers were interviewed in this connection. In addition, field data were obtained on the recent trends in acreage and production in each community visited, the attitudes of growers and dealers in regard to the possibilities of the industry, methods of marketing through independent growers, general cultural, grading, and packing practices, and other information connected with the economics of strawberry production and marketing.

Due to the lack of time and funds no field work has yet been done in the other two principal commercial strawberry sections, that is in the western and north central part of the state.

In addition to the field work questionnaires were mailed to about 400 growers and handlers of strawberries in each of the three producing areas. Approximately 100 replies were received. While they are possibly not representative in all respects they furnish useful information in regard to production and marketing practices throughout the state. Where possible the results have been checked against similar data from other sources. In such cases the data from the different sources compare favorably. For instance the percentage decrease in acreage in Tennessee from 1928 to 1929 was about 21% as tabulated from the questionnaires and 20% as estimated by the U. S. Department of Agriculture.

Use has been made of survey data collected in East and West Tennessee by the U. S. Department of Agricultural Economics in cooperation with the Agricultural Extension Department of the University of Tennessee. This survey in this state was made as a part of a survey of the strawberry industry in the United States. Use has been made also of similar data collected in the Bowling Green area of Kentucky which is almost adjacent to and similar in many respects to the Middle Tennessee or Portland area.

Additional information and suggestions were obtained from the follow-

ing sources: the publications of the various state agricultural experiment stations, year books, bulletins and reports of the U. S. Department of Agriculture, annual reports of the U. S. Patent Office, Census reports, and various books relating to the economics and history of the strawberry industry.

Every opportunity has been taken to gain information from the Agricultural College students attending the University of Tennessee.

Chapter II.

BRIEF HISTORY OF THE DEVELOPMENT OF THE STRAWBERRY INDUSTRY
IN THE UNITED STATESThe Wild Strawberry (1)

The first white settlers at Jamestown in 1607 found wild strawberries abundant. Captain John Smith mentioned strawberries which ripened in April. One of the early colonists reported to his English friends that in the woods there were great areas of land overgrown with strawberry plants and that the berries were four times larger and much more exquisitely flavored than the wild strawberries of England.

For a century or two after the settlement of Virginia wild strawberries were so plentiful that very few persons took the trouble to transplant them, but could find enough to fill their baskets, when they had a mind, in the deserted old fields. The early new England colonies had a similar experience with the wild strawberries. Likewise the pioneers of the Mississippi Valley and the "forty-niners" of California enjoyed the fruit of the abundant wild strawberry.

These early settlers did not cultivate the strawberries until the land was fairly well subdued with tilled crops. There was no garden culture, except transplanted wild plants before 1750. The first strawberries marketed in the United States were of the wild species. At this time the strawberry season was limited to three or four weeks.

(1) Fletcher, S. W. The Strawberry in North America.

Early Commercial Production (2)

In the North and East. The cultivation of strawberries for market began early in the 19th Century. Until that time only wild fruit had been marketed, but at about this time the demand for strawberries increased until it could no longer be met by neighborly barter, and in response commercial strawberry culture, distinguished from garden culture, began. The first commercial strawberry production began in the vicinity of New York, Boston, Philadelphia, and Baltimore about 1812. The development was very slow until about 1840, at which time marketing conditions and varieties had been considerably improved.

Between 1838 and 1854 there was a considerable expansion of the strawberry industry, the greatest progress being made at Cincinnati. Between 1845 and 1849 Cincinnati was the leading strawberry market. In 1846, 4200 bushels were marketed there; in 1847, 4546 bushels; and in 1848, 4965 bushels (3). According to the U. S. Patent Office Report for 1848 the entire production of strawberries in the Cincinnati area was 6500 bushels in 1847, and 7000 bushels in 1848.

At this time the New York strawberry supply was coming by rail from the more distant points in the states of New York and New Jersey which until this time had not been accessible. On June 20, 1847, one train carried 26,667 quarts of strawberries into New York City, and in 1849 in 26 days 4,572 bushels were sold in New York City. This was a total of 146,304 quarts, or a daily average of 5,627 quarts.

The extracts from U. S. Government reports as given below will give an idea of some of the early commercial production (4).

(2) Fletcher, S.W. Op. cit.

(3) Strawberries were measured in bushels instead of in quarts.

(4) Extracts from U. S. D. A. reports. The U. S. Patent Reports became the U. S. D. A. Reports after 1862, at which time the U. S. D. A. was created.

The report of 1847 contains the following statement of the amounts marketed:

It is surprising what quantities of strawberries find their ways to the markets of our cities. ----- We find it stated that in 26 days 4572 bushels were sold in New York City; and as much as 514 bushels in a single day. Over 30,000 baskets, equal to 333 bushels, and weighing probably twenty five tons were brought to New York in one day over the Erie railroad. The price was $3\frac{1}{2}$ ¢ per basket.

Large quantities of this fruit are also gathered and sold in Cincinnati. The three best days' sales amounted to 489 bushels, 514 bushels, and 411 bushels respectively.

The quantity sold at Cincinnati in twenty days of 1846 is given as 4,150 bushels and for 1847 4,552 bushels.

The 1848 report gives data on the Cincinnati market as follows:

Four thousand bushels were sold in the Cincinnati market houses during the season of 1845 which was a rather unusually productive year. In 1846 this quantity was increased to 4,200 bushels.

In 1847 the first ascertainment of daily sales was commercial. It has been continued in 1848.

This is shown in the following table:

Table II.

Sales of Strawberries on Cincinnati Market, 1847 and 1848.

1847		1848	
Dates	Bushels	Dates	Bushels
May 24 -----	10	May 19 -----	6
25 -----	15	20 -----	15
26 -----	20	22 -----	20
27 -----	20	23 -----	30
28 -----	40	24 -----	60
29 -----	50	25 -----	75
31 -----	50	26 -----	198
June 1 -----	296	27 -----	313
2 -----	250	29 -----	211
3 -----	50	30 -----	450
4 -----	249	31 -----	589
5 -----	489	June 1 -----	307
7 -----	200	2 -----	352
8 -----	514	3 -----	310
9 -----	411	5 -----	145
10 -----	237	6 -----	450
11 -----	250	7 -----	418

continued

Table II (continued)

1847		1848	
Dates	Bushels	Dates	Bushels
June 12 -----	385	June 8 -----	260
14 -----	100	9 -----	244
15 -----	321	10 -----	156
16 -----	220	12 -----	60
17 -----	176	13 -----	80
18 -----	151	14 -----	50
19 -----	55	15 -----	30
21 -----	12	16 -----	20
22 -----	5	17 -----	10
		19 -----	6
Total -----	4576	Total -----	4965

In 1847 and 1848 large quantities were sent off by railroads; and for the last three years additions must be placed because considerable quantities were sold at hotels, steamboats, private dwellings and confectionaries, and in the consumption of strawberries on the spots where they are raised, by pleasure parties from the city of Cincinnati and other places in their vicinity. I should put down the entire production of strawberries, therefore, in 1847 at 8500 bushels, and in 1848 at 7000 bushels; each successive year increasing the proportion of strawberries sold direct to purchasers at their homes, over that disposed of in markets.

It will be observed that the Monday of each week exhibits lighter sales than the previous Saturday or succeeding Tuesday. In general, however, these tables present a regular ascending and descending grade of production during the 26 days which ordinarily constitutes the season.

The strawberries are brought in cases of from five to eight drawers, each drawer containing thirty or forty quarts, which lie an average depth of two or two and one half inches. They are delivered in Cincinnati for sale as early as 4:00 A. M. to 5:00 A. M., when disposed of at the market houses. A considerable share are sold in tin boxes of one quart each, or wooden ones of two quarts each, which fill up the same kind of drawers. These usually command a better price, not only because of more perfect keeping of the article, but because they measure out more than the ordinary quart measures.

In former years they were brought in in wagons.

The 1861 report continues the report on strawberry marketing:

Why do not the millions of our population have and enjoy so simple and so delicious, so health-giving a luxury as the strawberry? It is because the thousands of producers and those who might be producers of this fine fruit are unacquainted with the simple process that should be pursued in production of paying crops, and perhaps, also, because they will not take the trouble to create the millions of bushels for the

millions of consumers who are ready in all the cities, towns, and villages of our country to pay a full compensation for the labor bestowed on their production.

The productiveness of the strawberry is immense, and the consumption of them is in proportion, and yet they bring a good price. The export demand from some cities helps to keep up the price. Mr. Pardue estimates the sales in the four cities of New York, Boston, Cincinnati, and Philadelphia, at 93,000 bushels (2,976,000 quarts) per annum. A single train has taken into New York 893 bushels (28,546 quarts), and the aggregate amount of sales in that city may be estimated at \$200,000.

The strawberry trade of New York is the largest of any one point in the world. It is estimated that 50,000 bushels are sold annually in New York, while about 12,000 bushels are sold in Philadelphia, 12,000 in Cincinnati; and 10,000 in Boston. During one week 400,000 baskets were received daily in New York.

From one point in New Jersey, twenty five miles distant from the city there were received by steamboat, in a single day, 200,000 baskets. The largest receipt of strawberries in a single day, by railroad, was a load of 892 bushels, or 142,000 baskets, brought in by an evening train on the Erie railroad. New York received from all sources not less than 8,000,000 baskets of strawberries in 1860. The value of these at the wholesale price of 2½¢ per basket was \$200,000, for which the consumers probably paid double that sum.

The 1865 report gives some data on yields and revenues from strawberries as follows:

In the vicinity of Meerstown, New Jersey, there were grown in 1862 more than 6000 bushels of strawberries, which at the moderate rate of \$3.50 per bushel produced a return to the farmers of that vicinity of at least \$20,000.

One farmer whose strawberries are sent to New York, devotes 40 acres to this crop; and another received, for one day's picking, sent to that city, \$300. Two hundred and ten bushels of strawberries have been raised on one acre.

Such extraordinary yields should serve to stimulate fruit growers to inquire into the causes which have conspired to produce these magnificent results, which doubtless can be again obtained.

One grower produced 4,575 quarts of strawberries on 3½ acres. And for these he received \$975.00.

Something of the developments in the industry is given in the 1863 report:

Thirty years ago the daily receipts of strawberries in the city of Chicago - now the second greatest fruit market in the world - could have been carried in one wagon at one load. Now whole railroad

trains are engaged in carrying the daily supply of that market, which often amounts to 300 tons and sometimes twice that amount. A similar increase has taken place in most of the markets of the country.

The production of the Wilson strawberry was the beginning of a new era in strawberry culture, and has carried along the tide of enthusiasm which has planted strawberry fields all over the continent, and covered the tables of the rich and the poor alike with these dishes of fragrance and crimson beauty.

Then the season of this fruit was limited to two or three weeks of its ripening in each locality; now, by the help of railroads, and refrigerator transportation it extends over four or five months of the spring and summer, and strawberries are sometimes transported a distance equal to that from the Pacific to the Atlantic.

Commercial Production in the South. Prior to the development of strawberry cultivation in the South some authorities were of the opinion that it would not be successful there. A Mr. Downing, as quoted in 1853 report of the United States Patent Office, says that "the strawberry properly belongs to cold climates, and though well known, it is of comparatively little importance in the south of Europe." With this statement from this high authority, the horticulturist of the South never dreamed of cultivating the strawberry to any extent, although the woods and fields were covered with the wild berries.

In this same report one southern producer says: "It was knowledge of the fact that the wild strawberries grew all around me, that induced me to try strawberry culture in the South. I do not believe there is a plant in nature that so easily adapts itself to soil, situation, and climate, as the strawberry."

This idea is emphasized further by a statement of Micajah Burnette, Pleasant Hill, Kentucky, in the same report, who says that "nowhere in the world, perhaps, can the strawberry be produced in greater abundance, and in better perfection, with the same attention, than with us." (6) In the report of 1853 one writer says that "the strawberry is one of the most

(6) Quoted from Report of U. S. Patent Office of 1853.

profitable and easily cultivated fruits of the South. It begins to ripen early in April and continues to give a good supply of fruit during four or five months. The average season is from two to three months."

Strawberries were grown in the home gardens of the South from the early days of white occupancy. However, there was no considerable production until about 1860, at which time Norfolk and Charleston berries began to crowd the northern berries off the markets. The southern berries matured from two to several weeks earlier than the northern berries. By 1880 so many southern berries were being shipped north that some of the northern producers were ready to abandon strawberry production. However, soon after this, due to the large amount of spoilage of berries in transit some of the southern strawberry producers were reducing their acreage (7).

The period of railroad building following the Civil War opened up the channels of trade between the North and the South, encouraging the development of the strawberry industry. In 1868 a car load of vegetables including 64 quarts of strawberries were shipped from Mobile, Alabama, to Chicago. This was the first shipment made from the South. Various points in Mississippi began to ship strawberries to Chicago about 1871 in less than carlots. The first strawberry shipments from Louisiana were made from Independence in 1879 and consisted of 16 crates shipped to Chicago by express.

The first carload of strawberries shipped from the South was made from Greenfield, Tennessee, to Chicago in 1881.

Strawberry growing began in West Tennessee, at Memphis, Cadalen, Bartlett, and Milan about 1870. Weakley, Shelby, and Gibson were the first counties in the state to begin commercial production.

The East Tennessee Valley district comprising Hamilton, Rhea, Meigs, and Knox Counties has developed since 1880. J. B. Howell made the first shipment from his farm near Chattanooga.

(7) Fletcher, S. W. Op. cit.

The Ozark region of Arkansas and Missouri has developed since 1890.

The Effect of Varieties on the Historical Development
of the Strawberry Industry (8)

From the reference to it one must conclude that the strawberry varieties received little attention before the 17th Century, nor is it strange that this should have been the case. Only three small fruited species were available for production before that time.

Although the progress in commercial production was not very marked before 1840, several new and improved varieties were introduced. In 1800 the Redwood, Early Hudson, and Old Scarlet were considered the best varieties. By 1836 there were about 50 district varieties being grown, the most valuable of which were: Large Early Scarlet, Hudson's Bay, Methuen, and Mulberry.

In 1835 William Prince, a leading nurseryman, offered for sale 50 varieties, of which Hudson's Bay, Large Early Scarlet, Early Hudson, and Morrisania Scarlet were the only ones of North American origin.

The early growers, knowing but little about the sexual characteristics of strawberry varieties, were often disappointed in finding that thick and luxuriant vines would blossom well but fail to produce berries. The facts concerning the pollination and fertilization of the strawberry had been clearly pointed out by Duchesne and Keens in England but were not generally known and accepted by strawberry growers in either this country or England until a later date. These experiences of failures gave strawberries a reputation for fickleness which was not removed until 1845.

It has been said that there appears to be some relation between strawberry varieties and the cycles of the strawberry industry (9). At any rate

(8) Fletcher, op. cit; U. S. D. A. Farmer's Bulletin No. 1043; Virginia Experiment Station Technical Bulletin No. 11.

(9) A. B. Strand, Assistant Professor of Horticulture, U. of T.

varieties undoubtedly have greatly affected the development of this industry. The successful transportation of berries is dependent partly on their firmness. Prior to the development of a variety having this characteristic the distribution of shipments were confined to relatively small areas. The development of such a variety was favorable to a wider distribution. In other ways new varieties have had their effects on the development of this industry.

A discussion of some of the principal varieties found at different periods is given below in order to show their influence on this industry at the time of their popularity. In this connection some of the early history of these varieties is also given.

Nineteenth Century Varieties. 1. Early Scarlet. The Early Scarlet was the first improved variety of strawberries grown in the United States. It was extensively used until about 1845, and in some areas until 1860. It produced small roundish berries which were considered good as compared with the ordinary wild varieties. This variety was derived from the native wild varieties of the Eastern United States, and although of good quality, the fruit was too soft to ship to distant markets. Consequently, commercial strawberry production was limited to the vicinity of the larger cities until other improved varieties were introduced.

2. The Honey. The Honey variety was introduced in 1838 by Mr. C. M. Honey of Boston and was approved by the Massachusetts Horticultural Society. With this prestige this variety was disseminated to all parts of the country. It produced berries larger and more attractive than any previous variety and was advertised and sold as the "perfect" strawberry. However, this variety proved a disappointment to many commercial growers due to its insufficient pollination.

Apparently the Honey passed out of existence as a commercial variety about 1890, but it was still cultivated in gardens to a limited extent.

3. The Wilson. About 1860 the Wilson, which was introduced in 1854, began to replace the Honey and the Early Scarlet as a commercial variety. It was larger, firmer, and more productive than these varieties. Because of its firmness it could be shipped to distant markets and as a result strawberry production became important throughout the more thickly populated parts of the country. The Wilson was the most cosmopolitan of all varieties. Between 1860 and 1885 it practically monopolized the market.

4. The Crescent. The Crescent was introduced in 1876 and until 1890 was the leading commercial variety. It was more widely grown than any other variety except the Wilson prior to 1890. Its most valuable characteristics were productiveness and great vigor. The Crescent is rarely grown at present because of the competition with varieties that are higher in quality and better shippers.

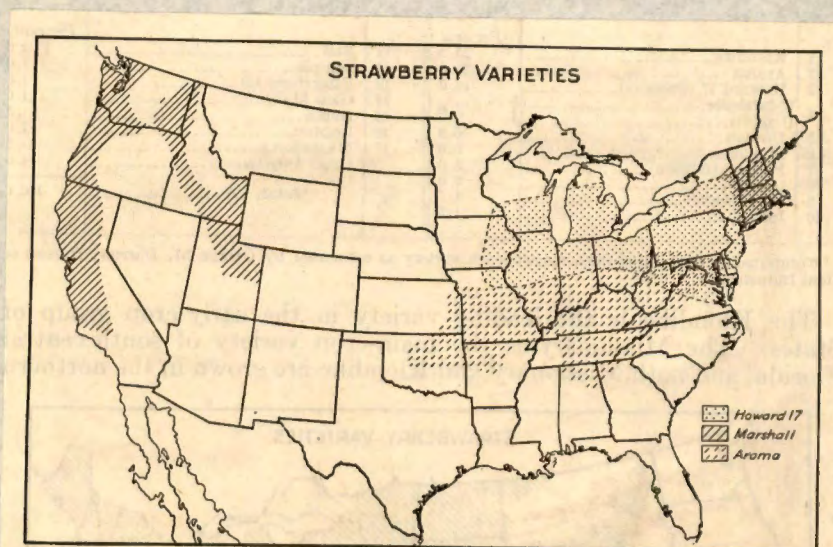
5. The Warfield. The Warfield, which was introduced in 1885, was a cross between the Crescent and Wilson. It became the most important early maturing variety from 1890 to 1900. It produces beautiful berries of excellent shipping quality and withstood frost better than most varieties.

6. The Gandy. This variety was introduced in 1888 and soon became the standard late variety for market and home use, which distinction it still holds. In recent years, however, it has been displaced in some sections by the Aroma. It is an excellent shipper. For the most satisfactory production it requires strong moist soil. The Gandy, as a late variety, and the Warfield, as an early variety, were leaders from 1890 to 1900.

Twentieth Century Varieties. The better varieties of today represent selections which combine a high degree of vigor and robustness, resulting presumably through heterosis, and from an accumulation through selection

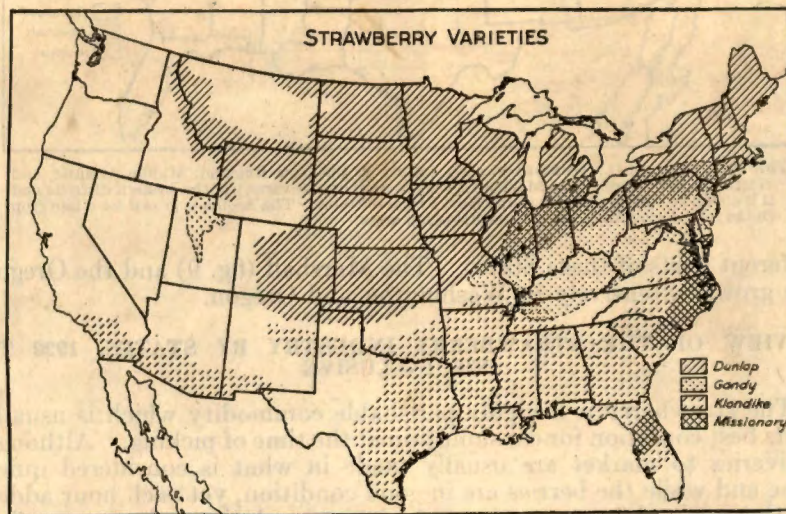
of favorable growth factors. Since the beginning of the present Century there has been no varieties which were distinctly outstanding under all conditions as compared with other varieties. Several have been introduced which are superior to the early varieties but no one of these has led in all areas. They are becoming more and more specialized to meet climatic, soil, disease, and shipping conditions. Hence, an outstanding variety under one condition may be a failure under other conditions.

Since 1900 many varieties have been introduced which are especially adapted to conditions in various parts of the country. Thus the Missionary has become the leading variety in Florida and along the Atlantic Coast to Maryland; the Klondike in most other parts of the South; the Aroma to some extent in the South and in the milder regions of the Central States; the Dunlap in all of the middle west north of the Aroma section; the Jucunda in western Colorado; the Marshall in Oregon; Clerk and Klondike in most parts of the Pacific States; and the Howard and Gandy in the states north of the Ohio and east of the Mississippi Rivers. The present distribution is shown in Maps 2 and 3.



Map 2.

FIGURE 2.—Howard 17 is grown as an early variety in the New England, Middle Atlantic, and North Central States. The Marshall is the general-purpose variety of the western districts and it is grown for special markets in the New England States. The Aroma is grown for a late crop in the inland sections of the intermediate-crop areas.



Map 3.

FIGURE 8.—The Dunlap is the general-purpose midseason variety grown in the States of the North and mid-West. The Gandy is grown as a late variety in an area extending from the Atlantic westward to the Mississippi River and bounded by the thirty-sixth and forty-second parallels. The Klondike is the early variety grown in the sections shown on the map. The Missionary is the chief variety grown in Florida, and it is grown extensively in the Carolinas, Virginia, and Maryland.

The strawberry industry in the South has grown rapidly since the introduction of varieties which originated in the South. The Cloud, the Thompson, and the Neunon, all of southern origin, gave impetus to the industry in the South during the latter part of the 19th Century. The greatest development, however, has come since the introduction in 1901 of the Klondike, a variety originating in Louisiana, and followed in 1906 by the Missionary which originated in Virginia.

1. The Klondike. This variety originated at Independence, Louisiana, and was introduced in 1901. It is now grown almost exclusively in many parts of the South, especially the Gulf States, for shipping to northern markets. It is a good shipping variety, of good size and attractive appearance, but is sour and a little later in ripening than the Aroma.

2. The Missionary. The Missionary originated in Virginia about 1900 and was introduced commercially in 1906. It is very similar to the Klondike but is somewhat earlier; therefore, as would be expected, it has replaced the Klondike in some parts of the southern strawberry producing areas, especially in Virginia, North Carolina, and Florida.

3. The Aroma. The Aroma was introduced in 1892 but it did not become

of much importance until about 1900. This variety is grown from Tennessee northward through the milder central states.

It produces large, well shaped, well colored berries, which ship well and are well adapted to the market demand. It is a medium late variety ripening earlier than the Gandy and lasting a week later.

4. The Premier. This variety, which was introduced in 1915, has in recent years attracted more attention due to its earliness. It produces large fresh red, sub-acid berries of good quality and is extra early. It is closely related and very similar to the Howard No. 17 which is described below.

5. The Howard No. 17. The Howard was introduced as a commercial variety in 1918. It is very early and ripens over a long season furnishing fairly large, good quality fruit. It is now one of the leading varieties from New England southward to Virginia. It is a fairly new variety and at present does not seem to be adapted to southern conditions.

6. The Blakemore.⁽⁹⁾ The Blakemore (U. S. D. A. No. 659) strawberry originated from a cross of Missionary and Howard No. 17 made in 1923 at the United States Plant Field Station, near Glendale, Maryland. Sufficient plants were available to send them out for trial in 1927. During the fruiting season of 1927, in comparison with many other sorts in the field plots at the United States Field Plant Station, it was picked out by the head of the research laboratories of the National Preservers' Association and, after thorough preserving tests it was selected as the most satisfactory variety for preserving and as superior to all known preserving varieties. It was selected as the most promising new commercial variety in Maryland and New Jersey.

The Blakemore is succeeding under a wide range of field conditions. It

(9) U. S. D. A. Circular No. 93.

has been grown on many classes and kinds of soils, both in matted rows and hills, with good results. It is recommended by the United States Department of Agriculture Circular No. 93 for trial in regions where Missionary, Klondikes, and Premiers are grown.

It is being planted at the present time (1930) at the Tennessee Experiment Station, Knoxville, Tennessee, and in the Portland area of Middle Tennessee. These trials have not been sufficient to determine definitely its adaptability to conditions in this state. Consequently its effect on the strawberry industry here is yet to be determined.

Chapter III.

TRENDS IN STRAWBERRY PRODUCTION IN THE UNITED STATES, 1899 TO 1930Production Areas.

The wide extent of the strawberry industry is indicated by the 1925 Census data on agriculture. According to these data this crop is produced in 2395 of the 3068 counties in the United States. While every state is represented, the acreage is very small in some of the states, especially those in the western part of the United States east of the Rocky Mountains, as shown in Map No. 4. In fact the few counties that report acreage in these states report 10 or less.

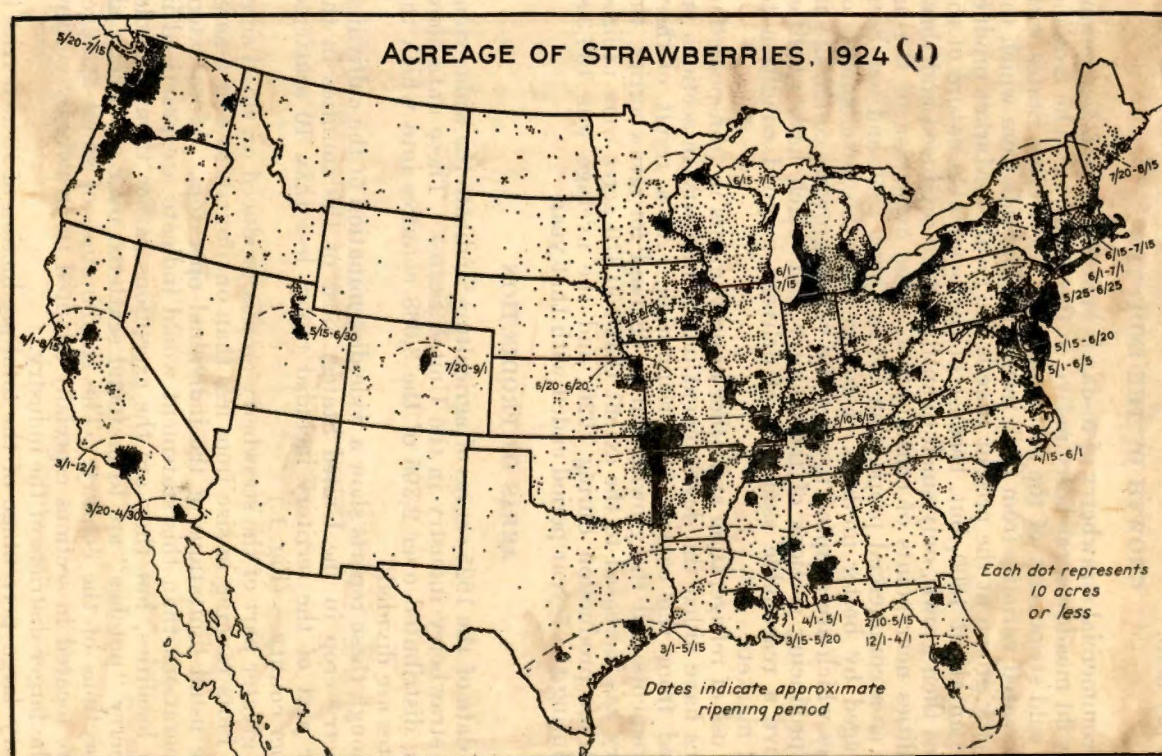


FIGURE 4.—Acreage of all counties in the United States that reported the cultivation of strawberries during 1924 is indicated by dots on this map. (1925 census and Division of Crop and Livestock Estimates report.) The sections south of each date line are included in the harvesting period indicated by date given

(1) J.W. Strowbridge. Origin and Distribution of the Commercial Strawberry Crop. Map 4. U.S.D.A. Tech. Bul. 180, p.6.

This map shows the total acreage reported whether grown for home consumption or sale on nearby markets in small lots, or grown for the general market in the principal producing centers. The estimated acreage in Table III is used as a basis for this map. These estimates are based on the 1925 Census and the estimates of the Division of Crop and Livestock Estimates for the 1924 season.

Table III.

Estimated Strawberry Acreage by States, Season 1924 (2)

State	Acreage			State	Acreage		
	Market ¹	All other ²	Total		Market ¹	All other ²	Total
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>		<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Alabama.....	3,560	464	4,424	Nevada.....		25	25
Arkansas.....	20,780	736	21,516	New Hampshire.....		352	352
Arizona.....		38	38	New Jersey.....	6,500		6,500
California.....	3,740	410	4,150	New Mexico.....		20	20
Connecticut.....		609	609	New York.....	4,900	1,086	5,986
Colorado.....	³ 489	301	790	North Carolina.....	6,180	771	6,951
Delaware.....	4,900		4,900	North Dakota.....		69	69
Florida.....	4,690	309	4,999	Ohio.....	3,800	1,053	4,853
Georgia.....	³ 445	570	1,015	Oklahoma.....		471	666
Idaho.....		397	397	Oregon.....	6,020	462	6,482
Illinois.....	3,590	1,617	5,207	Pennsylvania.....	3,250	922	4,172
Indiana.....	2,020	1,378	3,398	Rhode Island.....		88	88
Iowa.....	2,960	709	3,669	South Carolina.....	550	179	729
Kansas.....	920	968	1,888	South Dakota.....		115	115
Kentucky.....	4,370	1,277	5,647	Tennessee.....	26,220	1,401	27,621
Louisiana.....	14,600	213	14,813	Texas.....	1,070	905	1,975
Maine.....		714	714	Utah.....		813	964
Maryland.....	11,080	920	12,000	Vermont.....		261	261
Massachusetts.....		1,373	1,373	Virginia.....	11,360	2,121	13,481
Michigan.....	7,790	1,920	9,710	Washington.....	5,620	238	5,858
Minnesota.....	³ 1,552	913	2,465	West Virginia.....		838	838
Mississippi.....	1,190	205	1,395	Wisconsin.....	2,040	1,542	3,582
Missouri.....	11,420	1,658	13,078	Wyoming.....		52	52
Montana.....	³ 80	202	282				
Nebraska.....		382	382	Total.....	179,370	31,600	210,970

¹ Compiled from revised unpublished estimates of market or commercial acreage reported by the Division of Crop and Livestock Estimates under date of May 21, 1927, and from 1925 Census of Agriculture reports.

² Acreage in those counties which were not included in the reports of the Division of Crop and Livestock Estimates, but for which figures were published in the State reports of the Census of Agriculture, 1925.

³ Acreage, considered as commercial in this bulletin, which was published in the State reports of the Census of Agriculture, 1925, but was not included in the Division of Crop and Livestock Estimate reports.

This table shows that the commercial acreage is about 85% of the total and is distributed among 33 states. The areas reporting this acreage are shown in Map No. 6. Even in the principal producing states, with the possible exception of Delaware and Maryland, production is concentrated in only a few sections.

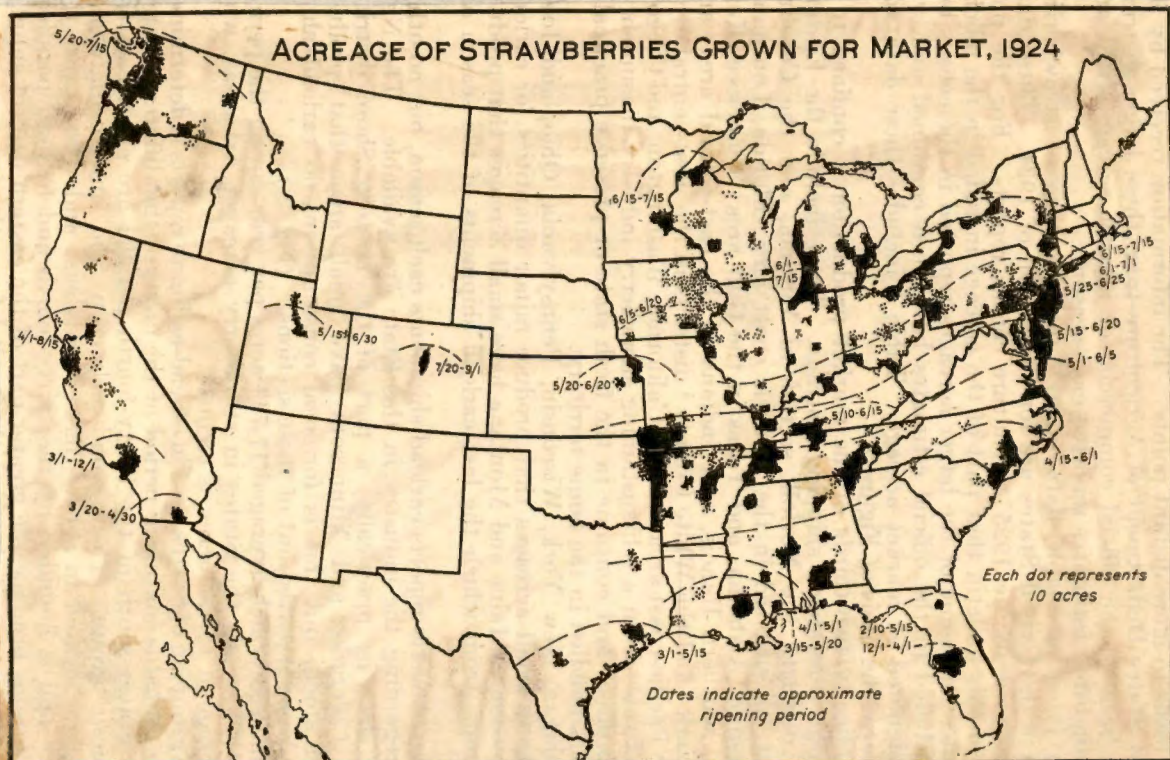


FIGURE 2.—The principal commercial areas are indicated on this map. Data for the New England areas are not available. The greater part of the production of Washington, Oregon, Utah, and Colorado districts is barreling, canning, or motor-truck shipment stock.

Map 5.

In regard to these areas J. W. Strowbridge, of the Bureau of Agricultural Economics, says:

Practically two-thirds of the market production is confined to a few large centralized shipping districts. These include the Eastern Shore district (4), the Norfolk section of Virginia, and the Carolina district, are situated on the Atlantic Coast area; Florida, Louisiana, Mississippi, Alabama, and Texas, in the Gulf area; Tennessee, Kentucky, southern Illinois, and Indiana, in the east central area; and the Ozark (5) and the White County (6) districts in the west central area.

The Pacific Coast area includes California, Washington, and Oregon. These states form a self-sustaining strawberry industry in as much as they produce and consume in the fresh state or preserve practically all stock handled in the home territory.

Michigan, New York, Wisconsin, Pennsylvania, Ohio, and Iowa each have small acreages that produce minor quantities for carload distribution. Maine and Montana have small acreages that produce late crops, from which the last

(3) Strowbridge, J. W., op. cit., p. 8.

(4) Includes Delaware, and those parts of Maryland and Virginia situated on the peninsula that lies east of Chesapeake Bay.

(5) Includes parts of Missouri, Arkansas, and Oklahoma.

(6) Includes White County, Arkansas, and vicinity.

carload shipments of the season are made.

Massachusetts reports carload shipments each season, but no other data regarding the industry in this state are available. The New Jersey area is, practically, a part of the Eastern Shore district. Utah, Colorado, and Minnesota have small areas that produce market stock, but this is for local consumption, no carload shipments being reported out of these sections (7)

The grouping of states used in official-estimates reports is determined by the probable maturing periods of the crops of the different states. This is shown in Map 4. Those states south of the thirty-fourth parallel are classed as the early-crop group. The second-early crop and intermediate crop groups are located in a belt that extends east and west across the country and is bounded by the thirty-fourth and fortieth parallels. These groups produce the greater part of the eastern market supply. The states north of the fortieth parallel form the late group (8).

The principal producing states are grouped as follows: The early group: Alabama, Florida, Louisiana, Mississippi, and Texas; the second early group: Arkansas, California (southern district), Carolinas, Tennessee, and Virginia; the intermediate group: California (other), Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Missouri, New Jersey, and Oklahoma; and the late group: Massachusetts, Michigan, New York, Ohio, Oregon, Pennsylvania, Utah, Washington, Wisconsin.

There is often some overlapping of maturing dates in states of different groups. The latter part of the season in the early-crop group may overlap with the first part of the season in the second-early-crop group. In the same way the second-early states may overlap with the intermediate group, and the intermediate overlap the late group. Sometimes the seasons are practically the same in some of the areas of states that are in different groups. For instance, Tennessee and Kentucky are listed in the second-early and inter-

(7) J. W. Stowbridge, op. cit., p. 7.

(8) Ibid., p. 7.

mediate groups respectively. However the Portland area in Middle Tennessee and the Bowling Green area in Kentucky have approximately the same ripening season. They are separated only by the state line (Map 5). It is essential therefore to go further than these groupings to determine actual competition among states. (This is discussed in Chapter VII)

Trend of Acreages

"The status of an industry of national importance that specializes in a perishable commodity does not remain stationary. It advances or recedes in accord with the financial results attained. An industry may slump or may boom for a season, but these abnormal conditions are incidental, and real growth or decline is determined by average results for a period of years." (9)

The growth of the strawberry industry is measured here by acreage trends by census periods from 1899 to 1924 and annually from 1920 to 1930.

From 1899 to 1924 (Census Periods). Census data have been used to show the trend of acreages from 1899 to 1924 inclusive. This is shown in Chart 1 and in Table IV, which also includes the acreage for 1928 as estimated by the Division of Crop and Livestock Estimates.

For the United States as a whole there was a decline in acreage from 1899 to 1919. Table IV shows that there were 151,363 acres in 1899; 143,045 acres in 1909; and only 119,395 acres in 1919. In 1924 there was an increase to 193,175 acres which is about 25% above that of 1899.

Chart 1 shows that most of the states have shown a downward trend from 1899 to 1919. The exceptions are Louisiana, Missouri, Oregon, Washington, Alabama, California, and Iowa. The decrease in Tennessee was relatively small as shown by Table IV and Chart 1. In 1899, 11,548 acres were reported as compared with 10,876 acres in 1919. Each of the principal competing states reported a greater acreage decline - Virginia from 7,821 to 2,446, North Caro-

(9) Stowbridge, J. W., op. cit., p. 12.

Chart 1. Strawberry Acreage at Four Census Periods, 1899-1924



Source: U.S. Census

lina from 5,616 to 2,186, and Arkansas from 9,611 to 8,324. The total increase in the United States was approximately 32,000 acres, which was 21% of the 1899 total.

A decline in some states was reported in both 1909 and 1919, notably Virginia, New York, Ohio, Illinois, and Pennsylvania. Others, including Tennessee, Kentucky, Wisconsin, and Indiana, reported a decline in 1909 but was followed with an increase from that period to 1919 (Chart I).

Table IV.
Strawberry Acreage in the Principal Producing States, 1899-1928

State	1928(1)	1924(1)	1919(2)	1909	1899
<u>Early</u>					
Alabama	5,380	3,125	1,359	1,167	697
Florida	3,670	5,001	834	7,194	6,344
Louisiana	23,200	9,999	4,007	3,570	1,395
Mississippi	1,000	967	691	727	1,383
Texas	1,600	1,967	503	2,166	1,361
Total	34,859	21,059	7,394	14,819	11,090
California (3)	3,750	3,589	4,974	4,585	2,418
<u>Second early</u>					
Arkansas	21,600	20,003	8,324	7,361	9,611
Georgia	170	1,015	665	890	1,423
N. Carolina	6,200	6,779	2,186	5,420	5,616
S. Carolina	300	428	312	815	499
Tennessee	18,080	24,628	10,876	10,761	11,548
Virginia	9,980	9,885	2,448	6,606	7,821
Total	56,330	62,738	24,809	31,853	36,518
<u>Intermediate</u>					
Delaware	4,930	4,886	3,503	7,194	6,344
Illinois	4,700	5,010	4,985	5,410	7,113
Indiana	1,680	3,155	3,401	2,574	4,714
Iowa	2,560	1,898	4,472	2,917	2,335
Kansas	960	1,870	1,188	1,719	2,304
Kentucky	8,720	4,791	3,112	1,553	4,128
Maryland	13,800	11,995	7,096	14,292	13,980
Missouri	26,490	15,489	8,645	9,048	7,498
New Jersey	7,000	6,488	5,029	8,684	8,746
Oklahoma	1,550	1,088	302	825	626
Total	72,390	57,660	41,733	54,216	57,788
<u>Late</u>					
Michigan	6,090	9,626	8,048	8,051	10,837
New York	4,480	5,430	4,872	6,382	7,311
Ohio	3,700	5,347	4,172	4,706	9,373

(continued)

(1) U.S.D. estimates. (2) The total U. S. acreage in 1919 was estimated at 86,910 by the U. S. Department of Agriculture. (3) Southern California belongs to the second-early group. Other parts belong to the intermediate group. This state is grouped separately here since census data are on a state basis.

Strawberry Acreage in the Principal Producing States (continued)

State	1928(1)	1924(1)	1919(2)	1909	1899
<u>Late (cont.)</u>					
Oregon	10,000	6,327	2,312	2,941	1,792
Pennsylvania	3,190	3,647	4,008	4,136	5,667
Utah	1,400	984	254	719	345
Washington	7,900	5,485	3,087	3,263	1,268
Wisconsin	2,840	3,422	3,352	2,863	3,508
Total	39,600	40,248	30,905	33,081	40,101
Grand total	206,920	176,470	109,815	138,554	147,915
Other states		16,705	9,530	4,491	3,448
U.S. total	no data	193,175	119,395	143,045	151,363

With a few exceptions, a substantial increase was reported in the states from 1919 to 1924. Those reporting a decrease were California, Pennsylvania, Iowa, Wisconsin, and Indiana. New York remained about the same (10). It is significant that the states showing decreases are northern states with the exception of California. However the amount of decrease was small. The late states as a group increased approximately 29%, from 30,905 to 40,248 acres. Among those reporting increased acreage, Tennessee was one of the most outstanding. This state's acreage increased from 10,876 in 1919 to 24,628 in 1924. Each of the other second-early states also had large increases as shown by both Chart 1 and Table IV. This entire group increased 153%, from 24,809 to 62,738 acres. Louisiana, Florida, and Alabama of the early group reported large increases. This group as a whole increased 185% to lead the other three groups. While the states of the intermediate group increased in acreage the percentage increase was only 38.

Only Louisiana, Missouri, Washington, Oregon, and Alabama reported an almost gradual and continuous increase during the entire period from 1899 to 1924. Each group of states in 1924 showed an increase over 1899 except the late and intermediate group (Table IV). By 1928, however, the intermediate group had exceeded the 1899 acreage while the late group had almost equaled it.

From 1920 to 1926. In recognition of the fact that trends showing acreages at 5 and 10 year periods, may not be representative of the actual conditions during the periods, some charts and tables are presented here to show the annual acreage changes from 1920 to 1930. These data are estimates of the Division of Crop and Livestock Estimates of the U. S. Department of Agriculture. These were not available prior to 1918.

Chart 2, taken from Technical Bulletin 180, U. S. Department of Agriculture.
 (10) These states showed a small increase according to the estimates of the U.S.D.A. See Appendix (acreage trends 1918-1929).

culture, shows the trend of acreages from 1920 to 1926 inclusive. The conditions of 1920 are considered as the beginning of an upward trend of the strawberry industry of the United States. For this reason it is used in this chart as the base year, or 100 per cent. The percentage of the 1920 acreage in each of the years is represented graphically in Chart 2 and is also shown in Table V.

Chart 2.

Estimated Commercial Strawberry Acreage by States, 1921 - 1926
(1920 = 100)

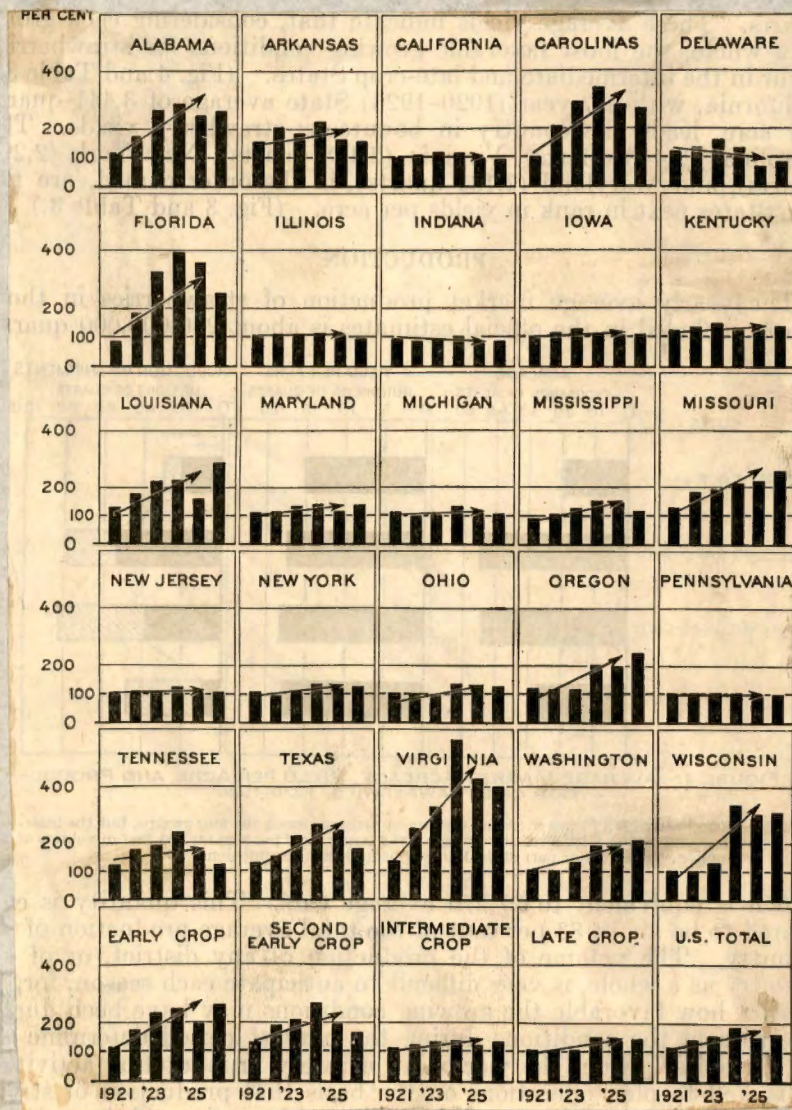


Chart 2 and Table V show that for the United States there was an increase above the previous year's acreage during each of the four seasons following 1920 that resulted in the peak year of 1924 for this 7-year period, when the acreage was 189% of that in 1920. The 1925 acreage was 18% less than that of 1924 - the percentage of the 1920 acreage having declined to 154. However, in 1926 this percentage had increased to 161. The average for the 6-year period was 146 as compared with 100 for 1920. The greatest percentage increase during the 6-year period occurred in the early and second early groups, which reported 90% and 81% increases respectively. The gains that were made in 1926, following the general decline in 1925, occurred in the early, intermediate, and late groups. The second-early group continued to decrease.

Table V.

Estimated Commercial Strawberry Acreage by States, 1920 - 1926 (1)

State	1920	Percentage of 1920 acreage in—						Average	
		1921	1922	1923	1924	1925	1926		
Early crop:	<i>Acres</i>							<i>Per cent</i>	<i>Acres</i>
Alabama.....	4,380	119	178	265	287	249	262	209	2,879
Florida.....	1,190	88	182	320	394	356	250	242	2,876
Louisiana.....	6,500	127	178	221	225	159	285	185	12,014
Mississippi.....	780	90	101	124	153	149	118	119	930
Texas.....	400	130	158	225	268	245	180	186	746
Total.....	10,250	119	172	231	249	197	261	190	19,445
Second early:									
Arkansas.....	9,070	157	202	187	229	165	156	171	15,499
California (southern district).....	900	102	107	176	219	128	91	132	1,186
Carolina ¹	1,970	102	204	203	342	282	273	228	4,491
Tennessee.....	11,090	122	177	191	236	169	124	160	17,744
Virginia.....	2,000	135	250	325	568	430	400	315	6,309
Total.....	25,030	133	192	208	268	196	168	181	45,229
Intermediate:									
California (other).....	2,300	98	102	92	77	88	91	93	2,129
Delaware.....	3,720	120	135	164	132	70	86	115	4,289
Illinois.....	3,210	101	105	106	112	104	95	103	3,317
Indiana.....	2,020	95	88	99	100	76	82	91	1,847
Iowa.....	2,590	101	114	127	114	107	110	110	2,860
Kansas.....	290	110	103	97	317	328	331	198	574
Kentucky.....	3,440	122	131	148	127	124	139	127	4,380
Maryland.....	7,910	110	112	130	140	115	135	120	9,524
Missouri.....	5,420	129	184	195	211	221	259	185	10,061
New Jersey.....	5,230	104	108	105	124	105	105	107	5,620
Total.....	36,130	111	124	135	137	122	135	124	44,591
Late:	<i>Acres</i>							<i>Per cent</i>	<i>Acres</i>
Michigan.....	5,900	111	99	102	132	109	106	108	6,396
New York.....	3,720	106	104	105	132	118	123	112	4,183
Ohio.....	2,810	103	98	100	135	132	128	114	3,191
Oregon.....	2,970	120	116	118	203	200	246	157	4,677
Pennsylvania.....	3,100	101	94	103	105	100	100	101	3,116
Washington.....	2,900	109	102	130	194	187	210	147	4,276
Wisconsin.....	610	102	102	131	334	302	307	197	1,200
Total.....	22,010	108	102	109	152	140	149	123	27,039
Grand total.....	93,420	117	142	159	188	154	161	146	136,304
Total production.....	<i>Cars</i>								
	17,409	122	163	169	208	150	181	157	27,276
Total shipments.....	7,207	151	260	247	263	170	188	197	14,203

Source: Tech. Bul. 180, U.S.D.A.

(1) 1920 data used as base or 100 per cent. (2) Includes N. C. and S. C.

Tennessee has followed the trend in its group fairly closely. The increase was continuous through 1924 and was followed by a decrease in 1925 and 1926.

In general, however, there was an upward trend in acreage in the various states during this 7-year period, despite the annual fluctuations. The only exceptions were California, Delaware, and Indiana, as shown in Chart 2 and Table V.

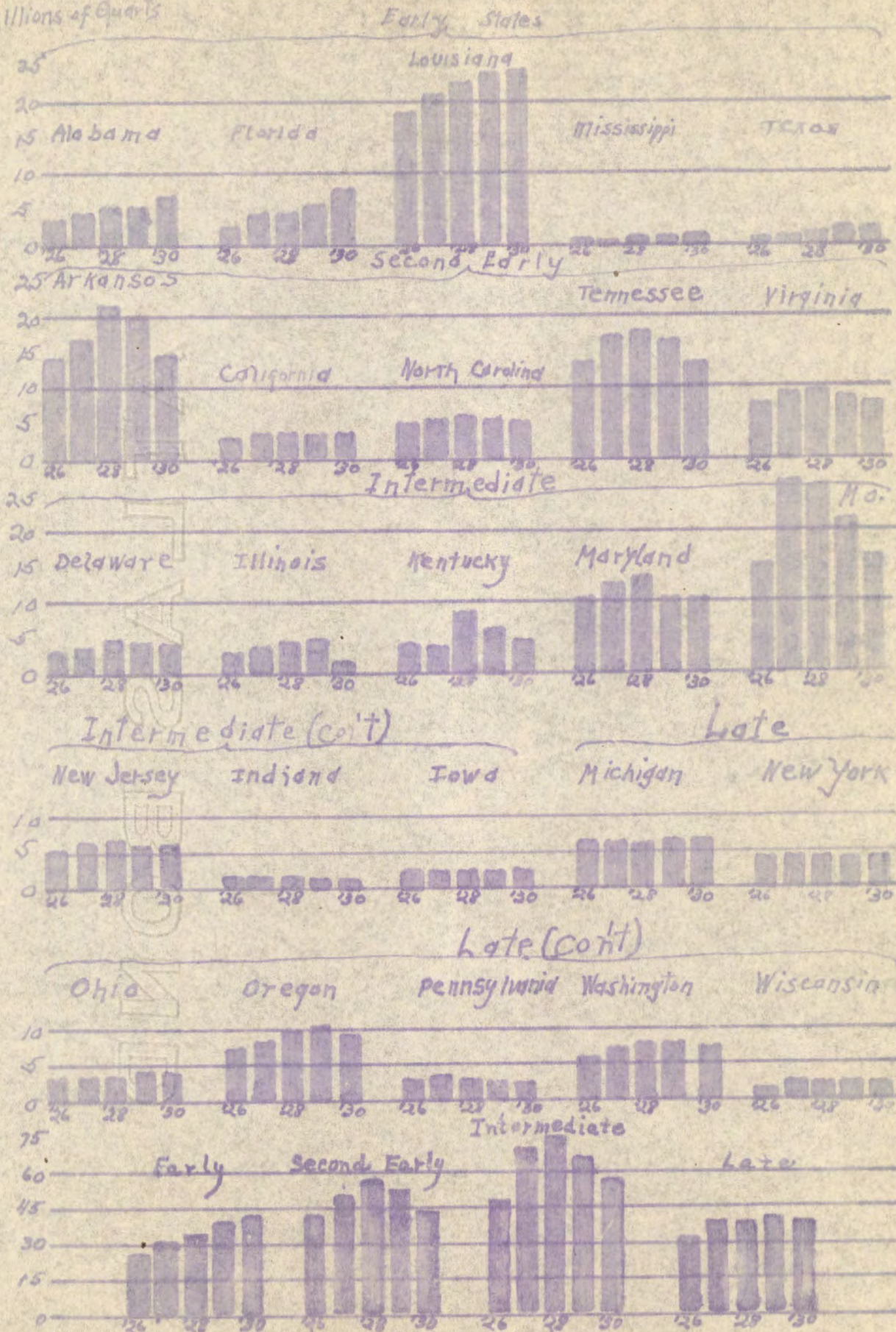
From 1926 to 1930. The trend from 1926 to 1930 is shown in Chart 3 and Table VI (11). This supplements the previous charts and tables, and brings the data down to date. From 1926 the trend was upward in the United States as a whole to 1928 at which time about 206 thousand acres were reported, the highest for any year of this 30-year period. Since that time the trend has been downward continuously. This is shown in Table VI.

The early-crop group of states, shown at the top of both the chart and table, has increased continuously to 42,950 acres in 1930 during this latter 5-year period - a continuation of the increase during previous periods. The intermediate and second-early groups increased through 1928 but reported a decrease at each of the two succeeding years. However, the acreage in 1930 in each of these two groups was estimated to be greater than that in 1926. There was an upward trend in the late group although there were small fluctuations up and down each year. The trends in the early and second-early states followed closely that of the United States as a whole - that is, an increase through 1928 followed by a decrease in 1929 and 1930.

(11) 1930 data taken from Outlook Report.

Strawberry Acreage, 1926 - 1930 Inclusive.

Millions of Quarts



Source U.S.D.A. Estimates

Table VI.

Strawberry Acreage, 1926-1930(1)

State	1926	1927	1928	1929	1930(2)
<u>Early</u>					
Alabama	3,620	4,520	5,380	5,430	7,000
Florida	2,980	3,680	3,670	5,640	8,000
Louisiana	18,500	21,100	23,200	24,360	24,600
Mississippi	920	600	1,000	1,040	1,250
Texas	720	1,200	1,600	2,720	2,100
Total	26,740	31,100	34,850	39,190	42,950
<u>Second early</u>					
Arkansas	14,140	17,000	21,600	20,100	14,870
Calif. (S. distn)	820	1,620	1,600	1,280	1,400
Georgia	no data	170	170	170	140
North Carolina	5,080	5,800	6,200	5,500	5,100
South Carolina	300	300	300	270	460
Tennessee	13,730	17,240	18,080	16,810	13,450
Virginia	8,000	9,420	9,980	8,980	8,080
Total	42,070	51,550	57,930	53,110	43,500
<u>Intermediate</u>					
Calif. (other)	2,090	2,130	2,150	2,280	2,280
Delaware	3,200	4,000	4,930	4,830	4,350
Illinois	3,060	4,280	4,700	4,790	1,410
Indiana	1,650	1,650	1,680	1,510	1,360
Iowa	2,850	2,560	2,560	2,690	2,800
Kansas	960	960	960	960	960
Kentucky	4,350	3,420	8,720	6,240	4,620
Maryland	10,650	12,780	13,800	11,750	11,750
Missouri	15,170	27,000	26,490	21,990	16,710
New Jersey	5,500	6,600	7,000	6,300	6,300
Oklahoma	no data	no data	1,550	1,950	1,900
Total	48,480	70,380	74,540	65,240	57,440
<u>Late</u>					
Michigan	6,230	6,480	6,090	6,940	7,150
New York	4,570	4,570	4,480	4,300	4,390
Ohio	3,600	3,780	3,700	4,370	4,200
Oregon	7,320	8,400	10,000	10,500	9,450
Pennsylvania	3,100	3,260	3,190	2,870	2,960
Utah	1,000	1,300	1,400	1,300	1,300
Washington	6,090	7,670	7,900	7,900	7,500
Wisconsin	1,840	2,760	2,840	2,840	2,840
Total	33,750	40,220	39,600	41,020	39,790
<u>Grand Total</u>	152,040	191,250	206,920	198,560	183,680

(1) U.S.D.A. Estimates.

(2) Preliminary.

Summary of Trends. The intermediate and late groups reported less acreage in 1930 than in 1899 (12). Taking 1899 as 100 the former group was 96 and the latter was 99. The early group was 378 and the second early 121. A total of fifteen states reported a decrease. These, together with the acreage at the beginning and end of the period, are shown in Table VII.

Table VII.

States Reporting Decrease in Strawberry Acreage, 1899-1930

States	Acreage in 1899	Acreage in 1930	Per cent decrease
<u>Early</u>			
Mississippi	1,383	1,250	9.6
<u>Second early</u>			
North Carolina	5,616	5,100	9.2
South Carolina	499	460	7.8
Georgia	1,423	140	90.2
<u>Intermediate</u>			
Delaware	6,344	4,350	31.4
Indiana	4,714	1,360	71.1
Illinois	7,115	1,410	80.2
Kansas	2,304	960	58.3
Maryland	13,980	11,750	16.0
New Jersey	8,746	6,300	28.0
<u>Late</u>			
Michigan	10,837	7,150	34.0
New York	7,311	4,390	40.0
Ohio	9,373	4,200	55.2
Pennsylvania	5,667	2,960	47.8
Wisconsin	3,508	2,840	19.0

Only four of these states, Mississippi, North Carolina, South Carolina, and Georgia were in the early and second early groups. These are minor producing states except North Carolina. The other eleven states were in the intermediate and late groups.

On the other hand, from 1920 to 1930 inclusive, every state, with three exceptions, reported an increase of acreage (Tables V and VI). These exceptions were Illinois, Indiana, and Pennsylvania. However, the

Illinois acreage in 1929 was approximately 50% greater than that of 1920. Each group of states had a substantial increase during this period. The early-crop group increased approximately 319% or from 10,250 acres to 42,950 acres; the second-early-crop group increased 73%, from 25,030 acres to 43,500 acres; the intermediate-crop group 59%, from 36,130 acres to 57,440 acres; and the late-crop group 80%, from 22,010 acres to 39,790 acres. Of the second-early states Tennessee increased 21% as compared with 304% in Virginia, 282% in the Carolinas and 64% in Arkansas.

In general the trend was downward from 1899 to 1919. The following exceptions were noted, Louisiana, Mississippi, Oregon, Washington, Alabama, California, and Iowa. From 1920 to 1930 the trend was upward with the exception of Illinois, Indiana, and Pennsylvania mentioned above. This recent expansion is shown also in the production trend in the following section.

These long time trends were accompanied by minor fluctuations. The periods of increase or decrease vary in length from one year to as many as six. Louisiana had a continued increase from 1919 to 1924 inclusive. It has had annual fluctuations since that time. It is evident from a study of prices trends and acreage trends that they are closely associated. These minor acreage fluctuations are affected to some extent by prices of previous years.

(See Chapter)

Trends of Quantities Produced

Data on production in the commercial strawberry states are presented here mainly to show the relative position of Tennessee among the other producing states at different periods. These are presented in maps and tables which show a time series from 1899 to 1928. Census data are used for 1899, 1909, and 1919. Use is made of the estimates of the U. S. Department of Agriculture for 1924 and 1928.

In studying the maps one should keep in mind that each color represents

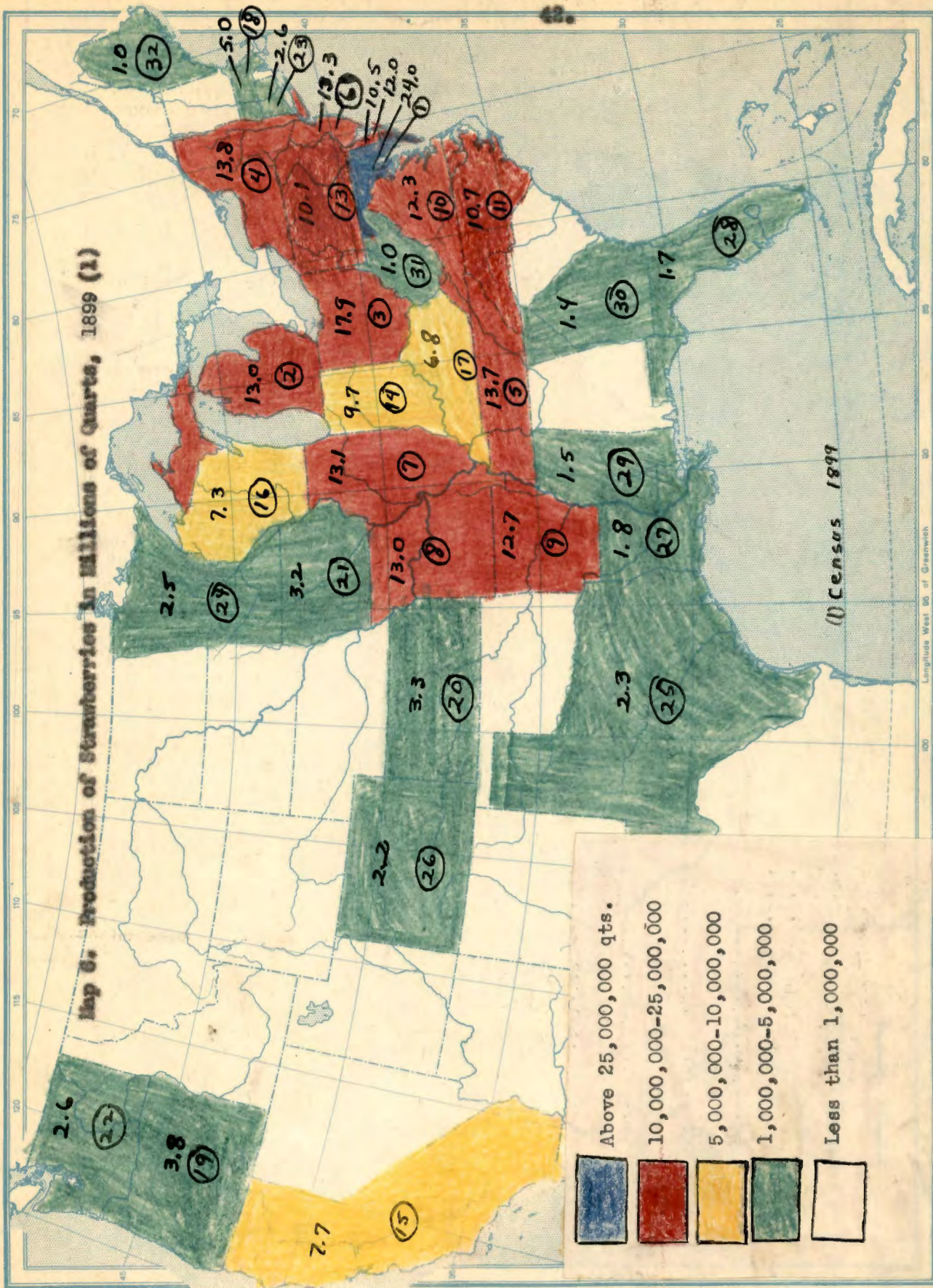
the same quantity at each period. For example, the blue on each map represents all states of 24 million quarts and above; the red represents those reporting from 15 to 24 million quarts, etc. (For others see legend on maps.) In this way a change from one group to another can be determined by noting the change in color. It is recognized that exact changes cannot be determined in this way. For that reason the production in millions of quarts has been inserted on the map; and in addition Table VIII is presented showing the production in both quarts and crates (24-quart capacity) (12). The rank of each state is inserted to show relative changes.

Table VIII shows that in the United States as a whole there has been about $3/4$ million quarts increase from 1899 to 1928, or from approximately 257 million quarts to about 334 million quarts. The latter was only about 5 million quarts short of the 1927 crop which was the largest reported.

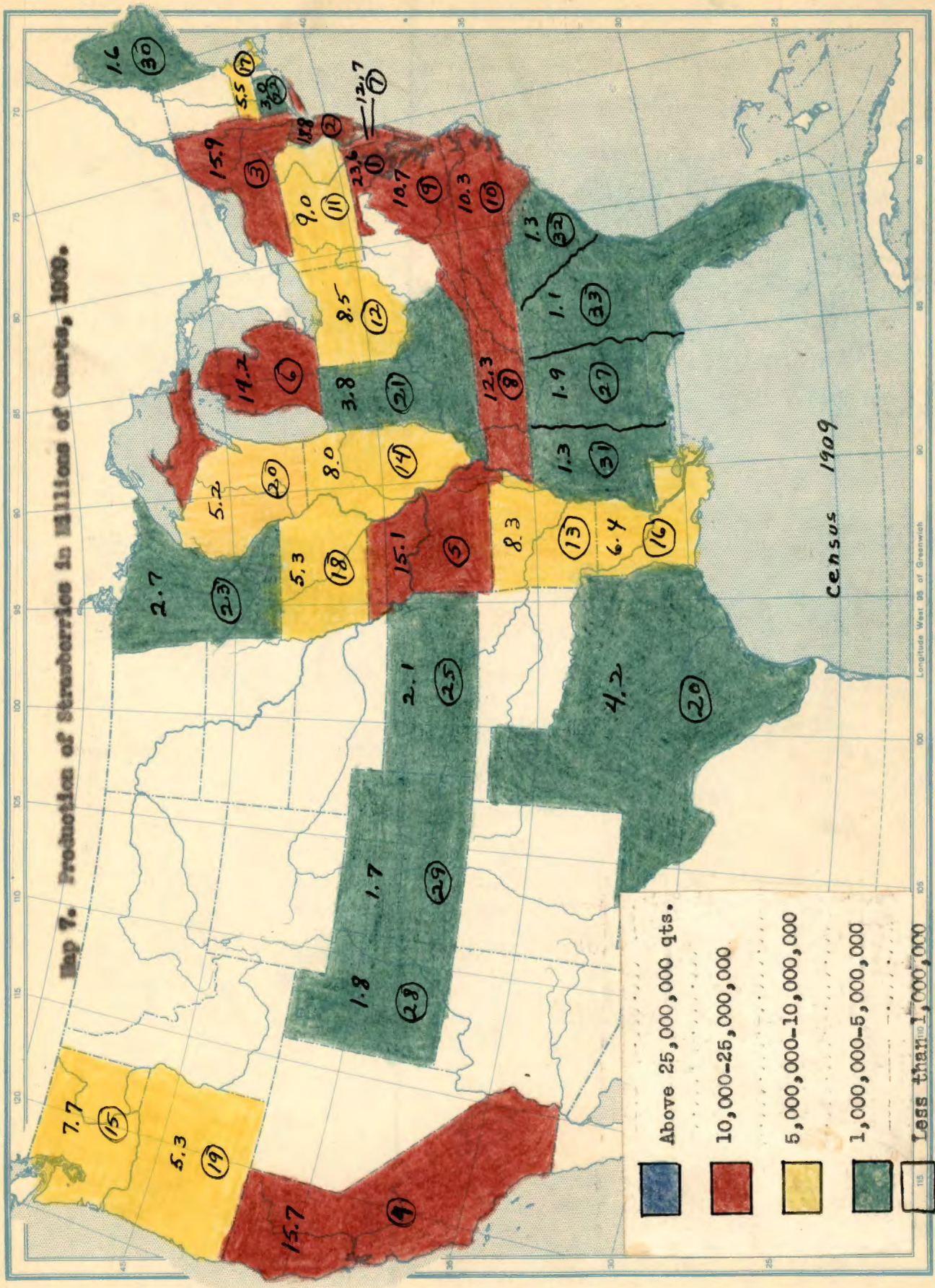
From the available data it seems that some of the principal southern states are expanding their strawberry production more rapidly than any of the principal northern states (Maps 6, 7, 8, 9, and 10). From 1899 to 1928 Louisiana increased in rank from 27th to 1st; Virginia from 10th to 4th; Missouri from 8th to 2nd; Arkansas from 9th to 6th. On the other hand each of the northern states reported a decline in relative rank - New York from 4th to 17th, Pennsylvania from 13th to 16th, Ohio from 12th to 19th, Michigan from 2nd to 15th, Illinois from 7th to 18th, Indiana 14th to 21st, Iowa from 21st to 23rd, and New Jersey 6th to 11th. While there have been minor fluctuations the relative ranks of these southern states have been increasing and those of the northern states have been decreasing. There has been a continuous increase in the relative rank of Oregon and Washington at each of the periods shown in this series of maps - the former from 19th to 8th and the latter from 22nd to 9th.

The increase in Oregon and Washington has probably been due largely to the increase in cold packing berries. They are the only states that reported (12) This is capacity of crates used in Tennessee and was used here to make state comparable on a production basis.

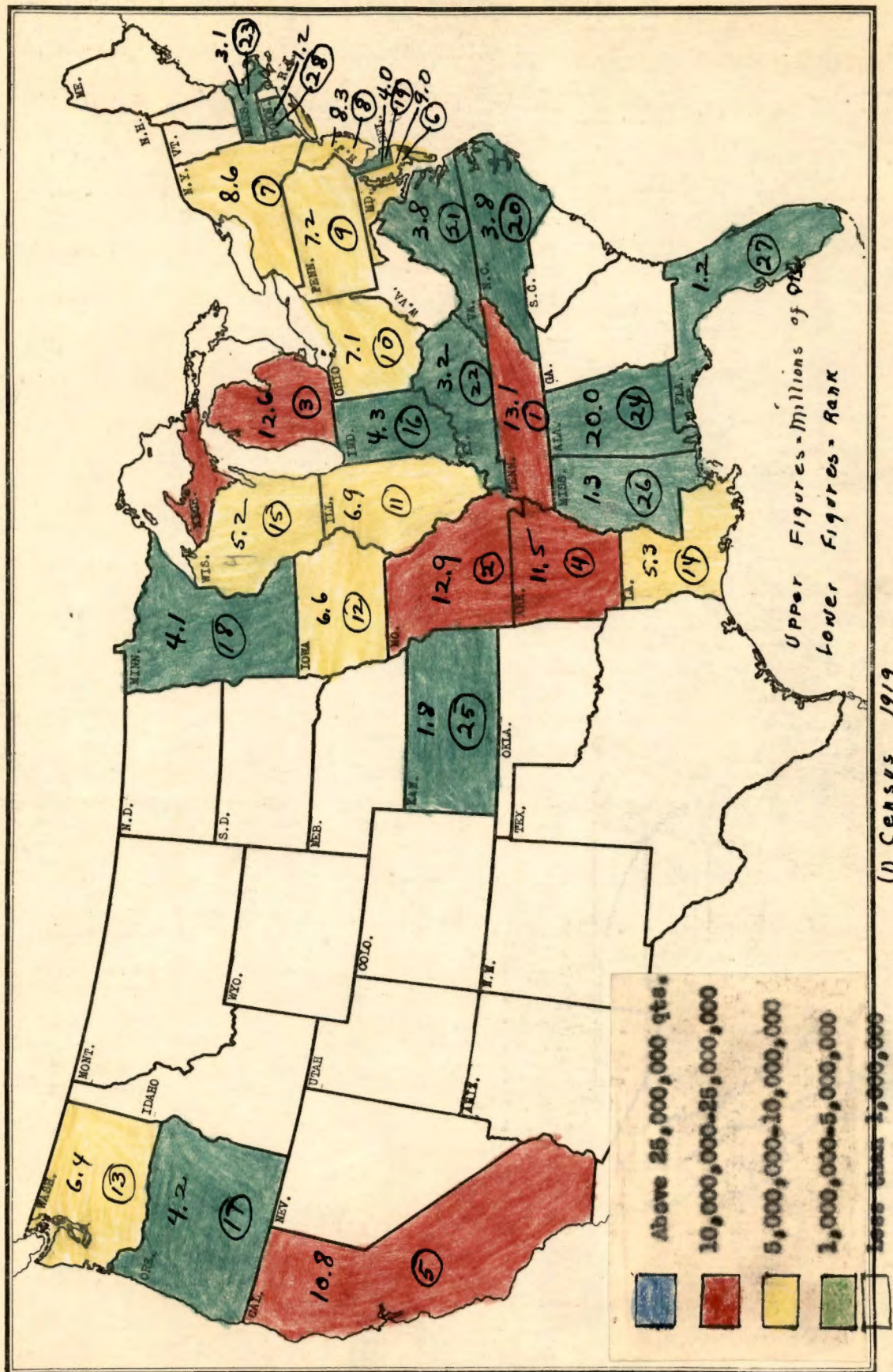
Map 6. Production of Strawberries in Millions of Quarts, 1899 (1)



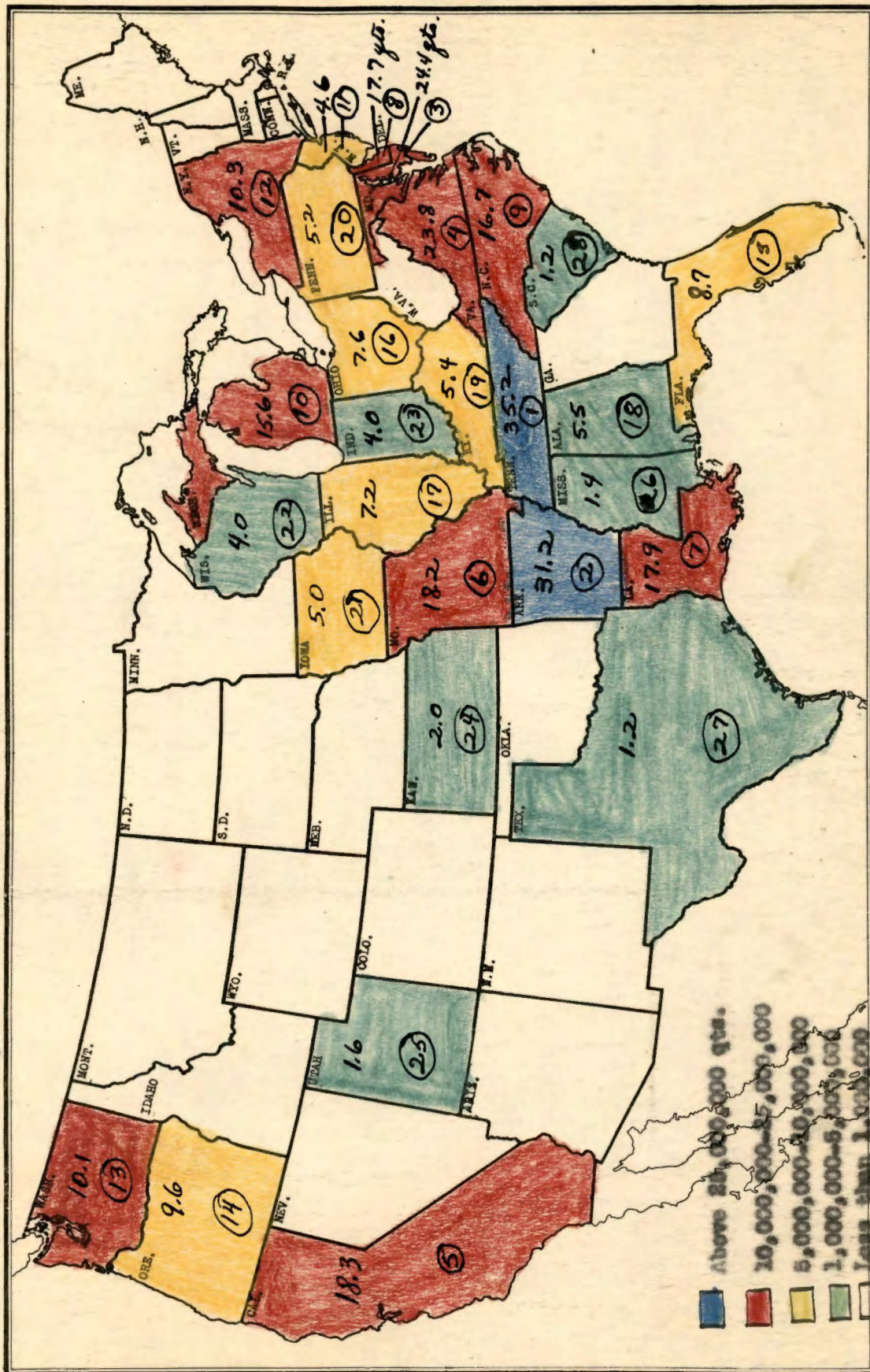
Map 7. Production of Strawberries in Millions of Quarts, 1909.



Map 8. Production of Strawberries in Millions of Quarts, 1919 (1)



Map 9. Production of Strawberries in Millions of Quarts, 1924



- Above 25,000,000 qts.
- 10,000,000-25,000,000
- 5,000,000-10,000,000
- 1,000,000-5,000,000
- Less than 1,000,000

U. S. D. A. Estimates

Table VIII.

Trend in Strawberry Production, 1899-1928

State	1928 (1)		1924 (1)		1919 (2)		1909 (2)		1899 (2)	
	Quarts (000 o- mitted)	Crates (000 o- mitted)	Quarts (000 o- mitted)	Crates (000 o- mitted)	Quarts (000 o- mitted)	Crates (000 o- mitted)	Quarts (000 o- mitted)	Crates (000 o- mitted)	Quarts (000 o- mitted)	Crates (000 o- mitted)
1. Louisiana	33,083	1,379	17,885	745	5,324	222	6,405	267	1,842	78
2. Missouri	28,212	1,175	18,272	761	12,862	536	15,171	632	13,019	542
3. Tennessee	24,372	1,046	35,240	1,468	13,131	547	12,340	514	13,684	570
4. Virginia	23,453	977	23,856	994	3,803	158	10,761	448	12,270	511
5. Maryland	22,080	920	24,376	1,016	8,976	374	23,611	984	24,036	1,001
6. Arkansas	21,775	907	31,170	1,299	11,464	478	8,259	344	12,678	528
7. California	17,246	718	18,304	763	10,808	450	15,694	654	7,691	320
8. Oregon	17,000	708	9,632	401	4,159	173	5,322	222	3,838	160
9. Washington	16,866	703	10,116	421	6,377	266	7,684	320	2,578	107
10. North Carolina	16,659	694	16,713	696	3,808	159	10,313	430	10,675	445
11. New Jersey	15,232	635	14,560	607	8,302	346	18,767	782	13,274	553
12. Delaware	12,719	530	17,760	490	4,056	169	12,730	530	10,499	437
13. Kentucky	12,426	518	5,454	227	3,195	133	2,115	88	6,767	282
14. Alabama	11,836	493	5,544	231	2,024	84	1,849	77	804	34
15. Michigan	9,103	375	15,580	694	12,586	524	14,219	592	18,384	766
16. Pennsylvania	8,358	348	5,200	217	7,184	299	9,034	376	10,179	424
17. New York	7,840	327	10,290	429	8,580	357	15,946	666	13,850	577
18. Illinois	6,228	259	7,180	299	6,901	288	8,032	335	13,151	548
19. Ohio	5,920	247	7,600	317	7,166	299	2,501	354	17,916	747
20. Florida	5,138	214	8,676	361	1,268	53	2,383	98	1,732	72
21. Indiana	3,276	136	4,040	168	4,278	178	3,759	157	9,670	403
22. Wisconsin	3,096	129	4,080	170	5,203	217	5,188	216	7,344	306
23. Iowa	3,072	128	5,032	210	6,607	275	5,330	222	3,164	132
24. Utah	2,800	117	1,615	67	485	20	1,833	76	663	28
25. Texas	2,448	102	1,248	53	591	25	4,207	175	2,344	98
26. Mississippi	1,500	62	1,428	59	1,323	55	1,345	56	1,547	64
27. South Carolina	720	30	1,210	50	224	9	1,337	10	1,846	3
28. Kansas	461	19	2,024	84	1,828	76	2,119	88	3,322	139
29. Georgia	265	11	no data	no data	506	21	1,157	48	1,386	58
Total	333,181	13,544	324,085	13,255	163,019	6,792	235,411	9,809	239,152	9,965
U.S. Total	no data	no data	no data	no data	176,932	7,372	255,702	10,654	257,427	10,726

(1) Estimates of U. S. Dept. of Agriculture.

(2) Census of Agriculture.

strawberries processed in this way in the 1930 issues of Facts in the Food Market. The amount barreled has increased at each year reported. In 1926 there were 32,600 fifty-gallon barrels processed; in 1927, 57,236 barrels; in 1928, 93,109 barrels; and in 1929, 65,021 barrels.

Why should the principal southern states increase more rapidly than the northern states? There is very little competition among these states. It is not likely therefore that competition could be assigned as a factor. In Louisiana where the greatest and most consistent increase has occurred, price has evidently been a contributing factor. Since 1918 the price per quart has varied from 18¢ to 35¢. They are as follows: 1918, 24¢; 1919, 26¢; 1920, 28¢; 1921, 27¢; 1922, 18¢; 1923, 25¢; 1924, 27¢; 1925, 33¢; 1926, 29¢; 1927, 23¢; 1928, 23¢; 1929, 21¢. No late state had as high prices so consistently.

The prices in the other second-early and the intermediate states do not appear to be any higher on the average than those in the late states. Could the expansion in these states be due partly to cheaper labor and cheaper land than found in the northern states? Or has there been a greater demand for strawberries during the earlier months than in the latter part of June and in July?

It is significant to note in this connection that there has been an over-expansion in the second-early and intermediate states as indicated by the downward trend in prices recently. The expected decline since 1929 is greater in these states than in the late states. This indicates a tendency toward lower relative ranks of these southern states. Will the northern states return to their former rank?

Tennessee has ranked high in production at each of these periods, as shown by Maps 6, 7, 8, 9, and 10. From 5th and 8th in 1899 and 1909 respectively her rank increased to 1st in both 1909 and 1919 (13). The annual estimates

(13) Ranked 2nd in acreage at both of these periods.

place this state first from 1918 to 1924 (See Chart 4I). The rank has not been this high since that time. In 1928 it had declined to third, despite the fact that 24,372,000 quarts were reported at that time as against 13,130,904 quarts in 1918 when she ranked first. During this period the total U. S. production increased from about 170 million to 334 million. However some of the principal producing states in the South increased more rapidly than Tennessee during this latter 10-year period. While this state increased about two-fold Louisiana increased about $6\frac{1}{2}$ times, thus displacing Tennessee as the highest ranking state. In fact the entire early group of states had increased almost four-fold. North Carolina and Virginia of the second-early group reported an increase of about $4\frac{1}{2}$ and 6 fold respectively. The increase in Kentucky, in the intermediate group, was about $3\frac{1}{2}$ times. Arkansas and Missouri reported about the same percentage increase as Tennessee.

The chart referred to above in connection with Tennessee's rank shows the trend in production of the principal southern states from 1899 to 1930. The census data from 1899 to 1919 shows a downward trend in all states except Louisiana. An upward trend is shown from 1918 to 1930, although large annual fluctuations have occurred in some cases. For instance, Tennessee's production increased from about 23 million quarts in 1921 to over 42 million in 1922. The decline from 1924 to 1925 was almost in the same proportion.

This expansion has resulted in lower prices and general dissatisfaction among the producers. (See Chapter on prices). Recent outlook reports have contained warnings to growers in regard to this expansion of acreage. The 1927 report contained the following:

With average yields in 1927, it seems likely that returns per acre to strawberry growers will be considerably less than the average for the past two years. Acreage has increased considerably during this period and caution should be exercised by growers who contemplate increasing their acreage this spring.

In the Southern and mid-season States indications are for an acreage for harvest in 1927, 22 per cent greater than that of 1926 and 18 per cent greater than the 1923-1926 average. The earliest shipping States have an indicated increase over 1926 of 15 per cent and Arkansas, the Carolinas, Tennessee, and Virginia show 26 per cent more acreage than in 1926. The next States to ship, including Delaware, Maryland, Illinois, Kentucky, and Missouri, will probably harvest a 21 per cent greater acreage than in the previous year. Late States have also shown a tendency to increase plantings. The expansion over 1926 has been especially marked in Arkansas and Missouri. Increases have also been large in Tennessee, Louisiana, Illinois, and Maryland.

Similar statements were issued in the 1928 Outlook Report as follows:

The immediate outlook for strawberries is slightly less favorable than that of a year ago. The chief element of weakness in the situation is the unusually large acreage in some commercial section. With average yield, the crop this year will be one of the largest on record (325,000,000 largest ever produced).

In regard to the 1929 outlook for strawberries the U. S. Department of Agriculture says:

The principal trouble with the strawberry situation seems to remain in the second-early and the intermediate states, where acreage and production are still in excess of the market requirements. A general reduction of about 20% in commercial acreage in these mid-season sections appears advisable, if returns to growers are to be more favorable than in recent seasons.

The report says further than an expansion will be particularly dangerous in the Ozark region and in eastern states from Virginia to New Jersey.

Further expansion of strawberry acreage in the early states does not seem advisable, since the price tendency has been downward during recent years when acreage was increasing. In the second-early and intermediate states, the indicated area for picking in 1930 should, with normal yields, result in as large a crop as can be marketed to advantage. However, in some of these states old fields are now in poor condition and should be replaced with new plantings in the Spring of 1930. The present acreage in the late states can well be maintained.

This situation in these states will likely be improved in 1930. Preliminary figures show a net decrease in the United States of 16,000 acres or 8% from 1929 acreage, most of which is in Arkansas, Missouri, Kentucky, and Tennessee, where about 25% of the commercial crop is grown and where prices have been relatively low and marketing conditions the most unsatis-

factory. The indicated acreage reductions are 26% in Arkansas and 20% in Tennessee which should place them in a far better condition than in 1929.

The expected production in 1930 in the principal southern states is shown in Chart 3. Decreases are forecast for Louisiana, Tennessee, North Carolina, Arkansas, Missouri, Kentucky, and Maryland. Only Virginia was expected to have an increase among the states shown here.

The result of returned questionnaires from approximately 100 producers in Tennessee indicate a decrease in acreage of approximately 21%. This decreased acreage, accompanied by unusually dry weather throughout this state, has resulted in great reductions in production. Complete data are not available as to its extent. Reports from Spring City, one of the principal shipping points in East Tennessee show that only 11 carloads would probably be shipped from that section whereas 218 were shipped in 1929. Other areas report reduced shipments.

Relative Importance of States as Indicated by Their Percentage
of United States Production.

Table IX shows the percentage of the United States production that was in each state from 1899 to 1929. This shows their relative importance as well as that of the various geographic divisions at 9 periods. It does not show increases or decreases in production. With some minor fluctuations the trend has been downward during this period in the Middle Atlantic, East North Central, and Mountain states. It has been upward in the East South Central, West South Central, and the Pacific states. The West North Central group has had a slight increase from 1899 to 1929 but a decline since 1919. Missouri, the principal producing state in this group has had an almost continual increase during the entire 30-year period. The trend in the South Atlantic states has been upward, to 1925, but not continuously, and downward since that time. The New England states and most of the Mountain states are relatively unimportant in commercial production. They are not reported by the United States Department of Agriculture in its estimates.

The three leading groups of states in 1929 were, the South Atlantic

with 22.9% of the United States production, West South Central with 15.1%. In 1899 the leading groups were the East North Central with 25.8%, the South Atlantic with 24.3%, and the Middle Atlantic with 14.5%. It seems, therefore, from this data that southern states have outdistanced the northern states in production.

Table IX.

Per Cent Each State's Strawberry Production is of U.S. Production.
1899 - 1929

State or Section	(2) 1929	(4) 1928	(4) 1927	(4) 1926	(4) 1925	(4) 1924	(3) 1919	(3) 1909	(3) 1899
New England	(1)	(1)	(1)	(1)	(1)	(1)	3.6	4.6	3.9
Mid. Atlantic	8.4	9.7	10.1	9.6	9.9	9.2	13.6	17.1	14.5
E. N. Central	9.5	8.4	8.5	10.2	6.4	10.7	20.4	15.5	25.8
W. N. Central	10.3	9.7	9.7	9.8	13.1	7.9	14.1	10.5	8.7
S. Atlantic	22.9	22.9	24.7	27.8	29.2	30.0	13.3	24.7	24.3
E. S. Central	15.1	15.3	13.6	11.2	14.3	15.0	11.1	6.9	8.8
W. S. Central	19.4	17.8	11.4	17.3	10.6	14.6	10.0	7.7	6.8
Mountain	0.6	0.8	0.7	0.9	0.6	(1)	1.2	2.0	1.5
Pacific	13.5	15.1	20.8	13.0	15.6	12.5	12.1	11.2	5.5
<u>New England</u>									
Maine	(1)	(1)	(1)	(1)	(1)	(1)	0.5	0.6	0.4
New Hampshire	(1)	(1)	(1)	(1)	(1)	(1)	0.3	0.2	0.2
Vermont	(1)	(1)	(1)	(1)	(1)	(1)	0.2	0.2	0.2
Massachusetts	(1)	(1)	(1)	(1)	(1)	(1)	1.8	2.1	1.9
Rhode Island	(1)	(1)	(1)	(1)	(1)	(1)	0.07	0.1	0.1
Connecticut	(1)	(1)	(1)	(1)	(1)	(1)	0.7	1.2	1.0
<u>Mid. Atlantic</u>									
New York	2.7	2.4	3.9	4.1	6.0	3.1	4.8	6.2	5.4
New Jersey	3.8	4.7	4.3	3.8	2.3	3.8	4.7	7.3	5.1
Pennsylvania	1.9	2.6	1.9	1.7	1.6	2.3	4.1	3.5	3.9
<u>East N. Central</u>									
Ohio	2.2	1.8	1.7	3.2	1.4	2.0	4.0	3.3	7.0
Indiana	0.9	1.0	0.6	1.1	0.8	1.5	2.4	1.5	3.7
Illinois	2.0	1.9	1.0	1.2	2.0	2.4	3.9	3.1	5.1
Michigan	2.6	2.8	3.7	3.4	1.4	4.2	7.1	5.6	7.1
Wisconsin	1.8	0.9	1.5	1.3	0.8	0.6	2.9	2.0	2.8
<u>W. N. Central</u>									
Minnesota	(1)	(1)	(1)	(1)	(1)	(1)	2.3	1.1	1.0
Iowa	1.2	0.9	1.4	1.4	1.6	2.1	3.7	2.1	1.2
Missouri	8.6	8.7	7.6	7.9	11.0	5.4	7.3	5.9	5.0
N. Dakota	(1)	(1)	(1)	(1)	(1)	(1)	0.03	0.02	0.001
S. Dakota	(1)	(1)	(1)	(1)	(1)	(1)	0.08	0.09	0.02

continued

(1) Not reported. (2) Preliminary. (3) Census data. (4) U.S.D.A. estimates.

Per Cent Each State's Strawberry Production is of U. S. Production

State or Section	(2) 1929	(4) 1928	(4) 1927	(4) 1926	(4) 1925	(4) 1924	(3) 1919	(3) 1909	(3) 1899
<u>W.N. Cent. (cont.)</u>									
Nebraska	(1)	(1)	(1)	(1)	(1)	(1)	0.3	0.2	0.1
Kansas	0.5	0.1	0.7	0.5	0.5	0.4	1.0	0.8	1.3
<u>South Atlantic</u>									
Delaware	3.4	3.8	2.8	2.4	1.8	5.0	2.3	5.0	4.1
Maryland	6.5	4.9	8.4	12.3	7.6	8.4	5.1	9.2	9.3
D. of C.	(1)	(1)	(1)	(1)	(1)	(1)	0.01	0.007	0.03
Virginia	4.9	7.2	6.6	7.0	10.5	8.4	2.1	4.2	4.8
W. Virginia	(1)	(1)	(1)	(1)	(1)	(1)	0.5	0.3	0.4
N. Carolina	4.2	5.1	4.8	3.9	5.4	5.7	2.1	4.0	4.1
S. Carolina	0.2	0.2	0.1	0.2	0.4	0.4	0.1	0.5	0.3
Georgia	0.07	0.08	(1)	(1)	(1)	(1)	0.3	0.4	0.5
Florida	3.6	1.6	2.0	2.0	3.5	2.1	0.7	0.9	0.7
<u>E. S. Central</u>									
Kentucky	3.2	3.5	3.2	2.8	1.5	2.0	1.8	0.8	2.6
Tennessee	7.8	7.7	7.7	6.2	9.9	10.5	7.4	4.8	5.3
Alabama	3.7	3.6	2.3	1.8	2.4	2.1	1.1	0.7	0.3
Mississippi	0.4	0.5	0.4	0.4	0.5	0.4	0.7	0.5	0.6
<u>W. S. Central</u>									
Arkansas	8.0	6.7	6.0	7.9	5.6	7.6	6.5	3.2	4.9
Louisiana	10.2	10.2	4.9	9.0	4.5	6.5	3.0	2.5	0.7
Oklahoma	(1)	(1)	(1)	(1)	(1)	(1)	0.2	0.3	0.3
Texas	1.2	0.9	0.5	0.4	0.5	0.5	0.3	1.6	0.9
<u>Mountain</u>									
Montana	(1)	(1)	(1)	(1)	(1)	(1)	0.1	0.1	0.2
Idaho	(1)	(1)	(1)	(1)	(1)	(1)	0.3	0.4	0.1
Wyoming	(1)	(1)	(1)	(1)	(1)	(1)	0.01	0.008	0.008
Colorado	(1)	(1)	(1)	(1)	(1)	(1)	0.5	0.6	0.9
N. Mexico	(1)	(1)	(1)	(1)	(1)	(1)	0.008	0.01	0.008
Arizona	(1)	(1)	(1)	(1)	(1)	(1)	0.01	0.04	0.04
Utah	0.6	0.8	0.7	0.9	0.6	(1)	0.3	0.7	0.2
Nevada	(1)	(1)	(1)	(1)	(1)	(1)	0.003	0.004	0.006
<u>Pacific</u>									
Washington	4.7	5.2	8.7	4.1	3.3	2.6	3.6	3.0	1.0
Oregon	4.6	4.6	6.8	4.6	5.7	2.2	2.3	2.1	1.5
California	4.2	5.3	5.3	4.3	6.6	7.7	6.1	6.1	3.0

(1) Not reported. (2) Preliminary. (3) Census data. (4) U.S.D.A. estimates.

The states that rank highest in 1929 in percentage of U. S. production are: Louisiana, 10.2%; Missouri, 8.6%; Arkansas, 8%; Tennessee, 7.8%; and Maryland, 6.5%. Of these Louisiana and Missouri had the most consistent in-

crease since 1899. In Tennessee the trend was upward to 1924, and downward from that time to 1929. Yet it had a higher percentage in 1929 than in 1899.

Trends of Yields per Acre

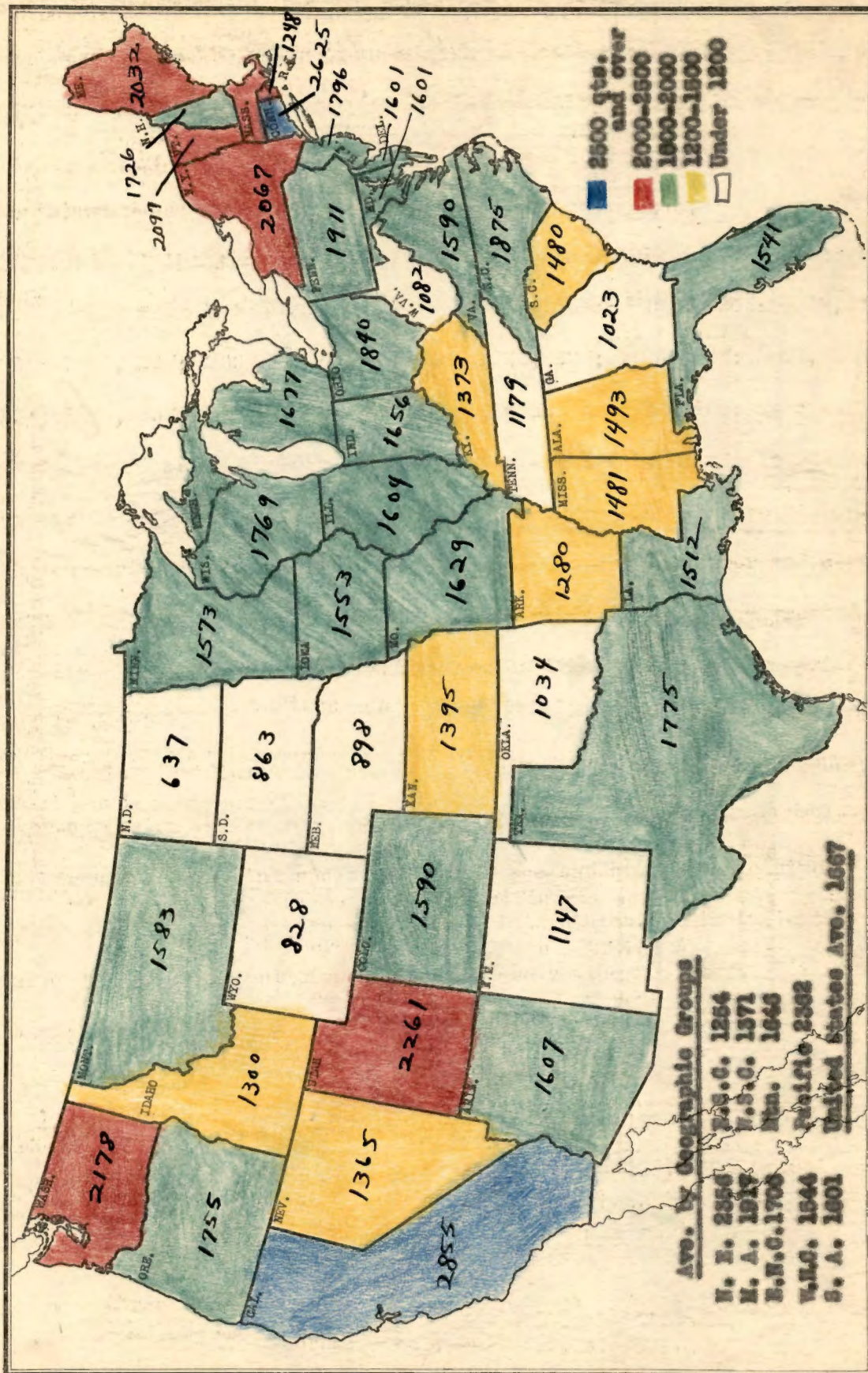
It is the purpose of this section to show not only the yields in the various states over a period of years but Tennessee's relative position among the other states. Census data are used for the period from 1899 to 1919. The annual estimates of the United States Department of Agriculture show the conditions since that time. There are often wide variations between the census data and these estimates for the same year, as shown in Chart 4 for 1919. Consequently in comparing one period with another it is essential that one should know of these variations. It is an open question as to which source is the more accurate. This has probably given rise to the policy that is sometimes pursued of making adjustments that narrow the differences between the two sets of data.

Average yields per acre have been calculated for the three census years from 1899 to 1919 and for the period from 1920 to 1926. This average yield for a period of years gives a fairer basis for comparison since the weather conditions so greatly affect yields. For a given year a state may have either a very good or a very poor yield depending largely on the weather.

From 1899 to 1919 Inclusive. The yield for each state and each geographic condition is shown in Table X for 1899, 1909, and 1919. The weighted average for this 20-year period is presented in this table and also in Map 11. For convenience the average yield for each state and for each geographic division is inserted in the map.

The Pacific states ranked highest, with an average yield of 2362 quarts. In this group California ranked highest with 2855 quarts (Table X, Map 11). The New England states ranked second with an average of about 2356 quarts.

Map 11. Average Yield Per Acre of Strawberries in Quarts, 1899 to 1919.



Source: Census Reports, 1899, 1909, and 1919. Weighted averages.

Table X.

Average Number Quarts Strawberries Produced Per Acre (1)

Section or State	1919	1909	1899	Average (Weighted)
New England	1884.7	2649.3	2422.5	2355.9
Middle Atlantic	1730.2	2278.3	1717.1	1917.0
East North Central	1489.5	1681.9	1869.9	1706.1
West North Central	1435.4	1600.9	1621.0	1544.7
South Atlantic	1301.2	1693.3	1653.9	1601.3
East South Central	1226.6	1258.2	1290.7	1253.7
West South Central	1346.7	1415.7	1348.7	1371.4
Mountain	1330.0	1614.9	1947.2	1646.4
Pacific	1963.1	2655.2	2575.1	2362.0
Maine	1610.3	2329.9	2083.7	2032.2
New Hampshire	1338.2	2058.2	1852.2	1725.8
Vermont	1557.6	2251.2	2577.7	2097.3
Massachusetts	2202.2	2738.9	2465.3	2497.3
Rhode Island	1296.1	2332.4	2479.7	2148.6
Connecticut	1949.0	3037.5	2645.8	2625.0
New York	1761.0	2498.6	1894.4	2067.1
New Jersey	1650.8	2161.1	1517.7	1796.3
Pennsylvania	1792.4	2184.2	1796.3	1911.3
Ohio	1717.6	1806.4	1911.4	1840.1
Indiana	1257.8	1460.4	2051.3	1656.6
Illinois	1384.4	1484.6	1848.9	1604.1
Michigan	1563.8	1766.1	1696.4	1677.6
Wisconsin	1424.7	1812.1	2093.4	1769.4
Minnesota	1435.5	1457.6	1924.7	1573.0
Iowa	1477.3	1827.2	1355.2	1553.0
Missouri	1487.8	1676.7	1736.2	1629.6
North Dakota	507.1	750.3	1346.7	637.1
South Dakota	621.9	1053.8	1055.3	863.6
Nebraska	599.2	1163.8	1106.6	898.6
Kansas	1538.8	1232.7	1441.7	1394.9
Delaware	1157.9	1769.6	1654.9	1601.1
Maryland	1264.9	1652.0	1719.3	1601.0
D. of C.	1688.2	1700.8	1689.6	1691.1
Virginia	1554.9	1629.0	1568.9	1590.4
West Virginia	835.3	1145.3	1337.0	1082.2
North Carolina	1741.8	1902.8	1900.7	1875.3
South Carolina	717.1	1640.7	1694.8	1480.1
Georgia	760.4	1300.5	973.8	1023.8
Florida	1520.0	1774.7	1316.9	1541.5
Kentucky	1086.5	1361.8	1639.4	1373.5
Tennessee	1207.3	1146.7	1184.9	1179.9
Alabama	1489.4	1584.0	1325.3	1492.8
Mississippi	1915.3	1742.2	1118.3	1481.0
Arkansas	1377.2	1122.0	1318.0	1280.5
Louisiana	1328.6	1794.2	1320.3	1512.6

(continued)

(1) Census data.

Table X.

Average Number Quarts Strawberries Produced Per Acre (continued)

Section or State	1919	1909	1899	Average (Weighted)
Oklahoma	1031.9	1006.5	1071.1	1034.0
Texas	1175.9	1946.8	1722.4	1774.6
Montana	1104.2	1532.2	1894.2	1582.7
Idaho	1055.0	1366.4	1588.4	1300.3
Wyoming	693.9	870.6	1048.4	827.8
Colorado	1446.0	1263.1	2084.6	1590.1
New Mexico	513.0	1781.7	1711.1	1147.3
Arizona	852.9	1642.2	1825.8	1607.6
Utah	1908.6	2550.0	1890.0	2261.6
Nevada	1027.2	2237.8	1174.3	1365.2
Washington	2065.9	2340.5	2032.8	2178.4
Oregon	1479.1	1810.0	2141.6	1765.3
California	2172.9	3423.0	3180.6	2854.9
United States	1481.9	1737.6	1700.7	1637.6

Connecticut, with 2625 quarts ranked highest. These are not considered as important commercial states. The Middle Atlantic states, with 1917 quarts, and the East North Central states, with 1706 quarts, ranked third and fourth respectively. New York is the leading state in the former group with 2067 quarts, and Ohio in the latter group with 1840 quarts. The Mountain and South Atlantic groups rank fifth and sixth respectively with 16,464 quarts and 1601 quarts respectively. The Mountain states are relatively unimportant producing states. Only Utah, in this group, is listed as a commercial producing state. (See Map 5, page 28.) This state reported an average of 2261 quarts to lead its group, while North Carolina ranked highest in the South Atlantic group with 1875 quarts. The West North Central states rank next to the South Atlantic group. Their average for this 20 year period was 1545 quarts. Missouri ranked highest with 1629 quarts. This group contains four of the lowest ranking states, North Dakota, South Dakota, Nebraska, and Wyoming. They are not commercial states. The South Central states reported the lowest average yields of all the groups. The West South Central group reported an average yield of 1371 quarts. Texas

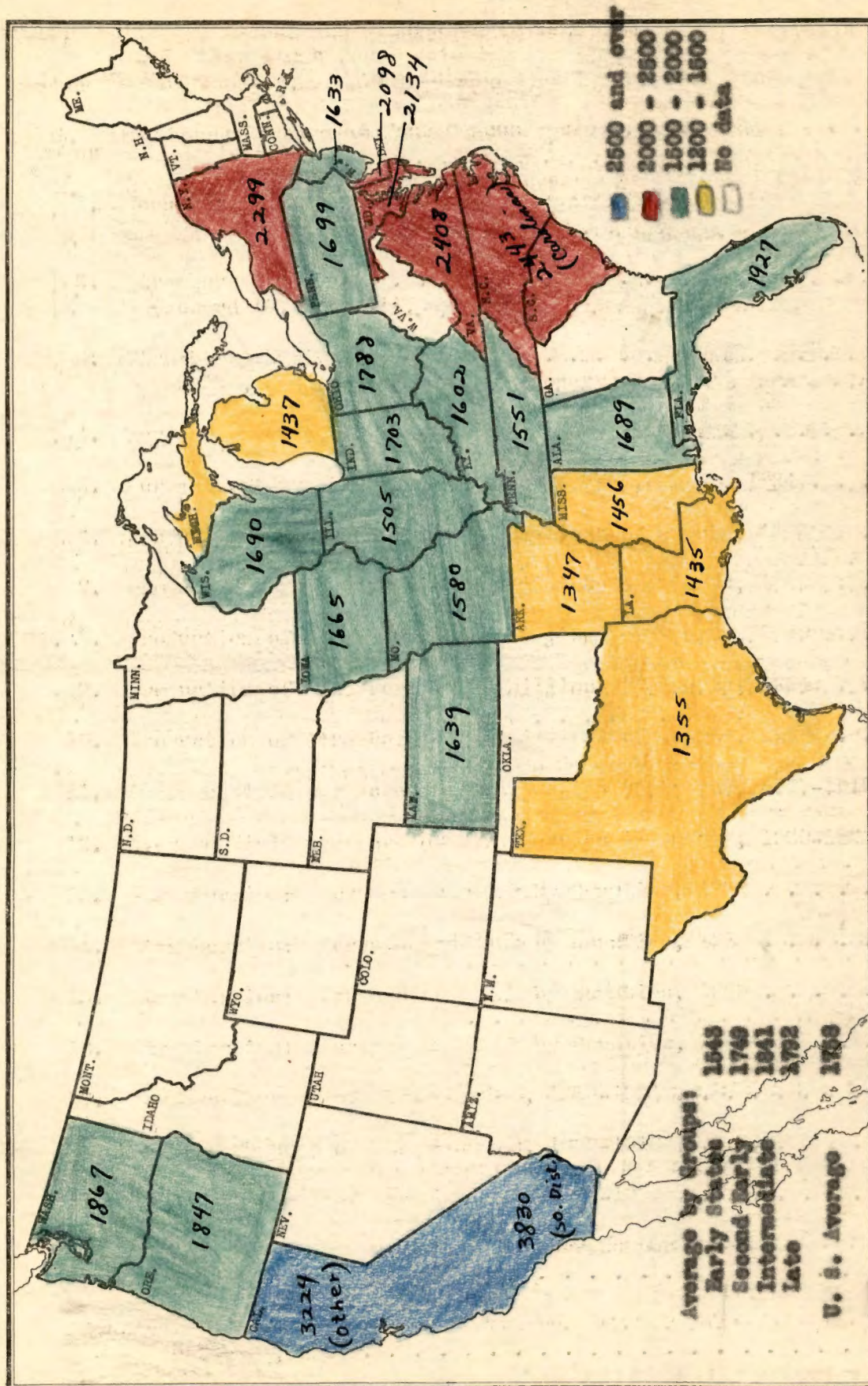
was highest with 1775 quarts. The average for the East South Central group, of which Tennessee is a part, was only 1253 quarts. This was only about 50% of the yield produced in the Pacific states (14). Alabama reported 1493 quarts to rank highest in this low group. It is a relatively unimportant producing state, however. Tennessee ranked lowest in this group with only 1179 quarts per acre. In fact only 8 states ranked lower than this state in the average for these census periods. They were Georgia, West Virginia, Oklahoma, New Mexico, Wyoming, Nebraska, North Dakota, and South Dakota. These are unimportant producing states. Only Georgia and Oklahoma are listed as commercial states. (See Map 5, page 28.)

Average Yield from 1920-1926 Inclusive. The data for this period, which are estimates of the United States Department of Agriculture, are not given for the less important producing states. The average yields for the states reported for this period are shown in Map 12. The annual estimated yields from 1918 to 1929 are presented in Table XI. According to this map the intermediate-crop states rank highest with an average of 1841 quarts per acre. The late-crop states report 1792 quarts to rank second. The second-early states produced an average yield of 1749 quarts. The early-crop states ranked lowest with only 1543 quarts. This is 215 quarts less than the U. S. average of 1758 quarts.

The highest ranking states are California, the Carolinas, New York, Maryland, Delaware, Florida, Washington, and Oregon. Tennessee has a rank of 22nd among 27 states. Only Michigan, Arkansas, Mississippi, Louisiana, and Texas ranked lower.

Annual Yields 1918-1929 Inclusive. The annual yields as shown in Table XI fluctuate considerably. The lowest average annual yield for the United States for this 12 year period was 1534 quarts in 1925. The highest was 1961 quarts in 1922. The yields in Tennessee fluctuated more widely. The lowest was reported at 1200 quarts in 1925 and the highest at 2160 quarts (14) Irrigation is practiced in some areas of the Pacific states.

Map 12. Average Yield per Acre of Strawberries in Quarts, 1920-1926 Inclusive.



Source: Estimates of U. S. Department of Agriculture. Data from U. S. D. A. Technical Bulletin 180, p. 9. Averages are weighted.

in 1922.

Yields in Second-Early States, 1899 to 1929 Inclusive. Tennessee is one of the lowest states among the second early group in yields per acre. This is shown in Chart 4 (15). It shows further that only Arkansas ranks lower, and then at only about one-half of the periods. One exception is noted in 1919 when South Carolina ranked lower than either Tennessee or Arkansas.

The yields per acre in Tennessee were approximately 1200 quarts, or 50 24-quart crates, at each of the three census periods from 1899 to 1919 inclusive. The average for these census periods was 1180 quarts (Table X). In 1929 according to the estimates of the United States Department of Agriculture, the yield had increased to 1500 quarts or about 62 crates. While this is 300 quarts higher than the census data of 10 years previous it is about 100 quarts less than the estimate for 1919 (16). In fact the estimates for 1919 are higher than the census figures for that year in all states and much higher in a few. This does not necessarily follow that the estimates are too high for the years since 1919. At any rate in only two years, 1925 and 1926, during the past 10 years, has the yield been as low as approximately 1200 quarts. In 1922, Chart 4 shows a yield of more than 2100 quarts. That evidently was a good season for strawberry production since most of the states in this group showed a higher yield at that time than at any other period.

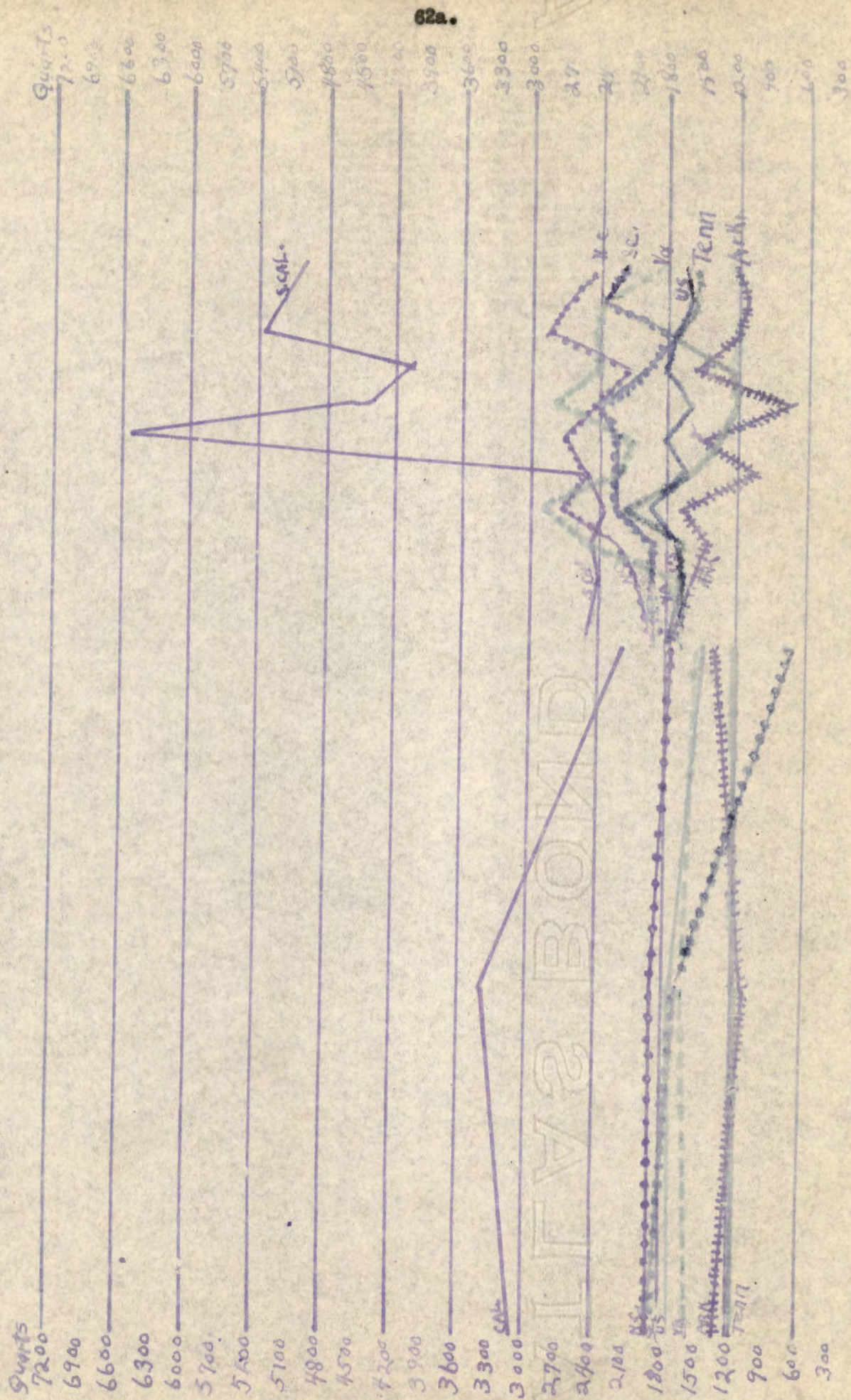
This state has exceeded the U. S. average in only one year, in 1922, but has about equalled this average at four periods, 1920, 1921, 1923, and 1927.

Sufficient data are not available to determine the reasons for these average variations among sections of the United States. Some of the probable factors are irrigation, cultivation practices, and fertilization. Irriga-

(15) Census data were used in charting the trend from 1899 to 1919 since no annual data were available. Beginning with 1919 annual estimates of U.S.D.A. were used. Both sources used for 1919. (16) Both census data and estimates of the U.S.D.A. are shown graphically for 1919.

Chart 4a.

Estimated Yields of Strawberries in the Second Early States and the United States.



1929
1928
1927
1926
1925
1924
1923
1922
1921
1920
1919
1918
1917

tion in California likely is a contributing factor to the large yield there. For the causes of low yields in Tennessee see Chapter 4, page .

Effect of Yield on Production Rank. Table XII shows that the rank of acreage and production differ widely in some states in the same year. This is the most obvious in California. From 1909 to 1928 its rank in production at each period was considerably higher than the rank in acreage. The production ranks varied from 4th to 7th while the acreage ranks showed variations from 8th to 19th. Apparently the higher rank in production was due largely to the greater yields in this state (see Tables X and XI). This would be true because of the well known fact that, even with the same acreage, the state with the higher yield will have the greater production. This state ranks far ahead of most of the other states in yield as shown by the tables referred to above.

Table XII also shows that states may change in rank in production without a corresponding change in acreage rank. For instance, the acreage rank in Tennessee was 2nd in both 1899 and 1909. The production rank was 5th and 8th at each respective period. However at the two following periods this state ranked 1st in both acreage and production. The production rank had changed from 8th to 1st. The acreage rank had changed from 2nd to 1st. Other states have had similar changes, particularly in Arkansas.

The changes in the relative rank of production in Tennessee could have been due partly to changes in the yield per acre in that state, for there was a decline from 11,849 quarts in 1899 to 11,467 quarts in 1909, followed by an increase to 1207 quarts in 1919. These changes were followed by downward and upward changes in rank respectively as shown above. However these changes are likely not great enough to account entirely for the relative changes in production rank. It is probable that changes in other states had considerable effect on Tennessee's relatively low production rank in 1899 and 1909, in that other states may have increased more rapidly. This

more rapid increase may be due in turn to an increased yield or acreage, or more likely to a combination of both. During this time some of the higher yielding states also had large acreage increases, particularly California, Louisiana, and Washington. Even with the same increase in acreage those states with the highest yields will increase the most rapidly in production rank. Consequently, yield has considerable effect on the change in the relative rank of states in quantities produced.

Table XII.

Rank of States in Acreage and Production of Strawberries, 1899-1928(1)

State	Rank in 1928		Rank in 1924		Rank in 1919		Rank in 1909		Rank in 1899	
	Prod.	Acre.	Prod.	Acre.	Prod.	Acre.	Prod.	Acre.	Prod.	Acre.
Louisiana	1	2	7	5	14	13	16	15	27	22
Missouri	2	1	6	3	2	2	5	3	8	8
Tennessee	3	4	1	1	1	1	8	2	5	2
Virginia	4	7	4	6	21	20	9	8	10	7
Maryland	5	5	3	4	7	5	1	1	1	1
Arkansas	6	3	2	2	4	3	13	6	9	4
California	7	17	5	19	5	8	4	13	15	17
Oregon	8	6	14	10	17	19	19	17	19	21
Washington	9	9	13	11	13	18	15	16	22	29
North Car.	10	11	9	8	20	21	10	10	11	13
New Jersey	11	10	11	9	8	6	2	4	6	6
Delaware	12	14	8	16	19	15	7	7	12	11
Kentucky	13	8	20	17	22	17	26	25	17	15
Alabama	14	13	18	22	not ranked				2	3
Michigan	15	12	10	7	3	4	6	5	13	12
Penn.	16	19	20	18	9	12	11	14	4	9
New York	17	16	12	12	17	9	3	9	7	10
Illinois	18	15	17	14	11	7	14	11	3	5
Ohio	19	17	16	13	10	11	12	12	28	25
Florida	20	18	15	15	27	26	24	26	14	14
Indiana	21		23	21	16	16	21	20	16	16
Wisconsin	22	22	22	20	15	14	20	19	21	18
Iowa	23		21	23	12	10	18	18		

Number and Percentage of Farmers Reporting Strawberries

Grown

In the United States from 1899 to 1924 the trend has been downward in both number and percentage of farms growing this crop. The increase from 1909 to 1919 is the only exception to this general decrease. Table XIII

shows that there were 280,203 farms reporting in 1899, 216,544 in 1909, 323,186 in 1919, and only 136,675 in 1924. The percentage of farms reporting followed this trend fairly closely. These were 4.9%, 3.4%, 5.0%, and 2.1% at each respective period.

The change in number and percentage of farms reporting this crop was in opposite direction to the change in acreage, with the exception of the period from 1899 to 1909. From 1909 to 1919 the acreage decreased from 143,045 to 119,395 while the number of farms increased from 216,544 to 323,186. On the other hand, the acreage increased from 119,395 in 1919 to 193,175 in 1924 which was accompanied with a decrease in number of farms from 323,186 to 136,675. In other words a smaller number of acres were being grown in 1919 than in 1909, and on more farms; while in 1924 a larger acreage was reported than in 1919, but on fewer farms. During the former period the acreage per farm reporting declined from 0.66 to 0.37. There was an increase from 0.37 acres to 1.41 acres during the latter period.

From 1919 to 1924 only nine states showed an increase in number of farms reporting strawberries. These were Delaware, Maryland, Louisiana, Florida, Arkansas, Oregon, Texas, Virginia, and Utah. Four of these, Delaware, Maryland, Texas, and Utah, reported a decrease in period from 1909 to 1919 which was also in the opposite direction from the general upward trend. In fact only 8 states reported this decrease then.

There is apparently no reason for this trend from 1909 to 1919. One would not have expected a decrease of approximately 17% in acreage to be accompanied by an increase of about 49% in the number of growers. On the other hand, from the available data there seems to be more reason for the decrease in producers and an increase in acreage that occurred during the 1919-1924 period. Apparently the production is being placed more on a commercial scale as indicated by the increased acreage per farm from 0.37 to

Table XIII.

Number and Percentage of Farms Reporting Production of Strawberries
1899 - 1924

Section or State	1924		1919		1909		1899	
	No.	%	No.	%	No.	%	No.	%
New England	6,002	3.8	15,114	9.7	15,757	7.3	65,198	9.7
Mid. Atlantic	15,894	3.8	35,731	8.4	33,637	7.2		
E.N. Central	30,340	2.9	98,456	9.1	53,425	4.3	143,409	1.2
W.N. Central	21,450	1.9	94,597	8.6	52,331	4.3		
S. Atlantic	24,004	2.2	29,209	2.5	27,627	2.5	51,115	3.2
E.S. Central	14,236	1.4	22,103	2.2	12,772	1.2	25,408	1.2
W.S. Central	11,967	1.2	9,311	0.9	7,348	0.8		
Mountain	3,036	1.3	5,761	2.4	4,791	2.6	(1)	(1)
Pacific	9,746	3.7	12,904	5.5	10,306	5.4		
Maine	1,606	3.2	3,435	7.1	3,464	5.8	no data	no data
New Hamp.	772	3.7	2,197	10.7	1,594	5.9	" "	" "
Vermont	442	1.6	1,999	6.9	1,240	3.6	" "	" "
Massachusetts	2,024	6.0	4,866	15.2	4,654	12.6	" "	" "
Rhode Island	205	5.2	503	12.3	545	10.3	" "	" "
Connecticut	953	4.1	2,114	9.3	2,260	6.4	" "	" "
New York	5,933	3.1	15,237	7.9	14,086	6.5	18,812	8.3
New Jersey	4,223	14.2	5,041	17.0	6,086	18.2	7,100	20.5
Pennsylvania	5,739	2.9	15,453	7.6	13,515	6.2	25,632	11.5
Ohio	5,661	2.4	13,120	5.1	8,799	3.2	24,376	8.3
Indiana	3,968	2.0	13,209	6.4	5,433	2.5	no data	no data
Illinois	4,646	2.1	24,952	10.5	10,311	4.1	14,245	5.4
Michigan	10,270	5.3	24,987	12.7	16,798	8.1	28,227	13.9
Wisconsin	5,595	2.9	25,188	13.3	12,084	6.3	no data	no data
Minnesota	3,391	1.8	21,282	11.9	9,420	6.0	" "	" "
Iowa	3,935	1.9	36,662	17.2	19,871	9.2	" "	" "
Missouri	10,862	4.2	24,603	9.4	13,429	4.8	15,434	5.4
N. Dakota	151	0.2	837	1.1	883	1.2	no data	no data
S. Dakota	213	0.3	2,212	3.0	1,836	2.4	no data	no data
Nebraska	660	0.5	3,597	2.9	3,425	2.6	" "	" "
Kansas	2,180	1.3	5,404	3.3	3,967	2.2	" "	" "
Delaware	2,570	25.1	2,163	21.3	3,625	33.4	3,299	34.1
Maryland	5,743	11.7	5,260	11.0	7,463	15.3	7,499	16.3
D. of C.	6	4.3	18	8.8	16	7.4	no data	no data
Virginia	5,798	3.0	5,772	3.1	4,651	2.5	6,453	3.8
W. Virginia	1,225	1.4	3,905	4.5	2,408	2.5	no data	no data
N. Carolina	4,737	1.7	5,796	2.1	5,663	2.2	5,885	2.6
S. Carolina	595	0.3	2,067	1.1	1,333	0.7	no data	no data
Georgia	847	0.3	2,974	1.0	1,594	0.5	" "	" "
Florida	2,478	4.2	1,254	2.3	1,014	2.0	" "	" "
Kentucky	3,478	1.3	7,441	2.7	3,983	1.5	" "	" "
Tennessee	8,385	3.3	9,780	3.9	6,046	2.5	8,259	3.7
Alabama	1,951	0.8	3,883	1.5	1,958	0.7	no data	no data
Mississippi	422	0.2	999	0.4	785	0.3	" "	" "
Arkansas	6,810	3.1	8,032	2.6	3,869	1.8	4,481	2.5
Louisiana	3,304	2.5	1,481	1.1	874	0.7	no data	no data
Oklahoma	776	0.4	958	0.5	1,182	0.6	" "	" "

(continued)

(1) Data not comparable.

Source: Census.

Table XIII.

Number and Percentage of Farms Reporting Production of Strawberries (cont.)

Section or State	1924		1919		1909		1899	
	No.	%	No.	%	No.	%	No.	%
Texas	1,077	0.2	840	0.2	1,423	0.3	no data	no data
Montana	436	0.9	871	1.5	619	2.4	" "	" "
Idaho	617	1.5	2,340	5.6	1,605	5.2	" "	" "
Wyoming	142	0.9	172	1.1	146	1.4	" "	" "
Colorado	761	1.3	1,513	2.5	1,231	2.7	" "	" "
New Mexico	33	0.1	129	0.4	54	0.2	" "	" "
Arizona	34	0.3	56	0.3	88	0.7	" "	" "
Utah	975	3.8	634	2.5	1,049	4.8	" "	" "
Nevada	38	1.0	46	1.5	19	0.7	" "	" "
Washington	4,322	5.9	5,996	9.0	4,323	7.7	" "	" "
Oregon	4,200	7.5	4,134	8.2	3,701	8.1	" "	" "
California	1,224	0.9	2,774	2.4	2,232	2.6	1,906	2.6
United States	136,675	2.1	323,186	5.0	216,544	3.4	280,203	4.9

1.41 as mentioned above. Are some of the non-commercial producers quitting strawberry production? In Tennessee, during this period, the less important producing areas reported a decrease in number of farms reporting strawberries. (See Chapter IV, p. 88, for discussions on counties.) On the other hand each of the principal producing counties reported an increase. The decrease for the state was 14.3%. This indicates a greater concentration of production and apparently explains, partly at least, the decrease in number of farms producing this crop. It is probable that similar conditions exist in other states, which if true would help to explain the decrease in the United States as a whole.

The price trends in the United States might help to explain this situation. According to the U. S. D. A. estimates the annual averages were: 20¢ in 1920, 20¢ in 1921, 15¢ in 1922, 15¢ in 1923, and 14¢ in 1924. Low prices began in 1922 and continued through this 5-year period. Did some of the marginal and submarginal producers become discouraged and quit before 1924? This is probable. But why the continued annual increase in acreage through 1924? It could have been due to the probable trend toward concen-

tration in commercial areas mentioned above, which was accompanied by increase in acreage per farm.

Trend in Average Acreage per Farm Reporting.

Table XIV shows that the average number of acres of strawberries per farm is small. No state has reported a larger acreage than 4.08 during either of the four census periods. This was the average for Louisiana in 1909. The lowest average was one-tenth of an acre reported by South Dakota in 1919. The United States average has varied from approximately one-third to two-thirds of an acre from 1899 to 1919. Five years later the average was 1.41 acres. This increase was largely the result of the great expansion in total acreage from 119,395 in 1919 to 193,175 in 1924, which was accompanied by an actual decrease in number of farms reporting strawberries, during this period, from 323,186 to 136,675 (see page 67). During this expansion period an increase occurred in each state regardless of its importance as a producing state. Five states, however, had actual decreases in acreage. These were Indiana, Iowa, Pennsylvania, California, and Wisconsin (see page 33). In these states then, we find decreasing acreages and increasing number of acres per farm.

The principal producing states have greater acreages per farm than the less important states. In 1924 the New England states reported average acreages varying from 0.44 to 0.68. The average in the Mountain group of states varied from 0.37 to 1.12. None of the high producing states had an average as low as 1.12 acres. The acreages in these states vary from about $1\frac{1}{2}$ to approximately 5. Louisiana ranks highest with 5.05 acres. The next 5 high ranking states are Tennessee with 2.94 acres, Arkansas also with 2.94, California with 2.93, Mississippi with 2.29, and Maryland with 2.09.

The producers in the less important states have relatively small acreages per farm because they are producing largely for local markets and have con-

sumption. Those in the larger producing states are growing strawberries largely for shipment to the central markets. This crop is one of their principal cash crops. It is only natural then that they have larger acreages per farm.

Table XIV.

Average Acres of Strawberries Per Farm for Farms Reporting

State	1924	1919	1909	1899	State	1924	1919	1909	1899
<u>New England</u>					<u>E. S. Central</u>				
Maine	0.44	0.16	0.20	(1)	Kentucky	1.38	0.42	0.39	(1)
New Hamp.	0.45	0.17	0.20	(1)	Tennessee	2.94	1.11	1.78	1.40
Vermont	0.59	0.14	0.22	(1)	Alabama	1.60	0.35	0.60	(1)
Massachusetts	0.68	0.29	0.43	(1)	Mississippi	2.29	0.69	0.93	(1)
Rhode Island	0.43	0.18	0.26	(1)	<u>W. S. Central</u>				
Connecticut	0.64	0.30	0.44	(1)	Arkansas	2.04	1.38	1.90	2.10
<u>Middle Atlantic</u>					Louisiana	3.03	2.70	4.08	(1)
New York	0.91	0.32	0.45	0.39	Oklahoma	1.40	0.31	0.70	(1)
New Jersey	1.54	1.00	1.43	1.23	Texas	1.83	0.60	1.52	(1)
Pennsylvania	0.53	0.28	0.31	0.22	<u>Mountain</u>				
<u>East North Central</u>					Montana	0.65	0.18	0.43	(1)
Ohio	0.91	0.32	0.53	0.38	Idaho	0.64	0.20	0.43	(1)
Indiana	0.79	0.26	0.47	(1)	Wyoming	0.37	0.23	0.16	(1)
Illinois	1.08	0.20	0.52	0.50	Colorado	1.04	0.43	1.08	(1)
Michigan	0.94	0.32	0.48	0.38	New Mexico	0.61	0.22	0.37	(1)
Wisconsin	0.61	0.14	0.24	(1)	Arizona	1.12	0.36	0.85	(1)
<u>West North Central</u>					Utah	0.99	0.40	0.69	(1)
Minnesota	0.72	0.13	0.20		Nevada	0.66	0.11	0.26	(1)
Iowa	0.48	0.12	0.15	(1)	<u>Pacific</u>				
Missouri	1.42	0.36	0.67	0.48	Washington	1.27	0.52	0.76	(1)
North Dakota	0.46	0.11	0.10	(1)	Oregon	1.51	0.68	0.79	(1)
South Dakota	0.54	0.10	0.12	(1)	California	2.93	1.79	2.01	1.27
Nebraska	0.58	0.21	0.16	(1)	<u>United States</u>				
Kansas	0.85	0.22	0.43	(1)		1.41	0.37	0.66	0.54
<u>South Atlantic</u>									
Delaware	1.90	1.62	1.98	1.92					
Maryland	2.09	1.35	1.91	1.86					
D. of C.	-	-	-	-					
Virginia	1.70	0.42	1.42	1.21					
W. Virginia	0.68	0.23	0.29	(1)					
N. Carolina	1.43	0.33	0.96	0.95					
S. Carolina	0.72	0.15	0.59	(1)					
Georgia	1.20	0.22	0.57	(1)					
Florida	2.02	0.67	1.32	(1)					

(1) No data.

Chapter IV.

TRENDS OF PRODUCTION IN TENNESSEE AS A WHOLE AND
BY COUNTIES: 1899 - 1924

Production data for Tennessee counties, such as quantity produced, acreage, yields and farms reporting strawberries are not available except for census periods. No county estimates are made by the United States Department of Agriculture. Consequently annual changes cannot be traced. Mention of recent trends will be based on data collected by questionnaires and personal contacts with producers, dealers, and others interested in this crop.

Trend of Acreages.

In the State. The 24,628 acreage, as reported by the census in the state in 1924 was over twice that of any other census period beginning with 1899. The 11,548 acreage in 1899 was the second greatest. The decrease from 1899 to 1909 and the increase since 1909 is reflected in the county acreage data as shown in the series of Maps Numbers 13 -16 and Chart 5. However none of the principal producing counties follow the state trend very closely. An examination of Chart 5 will show that 7 counties had downward trends from 1899 to 1919 followed by increases to 1924. These were Gibson, Weakley, Hamilton, Carroll, Shelby, Obion, and Roane Counties. But in three of the principal counties, Gibson, Weakley, and Hamilton, the 1899 acreage was greater than the 1924 acreage whereas the opposite was true of the state. Two other counties, Knox and Davidson, had increases from 1919 to 1924, as in the state, but the trend was downward from 1909. In 6 counties, Crockett, Lauderdale, Haywood, Meigs, and Sumner, the increases have been continuous, thus differing from the sl

fluctuations in the state.

While in general the county trends have been upward they have not consistently followed the state trend. The exceptions to the upward trends have been noted above.

In Principal Producing Areas. As shown in Chapter I, there are 3 principal producing areas in this state - one in each the eastern, middle, and western sections. These areas will be referred to as East Tennessee, Portland, and West Tennessee areas respectively. The counties in each of these areas that had 50 acres or more of strawberries at the 4 previous census periods are shown in colors in Maps Numbers 13 - 16. The counties are arranged in groups, one color representing each group. The same grouping is used throughout the series of maps. For ready information the acreage and rank of each county has been inserted. Maps 17, 18, and 19 show the numerical increase from 1899 - 1909, from 1909 - 1910, and from 1919 - 1924. The trend for the 25-year period is shown in Chart 5. In this chart the counties are grouped by the three producing counties. Those in each group are ranked by the 1924 acreage.

Unfortunately no annual data are available by counties, as mentioned above. Consequently the census data must be relied upon to furnish data on changes. While this does not show annual changes it serves to show the general trends.

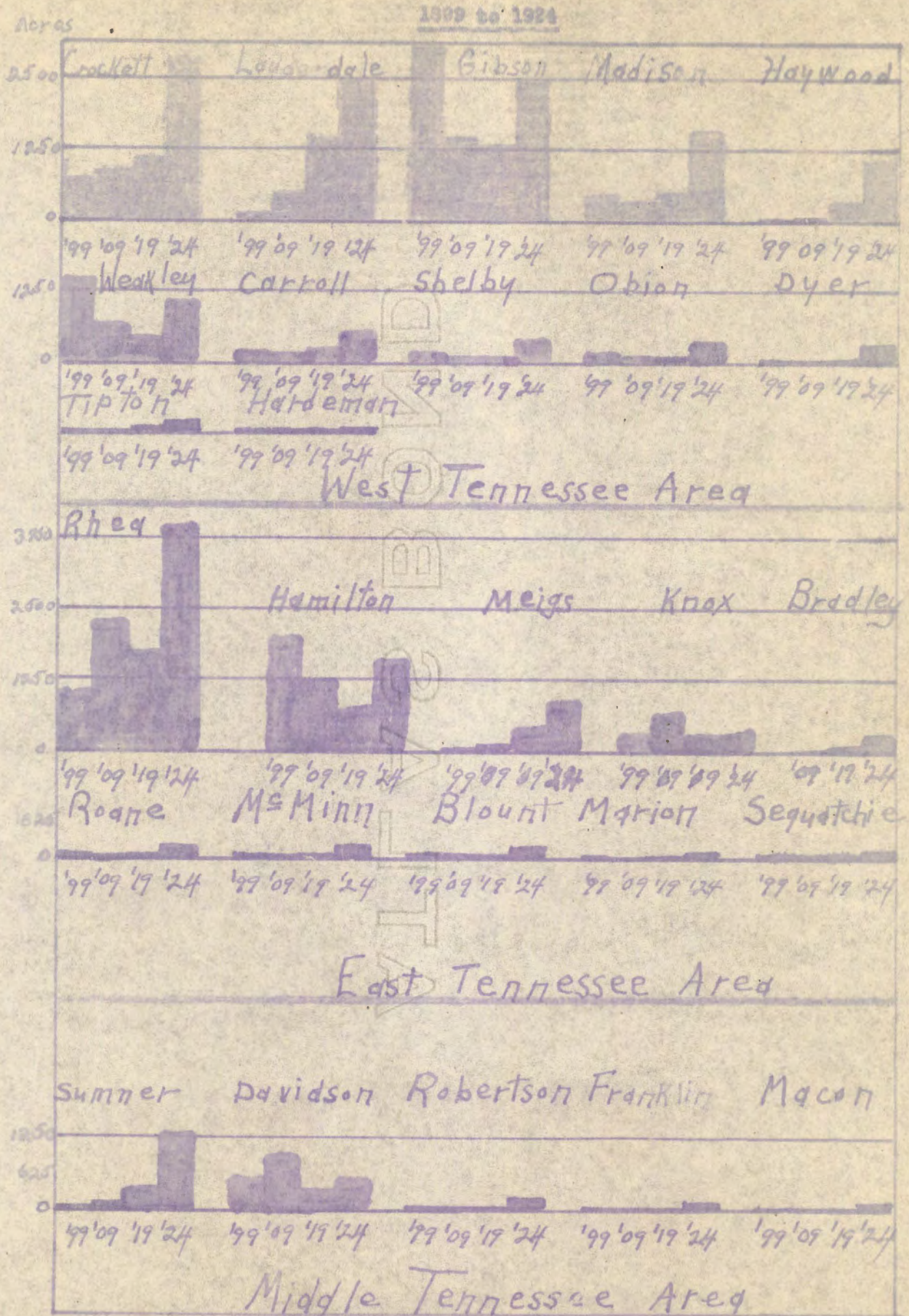
(1) The West Tennessee Area. This area has been the most important of the three at each of the four census periods from standpoint of total acreage. In 1899 the acreage in the nine West Tennessee counties, reporting 50 acres or more, was 6835 as compared with 3518 in the twelve counties in this acreage group in East Tennessee, the second largest area. In other words, the acreage in the former group was about 194% of that of the latter group. The increase to 1924 has been about in the same proportion. The West Ten-

nessee group had increased to 15,332 acres, which was 189% of the 8108 acres reported by the East Tennessee group at this time. Six of the ten highest ranking counties are in this area. They are Crockett, Lauderdale, Gibson, Madison, Haywood, and Weakley.

While there has been an upward trend in this area from 1899 - 1924, two of the principal producing counties, Gibson and Weakley, have had a decrease - the former from 3130 acres to 2494 acres and the latter from 1498 acres to 1101 acres. See Maps 13 - 16 and Chart 5. They remain, however, among the first 10 high producing counties - Gibson 3rd, and Weakley 9th. The former had declined from 1st place in 1899 and the latter from 3rd place. They both had an increase from 1919 to 1924 as shown in Chart 5. This was the period of the state increase of approximately 140%. This general decline in these two counties probably has been due partly to the competition of the strawberry crop with sweet potatoes. For, sometime after 1909, the acreage of the latter crop has increased greatly up to 1924. Weakley County reported an increase from 279 acres to 3624 acres, and Gibson from 379 acres to 1280 acres. The recent increase in the production of such truck crops, principally cabbage, green wrap tomatoes, and tomatoes, has likely affected the strawberry acreage (1)

Each of the other counties had an upward trend. In Crockett, Lauderdale, and Haywood Counties the increase has been continuous according to the census reports. Crockett and Lauderdale, with 2809 acres and 2557 acres respectively in 1924, rank first and second respectively in this area, and second and third in the state. Crockett has increased in rank since 1899 from fifth place and Lauderdale from tenth. Haywood's consistent increase to 1658 acres in 1924 has placed it fifth among the counties in this group and sixth in the state. The less important counties are Carroll

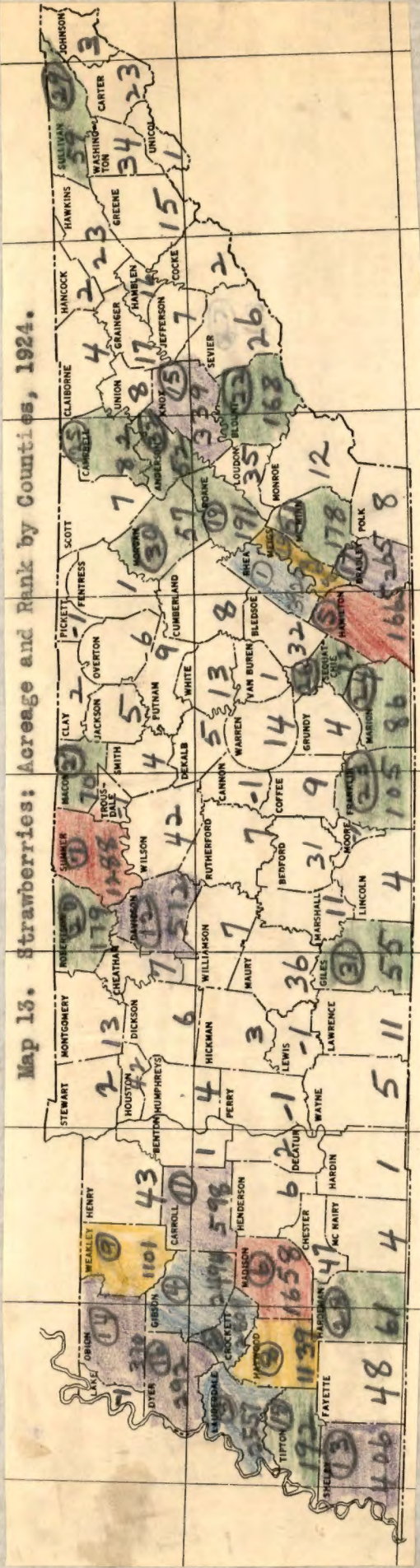
(1) Increases reported by agricultural workers.

Chart 3. Trend in Strawberry Acreages in Principal Counties,

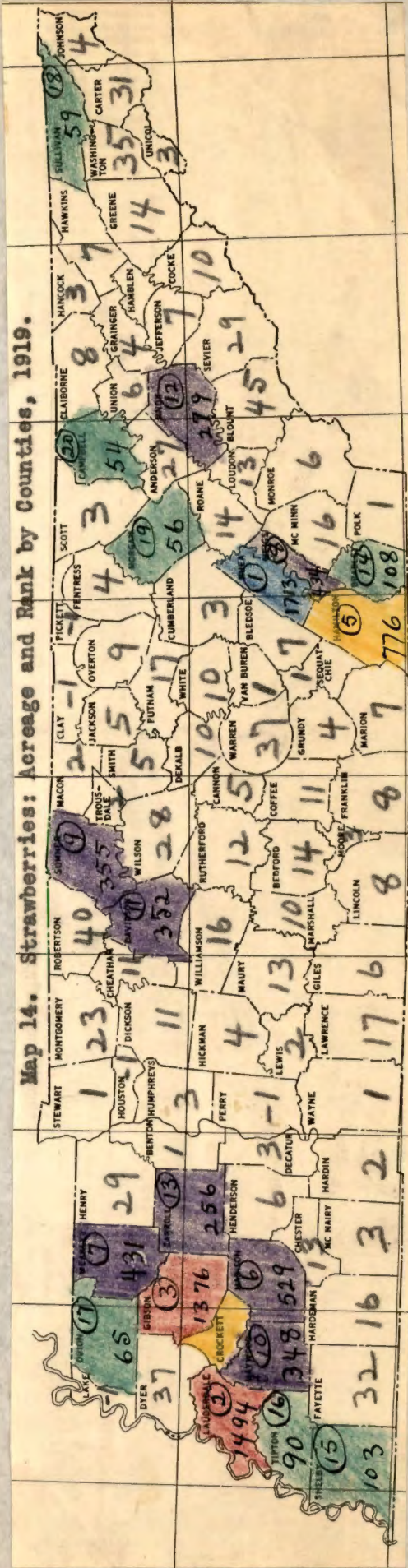
(1) All counties with over 50 acres in 1924.

Source: Census of Agriculture. Data found on Maps 13 to 16.

Map 13. Strawberries: Acreage and Rank by Counties, 1924.



Map 14. Strawberries: Acreage and Rank by Counties, 1919.

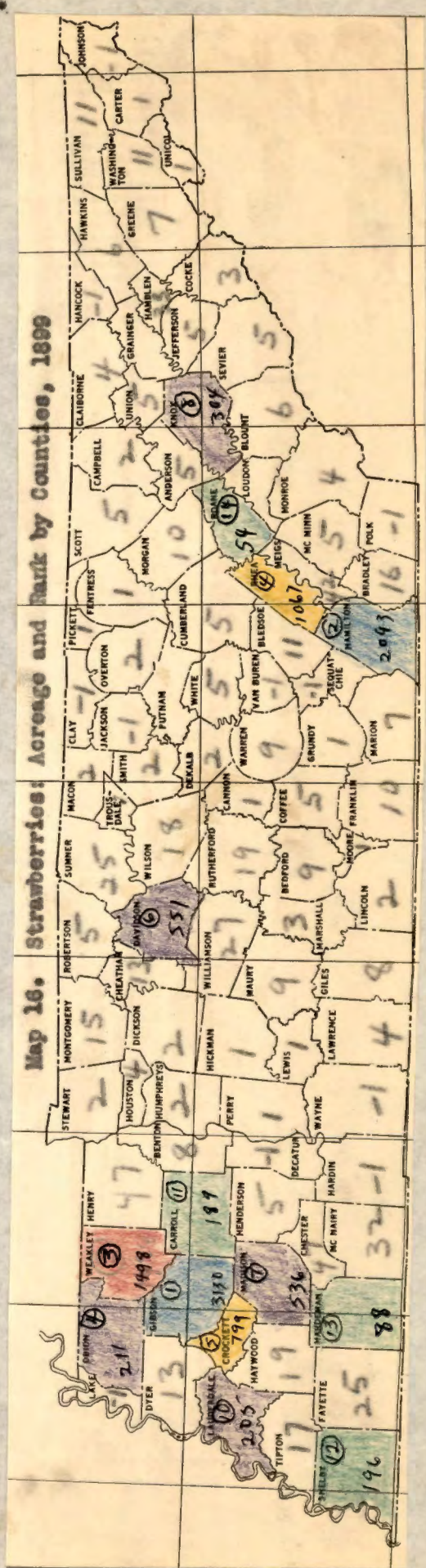
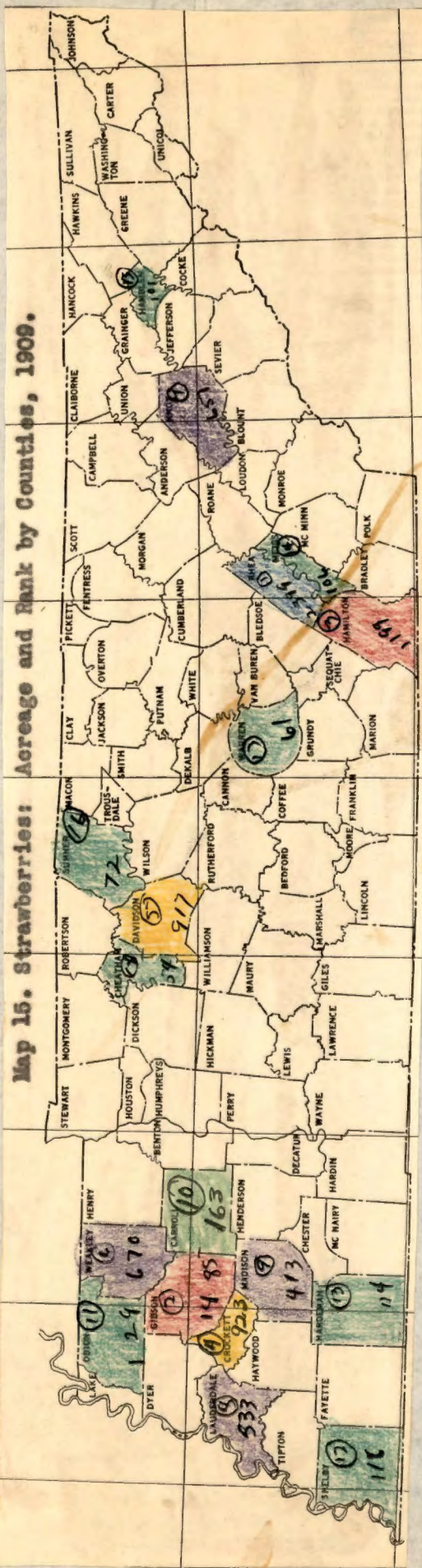


1700 acres and above
1200 acres to 1699

700 acres to 1199
200 acres to 699

☒ 50 acres to 199
☐ Less than 50 acres

Bottom figures - no. acres.
Top figures - rank.



1700 acres and above 700 acres to 1199 50 acres to 199 Bottom figures - no. acres.
1200 acres to 1699 200 acres to 699 Less than 50 acres Top figures = rank.

Shelby, Obion, Dyer, Tipton, and Hardeman, named in the order of their largest acreage in 1924. Their relative importance and trend are shown best in Chart 5.

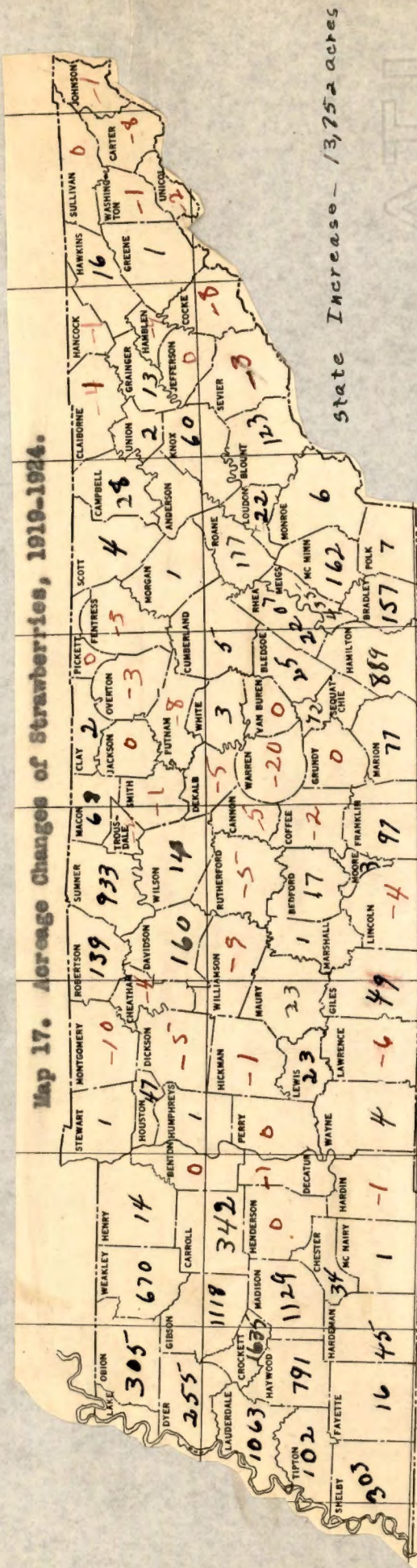
The numerical increases and decreases at each census period are shown in Maps Numbers 14, 15, and 16.

(2) Portland Area (North Middle Tennessee). In 1899 and until after 1919 this area was relatively unimportant in strawberry production. It is now the smallest producing area of the three mentioned above. Sumner County, which is now one of the highest producing counties in the state and the leading county in this area, has increased rapidly in strawberry acreage. In 1899 and 1909 it reported only 25 and 72 acres respectively. By 1919 the acreage had increased to 355 which gave the county a rank of 16th in the state. In 1924 it had increased to 1288 acres and 7th in rank. This is shown in the series of Maps Numbers 13 - 16 and Chart 5. These maps and chart show a downward trend in Davidson County, the other important producing county in North Middle Tennessee (2). It declined in relative rank from 6th to 12th. However the acreage is about the same as in 1899. Production has not increased in proportion to population. In fact a decrease of 565 acres was reported from 1909 - 1919, as shown in Map 17. During this period Sumner increased 283 acres. Robertson and Macon Counties never reported as many as 50 acres until 1924. They had only 179 acres and 70 acres respectively at that time. They are relatively unimportant producing counties.

The development of the strawberry industry in the Portland area is an extension of the industry in the Bowling Green area in Kentucky. As shown in Map 6, these areas are parts of the same general area. The production in the Kentucky area has spread southward into the Tennessee area.

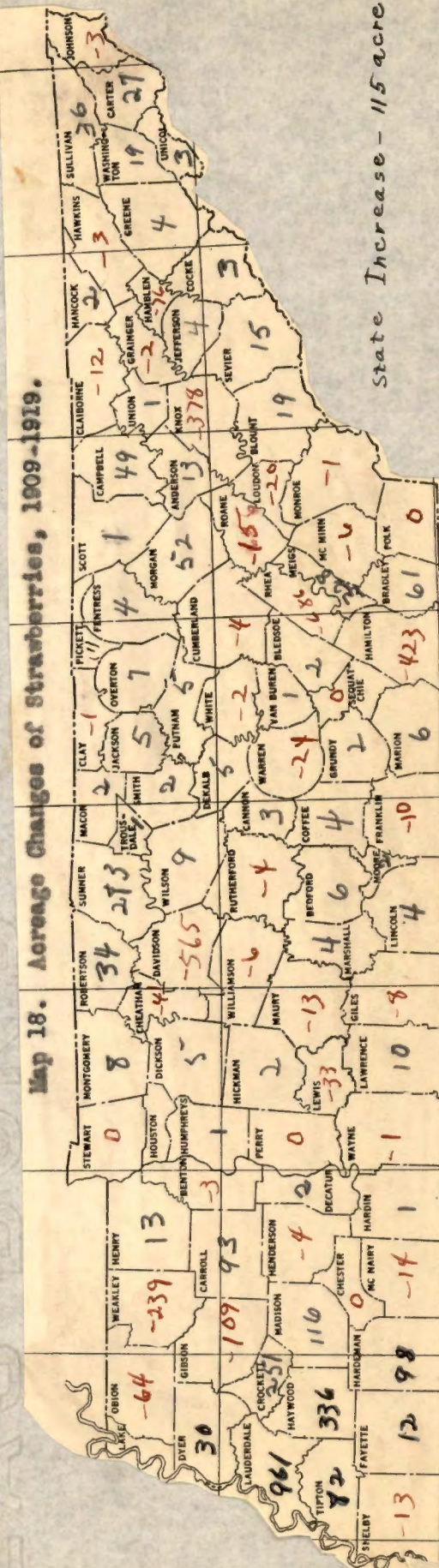
(2) Davidson is adjacent to Sumner but is not considered as a part of the Portland area, strictly speaking.

Map 17. Acreage Changes of Strawberries, 1919-1924.



state Increase - 13,752 acres

Map 18. Acreage Changes of Strawberries, 1909-1919.

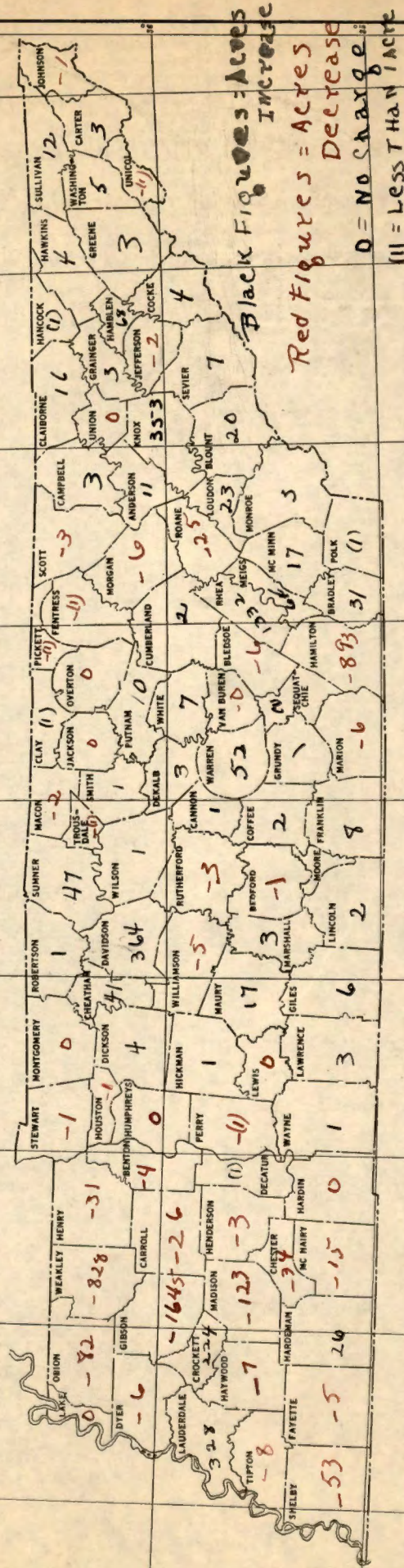


State Increase - 115 acres

Black figures - acres increase.
Red figures - acres decrease.

0 - no change.
(1) - less than 1 acre.

Map 19. Acreage Changes of Strawberries, 1899-1909.



RAND McNALLY

LETTER SIZE OUTLINE MAP

TENNESSEE

SCALE

0 10 20 30 40 50 60 70 Miles

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(3) The East Tennessee Area. Three of the principal strawberry producing counties are located in this area. The two outstanding counties in 1924 were Rhea and Hamilton, which reported 3920 acres and 1665 acres respectively. In fact Rhea ranked first in the state at this time and Hamilton ranked fifth. Meigs followed closely with 869 acres and a rank of 10th in the state. However, on a percentage basis this county is of greater importance than these figures indicate since the total crop area is much smaller. See Chart 6, page 82.

As in the other two areas there have been both increases and decreases within individual counties since 1899. For instance, the 2093 acreage in Hamilton County in 1899 was greater than at any of the following census periods. The relative rank has declined from 2nd to 5th. This is the only county in this area that reported a larger acreage in 1899 than in 1924.

However, Knox County's acreage in 1924 was only 35 greater than in 1899. This county's trend is very similar to that in Davidson County - upward in 1909 followed by a decrease in 1919 and an increase in 1924 to about the 1899 level. (See Chart 5.) Knox County's rank declined from 8th to 15th during the 25 year period.

Chart 5 shows further that Meigs and Bradley Counties have had continued acreage increases throughout the entire 25 year period - the former from less than 50 in 1899 to 869 in 1924 and the latter from 4, in 1909, to 265 in 1924.

The fluctuations in Rhea County were the most noticeable, as shown in Chart 5. Her acreage increased to 2399 in 1909; this was followed by a decrease to 1713 in 1919 and an increase to 3920 in 1924, thus placing her first in the state with the largest acreage for any county during these 4 census periods. The increase from 1919 to 1924 was 2207 acres, as shown by Map 19. The acreage changes for the other two periods are shown in Maps 17 and 18.

Several counties have come into commercial production in the East Tennessee area since 1909 (3). These are Bradley, McMinn, Sullivan, Morgan, Campbell, Blount, Marion, and Sequatchie (4).

By 1929, however, producing had almost ceased in Morgan, Marion, Sequatchie, Bledsoe, and Franklin. Robert Lyons, county agent in Cumberland County, states that the growers in Morgan County were discouraged largely by the excessive wet weather during the harvesting season (5). The growers in Marion, Sequatchie, and Bledsoe Counties were handicapped by lack of adequate railroad facilities. For further discussion of this see Chapter _____ on transportation. The farmers of Franklin County are more interested in livestock and general farming than in trucking. Apparently the competition of other farm enterprises has discouraged strawberry production there. Under existing conditions it is doubtful if strawberry growing will become a popular and profitable farm enterprise in these counties (5).

However there seemed to be greater activity in Monroe and Blount Counties (6). Approximately 35 carlots were shipped in 1929 from these two counties as compared with an average of 10.5 cars for 4 years from 1923 to 1927 (7). It is said that some increases are being made in plantings in 1930 in spite of an expected decrease throughout the state of 20% (8). Data are not available to show trends since 1924 by counties. However, U. S. D. A. estimates for the state show a downward trend from 26,220 acres in 1924, the

(3) Counties reporting 50 acres and over. It is recognized a county might be producing on a commercial basis with less than 50 acres. In fact Bledsoe County did this.

(4) Franklin is located in Middle Tennessee, but is considered here as a part of the so-called East Tennessee area since it is adjacent.

(5) The average rainfall for this area is 54 inches, which is higher than all other counties except some of those of the Cumberland Plateau area of which Morgan is a part. (Tennessee, Economic and Social, p. 19.)

(6) Reports from field trips, and from agricultural workers.

(7) Monroe County shipments are credited to Blount since shipments are made through the Blount County Association. Their shipments are a small part of those from Blount.

(8) Outlook reports of U. S. D. A.

peak year, to 16,810 acres in 1929 (9).

From this one might expect decreases in many of the principal counties but not necessarily in all. There may be some shifting in producing areas - decreases in some and increases in others.

The Decline in Relative Rank of Three City Counties. As shown above, Knox, Davidson, and Hamilton Counties have declined in relative rank among the other counties since 1899 - Knox from 8th to 15th, Davidson from 6th to 12th, and Hamilton from 2nd to 5th (Maps 13 - 16). The acreage in each of the two former counties was about the same in 1924 as in 1899, while that of Hamilton has decreased. However, Hamilton has shown an increase of 889 acres from 1919 to 1925, Davidson 512 acres and Knox 60 acres for the same period. Regardless of these increases Knox declined from 12th to 15th and Davidson from 11th to 12th, and Hamilton's rank was unchanged.

Apparently, therefore, commercial production is developing outside of these city counties at a more rapid rate. To what extent is this condition due to differences in cost of production? to competition with other crops? and to the development of improved highways which would make this competition more effective? It should be recognized, however, that highway improvement has taken place during the period of the least decline in relative importance. It should also be recognized that rural counties like Weakley and Gibson have had a decline similar to these city counties.

Percentage of Crop Area in Strawberries. Total acreage data by counties are adequate for showing the shifting of producing areas and the changes that have taken place within the counties, but they do not show the importance of the counties in proportion to their size. This is due to the wide variation in the size of counties. To place the counties on a comparable basis and to show the relative importance of the crop in the county the percentage of total

Chart 6. Percentage of Crop Area in Strawberries, 1909, 1919, 1924.

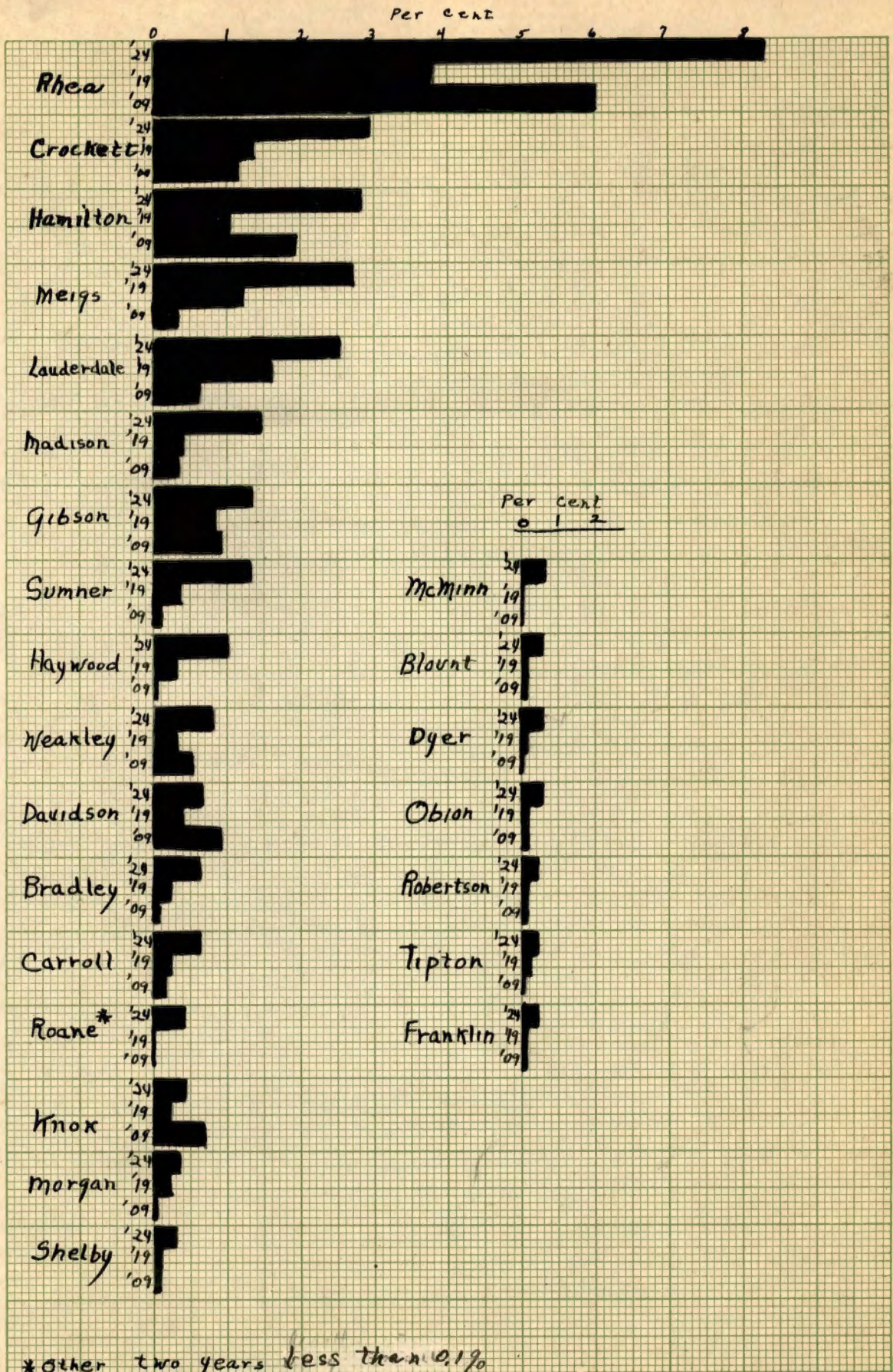


Table IV.

Percentage of Total Crop Area in Strawberries in the Principal Producing Counties,
1909-1924.

County	1924			1919			1909		
	% of crop area in strawberry-ries.	Rank in strawberry-ries.	% of crop area in strawberry-ries.	Rank in strawberry-ries.	% of crop area in strawberry-ries.	Rank in strawberry-ries.	% of crop area in strawberry-ries.	Rank in strawberry-ries.	
1. Ehea	8.33	1	3.82	1	6.06	1	1	1	
2. Crockett	2.97	2	1.37	3	1.16	4	4	3	
3. Hamilton	2.77	3	1.06	5	1.93	5	3	2	
4. Meigs	2.65	4	1.20	8	0.32	4	14	10	
5. Lauderdale	2.59	5	1.55	2	0.56	2	8	7	
6. Madison	1.44	6	0.42	6	0.36	7	9	9	
7. Gibson	1.31	7	0.77	3	0.90	6	2	5	
8. Sumner	1.29	8	0.26	9	(1)	11			
9. Haywood	0.96	9	0.28	10	(1)	10			
10. Weakley	0.84	10	0.31	7	0.51	9	6	8	
11. Davidson	0.62	11	0.37	11	0.92	8	5	4	
12. Bradley	0.56	12	0.18	14	(1)				
13. Carroll	0.56	13	0.23	13	0.15	13	10	11	
14. Roane	0.41	14	(1)		(1)				
15. Knox	0.40	15	0.23	12	0.64	14	7	6	
16. Morgan	0.30	16	0.24	19	(1)	12			
17. Shelby	0.37	17	(1)		(1)				
18. McMinn	0.26	18	(1)		(1)				
19. Blount	0.24	19	(1)		(1)				
20. Dyer	0.24	20	(1)		(1)				
21. Obion	0.24	21	(1)		(1)				
22. Robertson	0.18	22	(1)		(1)				
23. Tipton	0.14	23	(1)		(1)				
24. Franklin	0.14	24	(1)		(1)				
25. Chester	0.10	25	(1)		(1)				

(1) Less than 0.1%.

(1) Less than 0.1%.

crop acres in strawberries in the principal counties is presented here. This data for 25 of the highest ranking counties is presented graphically on page 82 and in Table XV. In both this chart and table the counties are ranked from the highest to the lowest by the 1924 data. The rank of each county in both total strawberry acreage and percentage of crop area in strawberries has been included in Table XV. This table shows that ranking by the latter changed most of the counties but little from the rank by acreage. In 1924 the two ranks in each Rhea, Crockett, Madison, and Knox Counties were the same. In fact Rhea held the first rank in both acreage and percentage in each of the three periods. The percentage rank varied very little in most counties.

The most obvious exceptions are Meigs and Morgan Counties. Meigs ranked 4th in percentage but only 10th in total acreage. Its small size caused a low acreage rank. Morgan ranked 30th in number of acres and 16th in percentage of crop area. The county as a whole is not small but it has a relatively small crop area.

This table also shows that strawberries occupy a small part of the crop land even in the principal producing counties. Rhea ranked highest with 8.33% in 1924. Four others had more than 2%. They were Crockett, Hamilton, Meigs, and Lauderdale. The majority had less than 1%. This low percentage indicates either a low percentage of farmers producing this crop, or a relatively small acreage per farm, or both. It is likely both as shown later (see p.).

Farms Reporting Strawberries Grown.

Number, and Per Cent of All Farms. In most counties of this state this crop is grown on relatively few farms. In 1924 and 1919 only 16 and 30 counties respectively reported more than 100 such farms, as shown in Table XVI. Gibson County ranked highest in 1924 with 1002 farms reported; Rhea, 2nd with 837; and Sumner 3rd with 590. Only these three counties reported 500 farms

or more. Forty-one counties reported 25 farms or less. No report was given for seven counties.

For a fairer comparison of counties these data are shown on a percentage basis. The percentage in 1924 is shown in the first column of Table XVI in which the counties are ranked from the highest to the lowest. Only 17 counties report 4% or more. On the other hand less than 1% is reported in 49 counties. Rhea ranked first with 52.7%; Meigs 2nd with 30.1%; and Hamilton 3rd with 17.2%. Gibson ranked 5th.

Table XVI.

Number and Percentage of Farms Reporting Strawberries, 1924-1919

County	Percentage		Number		County	Percentage		Number	
	1924	1919	1924	1919		1924	1919	1924	1919
Rhea	52.7	37.1	837	445	Haddon	1.9	1.8	54	50
Meigs	30.1	11.4	273	107	Warren	1.8	11.4	48	313
Hamilton	17.2	8.6	438	214	Washington	1.8	5.8	59	166
Crockett	14.2	9.8	480	302	White	1.8	6.3	57	128
Gibson	14.0	9.8	1002	648	Franklin	1.7	2.1	58	46
Lauderdale	13.1	8.8	483	300	Bladscoe	1.5	2.3	12	24
Sumner	13.0	5.7	590	260	Chester	1.5	2.8	26	46
Madison	10.3	4.1	441	185	Hamblen	1.5	4.9	23	77
Weakley	8.4	5.8	414	294	Dyer	1.4	1.9	53	73
Carroll	8.1	5.5	323	226	Grainger	1.4	3.0	33	67
Knox	7.1	9.3	291	370	Mauzy	1.4	1.8	54	66
Davidson	6.7	8.2	264	250	Marshall	1.3	3.5	36	89
Bradley	5.3	5.0	88	92	Tipton	1.3	1.3	54	70
Campbell	5.2	6.7	107	126	Grundy	1.1	5.2	7	29
Haywood	4.5	1.5	202	64	Hardeman	1.1	0.7	37	26
Blount	4.3	5.1	126	132	Monroe	1.1	1.9	27	48
McMinn	4.0	2.1	99	57	Johnson	1.0	4.2	17	70
Roane	3.9	2.5	69	42	Clay	0.8	no data	12	no data
Anderson	3.2	5.5	54	92	Cumberland	0.8	2.6	11	33
Marion	3.0	6.2	36	64	Houston	0.8	0.8	6	6
Morgan	2.6	3.7	32	46	Overton	0.8	4.9	22	134
Hawkins	2.6	3.1	97	102	Putnam	0.8	6.5	26	195
Loudon	2.4	3.9	31	54	Polk	0.8	1.5	8	14
Carter	2.4	5.4	67	148	Sevier	0.8	3.0	25	102
Sullivan	2.5	4.9	77	162	Cheatham	0.7	4.8	11	70
Sequatchie	2.2	3.5	16	12	Lawrence	0.7		27	136
Shelby	2.2	1.1	158	89	Wilson	0.7	3.8	27	223
Robertson	2.1	1.7	87	67	Giles	0.6	0.7	28	38
Obion	2.0	2.6	80	87	Greene	0.6	5.0	37	265

(continued)

Table XVI (continued)

Number and Percentage of Farms Reporting Strawberries, 1924 & 1919

County	Percentage		Number		County	Percentage		Number	
	1924	1919	1924	1919		1924	1919	1924	1919
Hickman	0.6	1.9	12	37	Jefferson	0.3	3.2	8	71
Jackson	0.6	2.7	15	65	Stewart	0.3	0.5	6	13
Union	0.6	3.6	12	75	Claiborne	0.2	5.1	6	154
Bedford	0.5	3.6	17	119	Fentress	0.2	6.0	2	73
Fayette	0.5	0.9	24	51	Montgomery	0.2	3.3	9	135
Henderson	0.5	1.5	15	48	Rutherford	0.2	2.0	12	105
Hancock	0.5	4.2	10	76	Williamson	0.2	2.4	7	82
Scott	0.5	2.3	8	35	Benton	0.1	0.6	2	12
Smith	0.5	2.5	15	73	Hardin	0.1	1.5	4	45
Van Buren	0.5	2.3	2	12	Lincoln	0.1	1.3	4	58
Coffee	0.4	7.6	9	177	Wayne	0.06	1.6	1	27
Dickson	0.4	1.5	10	38	Cannon	(1)	2.6	(1)	52
Henry	0.4	1.8	15	78	Lake	(1)	(1)	(1)	(1)
McNairy	0.4	0.6	13	19	Lewis	(1)	3.4	(1)	18
Unicoi	0.4	4.2	3	34	Moore	(1)	1.4	(1)	12
Cocke	0.3	3.0	9	85	Perry	(1)	0.2	(1)	3
Decatur	0.3	3.3	5	59	Pickett	(1)	0.5	(1)	5
DeKalb	0.3	4.6	8	128	Trousdale	(1)	3.4	(1)	30
Humphreys	0.3	1.9	5	35	State	3.3	3.9	8384	9780

This table shows that the state average percentage was 3.3% in 1924. This is much lower than that for some of the other principal crops. Apples were grown on 54.8% of the farms in the state, peaches on 47.4%, potatoes on 32.3%, sweet potatoes on 21.3%, and corn on 26.2%. The lowest percentage of farmers growing apples in any county was 7.4, for peaches 8.1, for potatoes 11.9, for sweet potatoes 5.6, and for corn 21.1 (10). As mentioned above, over one-half of the counties reported less than 1% growing strawberries and only about one-sixth reported 4% or more.

The production of strawberries is confined largely to a few counties. A large percentage of the farmers in the other counties apparently do not produce them, even for home consumption. This crop is considered as more of a luxury than the more essential foods, as corn, potatoes, apples, and peaches. This is likely one of the reasons for this crop's low rank in the percentage who grow it. The high ranking counties produce largely for the market.

Increases and Decreases in Farms Reporting Strawberries. Fewer farms

were growing strawberries in Tennessee in 1924 than in 1919. At the latter date 9780 were growing this crop while in 1924 the number had declined to 8385, a decline of 14.3%. On the other hand the total acreage increased from 10,876 to 24,628 and the acreages per farm from 1.11 to 2.94. In other words, some growers had increased their acreage while some others had discontinued production entirely.

While Tennessee as a whole showed a slight decrease a large majority of the principal producing counties showed an increase, according to Table XVII. These were Haywood, Meigs, Madison, Sumner, Hamilton, Rhea, Lauderdale, Crockett, Gibson, Carroll, Weakley, Shelby, and Davidson.

Table XVII.

Increase and Decrease in Farms Reporting Strawberries, 1919 and 1924

County	% Increase or Decrease in Number, 1919-1924	Number in 1924	Number in 1919	County	% Increase or Decrease in Number, 1919-1924	Number in 1924	Number in 1919
Haywood	215.6	202	64	Maury	-18.2	54	66
Meigs	155.1	273	107	Knox	-21.4	291	370
Madison	138.4	441	185	Tipton	-22.9	54	70
Sumner	126.9	590	260	Giles	-26.3	28	38
Hamilton	104.7	438	214	Dyer	-27.4	53	73
Rhea	88.1	337	445	Morgan	-30.4	32	46
Shelby	77.5	158	89	McNairy	-31.6	13	19
McMinn	73.7	99	57	Anderson	-41.3	54	92
Roane	64.3	69	42	Loudon	-42.6	31	54
Lauderdale	61.0	483	300	Polk	-42.9	8	14
Crockett	58.9	480	302	Chester	-43.5	26	46
Gibson	54.6	1002	648	Marion	-43.7	36	64
Carroll	42.9	323	226	Monroe	-43.7	27	48
Hardeman	42.3	37	26	Bledsoe	-50.0	12	24
Weakley	40.8	414	294	Grainger	-50.7	33	67
Sequatchie	33.3	16	12	Sullivan	-52.5	77	162
Robertson	29.9	87	67	Fayette	-52.9	24	51
Macon	8.0	54	50	Stewart	-53.8	6	13
Davidson	5.6	264	250	Carter	-54.7	67	148
Houston	0	6	6	Marshall	-59.6	36	89
Bradley	-4.3	88	92	Washington	-64.5	59	166
Blount	-4.5	126	132	Cumberland	-66.7	11	33
Hawkins	-4.9	97	102	Hickman	-67.6	12	37
Obion	-8.0	80	87	Henderson	-68.7	15	48
Campbell	-15.1	11	33	Hamblen	-70.1	23	77
Franklin	-17.4	38	46	White	-71.1	37	128

(continued)

Table XVII (continued)

Increase and Decrease in Farms Reporting Strawberries, 1919 and 1924

County	% Increase or Decrease in Number, 1919-1924	Number in 1924	Number in 1919	County	% Increase or Decrease in Number, 1919-1924	Number in 1924	Number in 1919
Dickson	-73.7	10	38	Jefferson	-88.7	8	71
Sevier	-75.5	25	102	Cocke	-89.4	9	85
Johnson	-75.7	17	70	Harden	-91.1	4	45
Grundy	-75.9	7	29	Unicoi	-91.2	3	34
Jackson	-76.9	15	65	Decatur	-91.5	5	59
Scott	-77.1	8	35	Williamson	-91.5	7	82
Smith	-79.5	15	73	Lincoln	-93.1	4	58
Lawrence	-80.1	27	136	Montgomery	-93.3	9	135
Henry	-80.8	15	78	DeKalb	-93.7	8	128
Benton	-83.3	2	12	Coffee	-94.9	9	177
Van Buren	-83.3	2	12	Glaiborne	-96.1	6	154
Overton	-83.6	22	154	Wayne	-96.3	1	27
Union	-84.0	12	75	Fentress	-97.3	2	73
Cheatham	-84.3	11	70	Cannon	no data		
Warren	-84.7	43	313	Clay	no data		
Bedford	-85.7	17	119	Lake	no data		
Humphreys	-85.7	5	35	Lewis	no data		
Greene	-86.0	37	265	Moore	no data		
Putnam	-86.7	26	195	Perry	no data		
Hancock	-86.8	10	76	Pickett	no data		
Wilson	-87.9	27	223	Trousdale	no data		
Rutherford	-88.6	12	105	State	-14.3	8384	9780

Haywood increased from 64 to 202 or 215.6%. Meigs, Madison, Sumner and Hamilton also had increases of more than 100%. Some of the less important counties also showed an increase. These were McMinn, Roane, Hardeman, Sequatchie, Robertson, and Macon. Seventy-five of the counties reported a decrease. Most of these were counties that produced largely for home consumption. Exceptions are Knox, Blount, Bradley, Tipton, and Dyer Counties, which reported carlot shipments (11). However, it is shown in Table XVII that the percentage decreases are relatively small in these five counties.

In general more farmers were reported as growing strawberries in the principal producing areas, while fewer were growing them in the areas that produce largely for home consumption. The increase in the principal producing counties is partly explained by the increase in acreage (see Map 17). The decrease in

(11) U. S. D. A. Technical Bulletin #19.

the less important counties could have been due to decreased acreages in only 25 counties or 1/3 of these counties that reported decreases in farms growing strawberries. Fifty of these less important counties reported an increased acreage, but, on the other hand, showed a decrease in the percentage of farmers that grew the crop. This is indicative of increased acreage per farm. (See page 91).

Acres per Farm.

In 1924 and More Recent Years. As a rule the largest acreages per farm are in the shipping areas, which are synonymous with the principal producing areas. Map Number 20 and Table XVIII show that all of the counties that had an average of 3 acres, or more in 1924, were in the two leading producing areas, East and West Tennessee. The East Tennessee counties were Rhea, Hamilton, Meigs, Bradley, and Sequatchie. The West Tennessee counties were Lauderdale, Haywood, Crockett, Dyer, Obion, Madison, and Tipton. The average for Sumner County, the leading county of the Portland area, was 2.2 acres per farm. It was in a lower group than the principal producing counties in East and Middle Tennessee.

Each of the city counties had a relatively high acreage per farm in 1924. Hamilton had 3.8 acres; Shelby, 2.6 acres; Davidson, 1.9 acres; and Knox, 2.8 acres. Most of the adjacent counties had an average of 1 acre or more, which was higher than in most of the counties. Some of these counties, Blount, Roane, Rhea, Meigs, Bradley, Haywood, and Tipton are among those that produce for shipment in carlots. The other counties that are adjacent to the cities, Wilson, Williamson, Robertson, Fayette, Anderson, Meigs(12), Loudon, Sevier, Bladsce, Sequatchie, and Marion were not reported as shipping strawberries. Some of them probably make some shipments, as there were 49

(12) Strawberries from Meigs County are shipped from stations in other counties.



Map 21. Average Number of Acres of Strawberries per Farm Reporting, 1919



Table XVIII

Strawberries: Number Acres per Farm; and Number Farms Reporting, 1919-1924

Rank	County	Acres per Farm		No. of Farms		Rank	County	Acres per Farm		No. of Farms	
		1924	1919	1924	1919			1924	1919	1924	1919
1.	Houston	7.0	(b)	6	6	50.	Sullivan	0.8	0.36	77	162
2.	Crockett	5.8	3.80	480	302	51.	Claiborne	0.7	0.05	6	154
3.	Haywood	5.6	5.45	202	64	52.	Hamblen	0.7	0.32	23	77
4.	Dyer	5.5	0.50	53	73	53.	Cumberland	0.7	0.10	11	33
5.	Lauderdale	5.3	5.00	483	300	54.	Maury	0.7	0.20	54	66
6.	Wayne	5.0	0.04	1	27	55.	Union	0.7	0.08	12	75
7.	Rhea	4.7	3.85	837	445	56.	Cheatham	0.6	0.15	11	70
8.	Obion	4.6	0.75	80	87	57.	DeKalb	0.6	0.08	8	128
9.	Sequatchie	4.5	0.08	16	12	58.	Dickson	0.6	0.30	10	38
10.	Madison	3.8	2.80	441	185	59.	Grundy	0.6	0.14	7	29
11.	Hamilton	3.8	3.61	438	214	60.	Rutherford	0.6	0.11	12	105
12.	Tipton	3.5	1.28	54	70	61.	Washington	0.6	0.20	59	166
13.	Meigs	3.2	4.00	273	107	62.	Benton	0.5	0.08	2	12
14.	Bradley	3.0	1.20	88	92	63.	Fentress	0.5	0.05	2	73
15.	Henry	2.9	0.37	15	78	64.	Grainger	0.5	0.06	33	67
16.	Roane	2.8	0.51	69	42	65.	Van Buren	0.5	0.08	2	12
17.	Franklin	2.8	0.17	38	46	66.	Decatur	0.4	0.05	5	59
18.	Bledsoe	2.7	0.08	12	24	67.	Greene	0.4	0.05	37	265
19.	Shelby	2.6	1.15	158	89	68.	Henderson	0.4	0.12	15	48
20.	Weakley	2.6	1.40	414	294	69.	Lawrence	0.4	0.12	27	136
21.	Gibson	2.5	2.12	1002	648	70.	Monroe	0.4	0.12	27	48
22.	Marion	2.4	0.11	36	64	71.	Jackson	0.3	0.08	15	65
23.	Sumner	2.2	1.57	590	260	72.	McMairy	0.3	0.14	13	19
24.	Payette	2.0	0.60	24	51	73.	Carter	0.3	0.20	67	148
25.	Giles	2.0	0.16	28	38	74.	Marshall	0.3	0.11	36	89
26.	Robertson	2.0	0.60	87	67	75.	Overton	0.3	0.07	22	134
27.	Davidson	1.9	1.40	284	250	76.	Putnam	0.3	0.08	26	195
28.	Bedford	1.8	0.10	17	119	77.	Smith	0.3	0.07	15	73
29.	Carroll	1.8	1.10	323	226	78.	Stewart	0.3	0.08	6	13
30.	Chester	1.8	0.30	26	46	79.	Unicoi	0.3	0.09	3	34
31.	McMinn	1.8	0.28	99	57	80.	White	0.3	0.08	37	128
32.	Morgan	1.8	1.20	52	46	81.	Warren	0.3	0.12	48	313
33.	Hardeman	1.6	0.60	37	26	82.	Clay	0.2	(a)	12	(a)
34.	Wilson	1.5	0.11	27	223	83.	Cocke	0.2	0.10	9	85
35.	Montgomery	1.4	0.17	9	135	84.	Hancock	0.2	0.04	10	76
36.	Blount	1.3	0.33	126	132	85.	Hickman	0.2	0.11	12	37
37.	Macon	1.3	0.04	54	50	86.	Johnson	0.2	0.06	17	70
38.	Knox	1.2	0.75	291	370	87.	Hardin	0.2	0.04	4	45
39.	Loudon	1.1	0.24	31	54	88.	Hawkins	0.01	0.07	97	102
40.	Anderson	1.0	0.50	54	92	89.	Cannon	(a)	0.10	(a)	52
41.	Coffee	1.0	0.06	9	177	90.	Lake	(a)	(a)	(a)	(a)
42.	Lincoln	1.0	0.13	4	58	91.	Lewis	(a)	0.11	(a)	18
43.	Polk	1.0	0.07	8	14	92.	Moore	(a)	0.25	(a)	12
44.	Sevier	1.0	0.29	25	102	93.	Perry	(a)	(b)	(a)	(b)
45.	Williamson	1.0	0.20	7	82	94.	Pickett	(a)	(b)	(a)	(b)
46.	Jefferson	0.9	0.10	8	71	95.	Trousdale	(a)	0.07	(a)	30
47.	Scott	0.9	0.09	8	35						
48.	Campbell	0.8	0.43	107	126						
49.	Humphreys	0.8	0.09	5	35						
							State	2.9	1.29	8384	9780

(a) None reported.

(b) Less than 1 acre reported for the entire county.

carloads shipped from counties that were listed as "other counties" (13). Apparently the growers in the city counties, and those adjacent, supply the local markets, as well as furnish some shipments to outside markets.

Results of a recent survey of the strawberry industry in 1928 in Crockett, Dyer, Gibson, Lauderdale, Madison, and Obion Counties in West Tennessee, and in Hamilton, and Rhea Counties in East Tennessee show a higher average acreage per farm than reported in Table XVIII (14). In the Western area 61 farms grew an average of 7.4 acres. An average of 11.1 acres was reported as grown on 50 farms in the Eastern area.

Questionnaires, returned by 87 farmers, located in the principal producing counties, show an average of 8.85 acres per farm reporting in 1929, and 7 acres in 1930. In comparing these averages with those of the commercial areas, as shown in Table XVIII, one should consider that the data were obtained in different years. There could have been changes from 1924 to the present time. The census data, shown in this table, also represents all growers in each of the counties, and are, therefore, probably more representative of the counties as a whole, than either the survey or the questionnaire data. But the latter data are probably more representative of the commercial producers.

This is indicated by the number of farms reported in given acreage groups. Of 61 farms surveyed in the West Tennessee producing area in 1928, 15 had less than 3 acres of strawberries, 17 had from 3 to 6 acres; and 29 had 6 acres or more. Of 50 farms surveyed that year in the East Tennessee producing area, 7 had less than 3 acres; 13 had from 3 to 6 acres; and 30 had 6 acres or more (15). Of the 84 farmers who returned questionnaires

(13) Statistical Bulletin No. 19, U. S. D. A.

(14) Brodell, A. P., Cost of Production Statistics of Strawberries in Southern and Eastern States - A survey made by Bureau of Agricultural Economics, U. S. Department of Agriculture in cooperation with the Division of Agricultural Extension, University of Tennessee, and Extension Divisions in other states.

(15) A. P. Brodell, op. cit.

sent them, 24 had less than 3 acres in this crop; 28 had from 3-6 acres; and 32 had 6 acres or more. A more detailed classification of these 84 farms shows that only 4 had less than 9 acre; 20 had from 1 to 3 acres; 21 had from 3 to 5 acres; 18 had from 5 to 10 acres; 18 had from 10-20 acres; and 7 had 20 acres and above. In fact one of these farmers reported 200 acres; another, 40 acres, and another, 38 acres (15). It is not at all unusual for some farmers to grow more than 20 acres each.

Very few of the non-commercial areas had more than 1 acre per farm, as shown in Map 20 and Table XVIII. In fact, 55 of these counties had less than 1 acre per farm, and 30 had less than 1/2 an acre. Seven of these counties did not report any farmers growing this crop. The high average acreage in Houston and Wayne Counties, as shown in this map, is accounted for by the small number of farms that reported strawberries grown. Apparently, then, the largest average acreages per farm are confined, principally, to commercial areas, in which production is for, either or both, shipment to other states, or consumption in the local markets.

The principal car-let shipping areas, however, had larger average acreages than the market garden areas, near the large cities. In the shipping areas, the strawberry is one of the principal cash crops. Hence, the larger average acreage per farm is grown there than in the market garden areas, where production is for a more limited market and where it is more of a side line than some of the principal cash crops. A relatively small patch is often grown there, along with other market garden crops.

The lower average acreage per farm in the less important producing areas is due to the fact that production there is largely for home consumption. Consequently, a small patch in the garden is usually sufficient to supply this demand.

(15) These are returns per farmer, and not returns per farm.

Trend from 1919 to 1924. The acreage per farm increased during this period in every county except in Meigs, which decreased from 4 acres to 3.2 acres; and in four other counties, Cammon, Lewis, Moore, and Trousdale, which reported a few farms growing this crop in 1919, but did not report any at all in 1924. This is shown in Table XVIII and Maps Numbers 20 and 21. The state average increase was from 1.29 acres to 2.9 acres. This was an increase of more than 100%. Furthermore, an average of 1 acre or more was reported by the producers in 16 counties in 1919 as compared with 45 counties in 1924.

This was a period of increasing acreage. The total in 1924 was 24,628, as compared with 10,876 in 1919 (17). The largest part of the increase was in the leading commercial counties. It was also in these counties that increases occurred in the number of farms growing this crop, as shown in Table XVIII. During this expansion period, then, it is likely that some farmers were increasing their acreages, while others were only beginning production. These beginners probably planted larger than average acreages - both in the commercial and non-commercial areas.

It is not so surprising that the number of producers in the non-commercial areas declined during this period, thus indicating a shift from these areas; but one would not likely expect it to be accompanied by actual increases in average acreages per farm. Although, it may be explained, partially, by assuming that the majority of the growers who quite producing were those who had the smallest acreages - in most cases only a very small part of an acre. This would have increased the average acreage without any increase in the actual size of the plantings. However, it is not altogether improbable that some of these growers actually increased their acreage. At any rate, it should be remembered that the acreage per farm in most cases

as shown in Table XVIII was much less than 1 acre in 1924, even after this increase.

Yields per Acre.

In Tennessee as a Whole. Tennessee is one of the lowest ranking states in yields per acre, as shown in the previous Chapter. There it was shown that this state ranked 40th in the average for the three census periods from 1899 to 1919, with 1179 quarts per acre. The average for each of the 3 census periods was, 1185 quarts in 1899, 1147 in 1909, and 1207 in 1919. The estimates of the United States Department of Agriculture show an average yield of 1551 quarts from 1920-1926 inclusive. This gave the state a rank of 22nd among the 28 producing states for which estimates are available. Among the second-early states, only Arkansas has ranked lower than Tennessee, during this 30 year period, except South Carolina in 1919 (Chart 4, p. 62a).

Furthermore its relatively low rank is shown by a recent survey of the strawberry industry in Southern and Eastern States (18). Table No. XIX shows the average yield in some of the principal producing areas in these states. Of the 15 areas in these states, in 1928, West Tennessee ranked the lowest, with a yield of only 1296 quarts, or 54 crates per acre. In 1927, this area ranked next to the lowest among these 15 areas. The Hammond area in Louisiana was the lowest, having only 1169 quarts per acre as compared with 1512 quarts in West Tennessee.

While the East Tennessee area had larger yields than the western area, it was outranked by eleven of the fifteen areas during both 1927 and 1928, as shown in Table XIX. In 1928 and 1927 yields of 1752 quarts and 1824

(18) Brodell, A. P., op. cit.

quarts were reported respectively in this Eastern area.

The yield in this state was approximately 1538 quarts, or 64.1 crates, in 1929, as reported by 75 producers in 22 counties (19).

Table XIX
Yield per Acre of Strawberries in Some Principal Producing Areas
in Eight Southern and Eastern States,
1927 and 1928

	1928			1927		
	Number Farms	24-Qt. Crates	Quarts	Number Farms	24-Qt. Crates	Quarts
Florida						
Plant City	96	99	2368	43	72	1728
Northern	23	117	2816	5	120	2880
Louisiana						
Hammond	40	50	1189	28	68	1632
Tennessee						
Eastern	50	76	1824	32	73	1752
Western	61	63	1512	40	54	1296
North Carolina						
Chadbourn	50	135	3232	46	123	2944
Duplin and Pender	53	141	3380	47	183	4160
Virginia						
Norfolk	45	127	3040	37	128	3072
Eastern Shore	60	163	3904	52	149	3584
Maryland						
Marion	45	108	2592	38	74	1776
Pittsville	31	74	1773	25	98	2349
Federalburg	15	166	4461	11	171	4115
Delaware						
Shelbyville	17	93	2240	8	108	2592
New Jersey						
Southern	57	125	3008	38	142	3408
Central	46	124	2976	25	128	3072

Source: Cost of Production Statistics of Strawberries in Southern and Eastern States, 1928

In Each of Three Producing Areas. Data from three sources have been collected in an attempt to determine the average yields in the three principal producing areas. These sources were, questionnaires returned by 75 (19) Returns from questionnaires.

growers for 1929, survey of the strawberry industry in East and Middle Tennessee in 1928, and the census reports from 1899 to 1919.

According to the questionnaire data the Portland area in Middle Tennessee had the largest yields in 1929. Table XX shows that the average for this area was 83 crates, or 1992 quarts. This was based on questionnaires returned by only 7 growers from Sumner County. While this is probably not a sufficient number of growers on which to base any conclusions, it gives an average which compares fairly closely with the average yield produced in the Bowling Green area, an adjacent area in Kentucky. This area reported an average of 70 crates, or 1840 quarts, for the first, second, and third crop seasons (20). This is not exactly comparable with the yield for a given year, since the yield for the second and third crop season are usually lower than that for the first season. Thus the yield in Bowling Green area for a given year is likely higher than that given above for each of 3 crop seasons, and would, therefore, approach nearer the yield that was reported above for Sumner County.

A yield of 67 crates, or 1608 quarts, was reported by 50 farmers in West Tennessee during this year. Thirty eight farmers in the Eastern area reported a production of 61 crates, or 1464 quarts, per acre.

On the other hand, the data for 1926, 1927, and 1928 furnished by the U. S. Department of Agricultural Economics, which is also presented in Table X^K, shows that the Eastern part of the state ranks ahead of the Western part. The former area reported 13 more crates per acre than the latter in 1926, 13 more in 1927, and 19 more in 1928. No attempt will be made here to explain fully the reasons for the larger yields in East Tennessee during these 3 years, because of lack of adequate data. However, according to the survey on the cost of production, the producers in the western area use

(20) Brodell, A. P., op. cit.

less fertilizer and cultivate less during the second and third season than the growers in the eastern area (21). For instance, the pre-harvest labor (man and horse) hours in East Tennessee were 294.5 for the first season, and 111.3 for each of the second and third seasons. In West Tennessee the hours were 218.8 for the first season, and only 11.5 hours for each of the second and third seasons. The East Tennessee growers, reporting, used 440 pounds of fertilizer per acre for the three crop seasons, as compared with 225 pounds used by the West Tennessee growers, reporting.

Table XX

Average Yield Per Acre of Strawberries in Three Principal Producing Areas, 1926 - 1929

	East Tennessee			West Tennessee			Sumner County		
	24-Qt. Crates	Qts.	Farm- ers re- port- ing.	24-Qt. Crates	Qts.	Farm- ers re- port- ing.	24-Qt. Crates	Qts.	Farm- ers re- port- ing.
1926 (a)	62	1488	11	49	1176	15	No data	No data	No data
1927 (a)	76	1824	32	63	1512	40	" "	" "	" "
1928 (a)	73	1752	50	54	1296	61	" "	" "	" "
1929 (b)	61	1464	38	67	1608	30	83	2092	7

(a) Data from Cost of Production Statistics of Strawberries in Southern and Eastern States.

(b) Data from 75 returned questionnaires.

While one might expect these variations in cultural and fertilization practices to affect yield they do not necessarily explain, fully, the larger yields in East Tennessee during this three-year period. For, in the first place, data are not available on the kind of fertilizers used by these farmers. In the second place, differences in weather conditions often cause such variations. However, it is not likely that lower yields in West Tennessee would have been caused altogether by the weather in three successive seasons.

(21) A. P. Bredell, op. cit.

Table XXI

Average Yields of Strawberries in Principal Counties in East, West,
and Middle Tennessee, 1899-1919(1)

County	East Tennessee			County	Middle Tennessee		
	Total acres	Total production in quarts	Yield in quarts		Total acres	Total production in quarts	Yield in quarts
Bradley	171	335,864	1315	Carroll	608	759,443	1249
Hamilton	4067	3,928,399	966	Crockett	2896	3,328,901	1150
Knox	1240	1,706,400	1376	Gibson	5991	7,653,507	1278
Meigs	582	695,435	1195	Hardeman	218	287,919	1321
Rhea	5179	6,273,406	1211	Haywood	379	464,964	1227
Total	11239	12,828,503	1141.4	Lauderdale	2232	3,156,023	1414
Middle Tennessee				Madison	1478	1,947,074	1317
Davidson	1820	2,202,519	1210	Obion	406	595,915	1464
Sumner	452	736,472	1629	Shelby	388	508,818	1311
Total	2272	2,938,991	1292	Weakley	2599	246,307	864
				Total	17194	20,948,871	1218.4

(1) These are weighted averages. Source: U. S. Census of Agriculture.

In an attempt to get additional data on yields in these areas the average yields for the three census periods, 1899 to 1919 inclusive, were calculated (1) for the principal counties in each area. Table XXI shows that the five principal producing counties in East Tennessee averaged 1141.4 quarts per acre. This average was lowered considerably by the low yield of 96.6 quarts in Hamilton County for this 20-year period. The average yield for the West Tennessee group was 1218 quarts. This yield was 77 quarts greater than that produced in the East Tennessee group. This average was lowered by the low yield in Weakley County. The growers there produced nearly 2½ million quarts, but averaged only 864 quarts per acre. The Middle Tennessee area ranked highest with an average of 1292 quarts per acre. Only Davidson and Sumner counties are considered as principal producing counties in this area. Sumner County ranked highest of all counties in the state, with an average yield of 1629 quarts per acre.

All available data indicate higher yields in the Middle Tennessee area, particularly in Sumner County. Both East and West Tennessee areas have ranked

second, varying with the time and source of the data. The eastern area outranked the western area according to the survey data collected for the years 1926, 1927, and 1928. On the other hand, it was outranked by the western area according to the average yields produced during the census periods from 1899 to 1919. It was also higher in 1929, according to the questionnaire returns mentioned above. Conversation with some teachers of vocational agriculture indicate a higher yield in this section in 1930. The difference was said to be due largely to a difference in weather conditions.

Trend in Yields in Individual Counties, 1899 - 1919. The yield per acre for each county is shown in Table XXII for the census years 1899, 1909, and 1919. Production data by counties are not available in the 1924 census report, nor in the estimates made by the United States Department of Agriculture. The average yield was calculated for the three periods. This gives a fairer basis for a comparison of counties, since unusually low or high yields, often due to abnormal weather conditions, will tend to be neutralized by averages.

There is not a very high correlation between high yield and large acreage. However, an examination of Table XXII shows that 15 of the 18 leading counties in production rank among the highest 25 counties in yield per acre. These are indicated by the asterisk. In other words, of the 25 highest counties in yield 15 are principal producing counties and 10 are those that produce small acreages, largely for home consumption and the small local markets. Of the 70 lowest ranking counties in yield only 3 can be listed as leading counties. These are Crockett, Hamilton, and Weakley. It is evident, then, that a small percentage of the less important producing counties have high yields, and that only a small percentage of the more important counties have low yields.

Table XXII

Yield per Acre of Strawberries: Average 1899 to 1919

R a n k	County	Ave. 1899- 1919	1919	1909	1899	R a n k	County	Ave. 1899- 1919	1919	1909	1899
1.	Sumner*	1629	1727	1152	1620	46.	Bledsoe	931	819	636	1136
2.	Obion*	1464	1202	951	1872	47.	Sevier	921	710	1014	1606
3.	Lauder.*	1414	1428	1422	1288	48.	Union	922	820	867	1100
4.	Knox*	1376	1153	1333	1694	49.	Grainger	914	824	966	930
5.	Franklin	1329	1658	927	1787	50.	Smith	911	740	1092	1065
6.	Hardeman	1321	1108	985	1800	51.	Montgomery	910	744	821	1255
7.	Madison*	1317	1388	1381	1198	52.	Morgan	903	755	993	1696
8.	Rutherford.	1316	1562	1027	1404	53.	Roane	901	576	844	1015
9.	Brad.*	1315	1348	1168	1527	54.	Humphreys	894	680	820	1290
10.	Blount*	1312	1458	1062	1293	55.	White	893	615	870	1102
11.	Shelby*	1311	1297	1414	1250	56.	Monroe	892	508	963	1343
12.	Gibson*	1278	1430	1095	1297	57.	Cannon	884	819	856	1260
13.	Lawrence	1262	1326	1137	1208	58.	Robertson	875	843	485	1242
14.	Carroll*	1249	1134	987	1632	59.	Benton	868	569	243	1218
15.	Chester	1241	938	1131	1356	60.	Weakley*	864	1081	894	787
16.	Haywood*	1227	1185	2576	1149	61.	Overton	864	803	871	1130
17.	Bedford	1223	695	1531	1679	62.	McMinn	848	1126	622	958
18.	Rhea*	1211	1162	1311	1066	63.	McNairy	841	487	866	861
19.	David.*	1210	1069	1019	1619	64.	Washington	819	537	1028	1412
20.	Greene	1209	945	1254	1676	65.	Campbell	815	795	916	1120
21.	Henry	1198	1232	760	1327	66.	Grundy	807	499	1165	1320
22.	Meigs*	1195	1221	1086	1195	67.	Cocke	806	487	1002	1410
23.	Tipton*	1181	1139	1000	1492	68.	Dickson	790	750	704	1275
24.	Hamblen	1174	682	1207	1445	69.	Williamson	780	810	785	757
25.	Sullivan	1173	1059	1521	1056	70.	Maury	771	497	723	1306
26.	Lincoln	1166	1290	742	1520	71.	Henderson	745	552	805	954
27.	Jeffers.	1147	940	1074	1480	72.	Anderson	720	584	746	1368
28.	Crockett*	1150	1109	996	1387	73.	Lewis	702	674	590	870
29.	Payette	1150	777	1334	1480	74.	Carter	688	656	767	1370
30.	Scott	1134	1108	954	1220	75.	DeKalb	618	699	428	690
31.	Marshall	1101	1225	905	1080	76.	Warren	360	541	90	1456
32.	Putnam	1048	1042	1100	791	77.	Decatur	(a)	309	765	(b)
33.	Loudon	1026	1247	756	1626	78.	Hancock	(a)	1028	1566	(b)
34.	Cheatham	1014	465	929	1833	79.	Houston	(a)	(b)	1022	756
35.	Cumber.	1014	690	936	1318	80.	Macon	(a)	463	(b)	1335
36.	Marion	1001	786	593	1273	81.	Moore	(a)	453	(b)	1070
37.	Claiborne	978	846	947	1400	82.	Polk	(a)	845	738	(b)
38.	Dyer	976	800	730	1607	83.	Sequatchie	(a)	1056	995	(b)
39.	Giles	966	431	1017	1279	84.	Stewart	(a)	2538	(b)	870
40.	Hamil.*	966	884	1116	911	85.	Trousdale	(a)	525	(b)	950
41.	Johnson	947	993	1176	740	86.	Unicoi	(a)	643	(b)	950
42.	Hawkins	940	775	826	1523	87.	Fentress	(a)	551	(b)	550
43.	Coffee	939	958	981	836	88.	Wayne	(a)	1117	1040	(b)
44.	Wilson	938	759	763	1384	89.	Clay	(a)	(b)	853	(b)
45.	Hickman	936	898	1062	840	90.	Hardin	(a)	698	(b)	(b)
						91.	Jackson	(a)	529	(b)	(b)
						92.	Perry	(a)	(b)	(b)	1520
						93.	Pickett	(a)	(b)	(b)	1000
						94.	Van Buren	(a)	323	(b)	(b)
						95.	Lake	(a)	(b)	(b)	(b)
* Principal producing counties.											
(a) Data incomplete.											
(b) Less than 1 acre reported											
State								1180	1207	1147	1185

The strawberry crop is grown in these leading counties largely for the market. It is often one of the principal cash crops. Apparently, the producers there give more attention to securing high yields than those in the majority of the non-commercial producing counties. At any rate, one would expect a larger percentage of them to give more attention to better cultivation practices, to fertilization, to the selection of desirable varieties, and to other factors that affect the yields.

As mentioned above some important producing counties have relatively low yields, and some unimportant ones have relatively high yields. The relatively high rank of the latter, in all probability, is affected by soil; for the soil in these counties is among the most productive in the state. It is also possible that the small acreages there could be given the attention conducive to high yields. More data would be necessary to make even a reasonable statement as to the probable cause for the low yields in Crockett, Weakley, and Hamilton Counties - three of the leading commercial producing counties.

There are often wide fluctuations in yields from one census year to another in most of the counties. These are common in both the commercial and the non-commercial areas. However, it seems, from an examination of Table XXII, that wide fluctuations occur more often in the latter.

It is probable that weather conditions are responsible, largely, for these differences in yields in a given county; hence, the desirability of having an average yield for the total period.

Warren County's yield decreased from 1456 quarts in 1899 to 90 quarts in 1909. Sixty-one acres produced only 5510 quarts, according to the census reports of 1909. Was there a near crop failure that year? Or, is there some possibility of error in the census enumeration?

If even small errors were made in enumeration of acreages or production the effect on the average yield would be greater in the smaller producing counties, like Warren.

Yield per Crop Season. (1) In the Southern and Eastern States. There is usually but one crop harvested from a given planting in Florida and Louisiana. Two crops are usually harvested in Virginia, Maryland, Delaware, and New Jersey. Three crops are usually harvested in Arkansas, Missouri, Kentucky,^{and} North Carolina, as well as in Tennessee.

Table XXIII shows that the percentage decrease in yield per acre, from the first to the second season, was greater in the states that usually harvested only two crops from a single planting. The decline in Delaware, and Maryland, was exactly 50%; in Southern and Central New Jersey, 33.3% and 30.0% respectively; and in Norfolk and Eastern Shore Virginia areas, 33.3% and 30.0% respectively.

Among the states that normally harvest three crops from each planting, North Carolina and Kentucky reported yields as high in the second season as in the first. The decreases in the other states vary from 11.7% to 33 1/3%. The percentage decrease in yield from the second to the third crop was greater in each of these areas than was the decrease from the first to the second, with the exception of the West Tennessee area. However, the numerical decreases were the same during each period in Arkansas and Missouri.

A comparison of the percentage decreases in yields for the total producing period, in the two-crop season states and the three-crop season states, shows that there is very little difference, as shown in Table XXIII. The percentage decreases in the states that harvest two crops varied from 30% to 50%; and in those that harvest three crops the variation was from 25% to 50%.

Table XXIII

Estimated Average Yields of Strawberries by Age of Fields (1)

State and District	Yield per Acre					
	First Crop No. Quarts	Second Crop No. Quarts	% Dec. from 1st to 2nd.	Third Crop No. Quarts	% Dec. from 2nd to 3rd.	% Dec. from 1st to 3rd Season
<u>Florida</u>						
Plant City	2000	(2)		(2)		
Northern	2880	(2)		(2)		
<u>Louisiana</u>						
Hammond (3)	1440	(2)		(2)		
<u>Virginia</u>						
Norfolk	2880	1920	33.3	(4)		
Eastern Shore	3200	2240	30.0	(4)		
<u>Maryland</u>						
Marion	3840	1920	50.0	(4)		
Pittsville	2520	1280	50.0	(4)		
Federalburg	2880	1440	50.0	(4)		
<u>Delaware</u>						
Selbyville	2720	1760	35.3	(4)		
<u>New Jersey</u>						
Southern	3840	2560	33.3	(4)		
Central	3200	2240	30.0	(4)		
<u>Arkansas</u>						
Southwest	1440	1080	25.0	720	33.3	50.0
White County	1560	1200	23.1	840	30.0	46.1
<u>Missouri</u>						
Southwest	1560	1200	23.1	840	30.0	46.1
<u>Tennessee</u>						
Western	1800	1200	33.3	960	20.0	46.6
Eastern	2040	1800	11.7	1200	33.3	41.1
<u>North Carolina</u>						
Chadbourn	2880	2880	0.0	2080	27.7	27.7
Dublin & Fender Granties	3200	3200	0.0	2400	25.0	25.0
<u>Kentucky</u>						
Bowling Green	1920	1920	0.0	960	50.0	50.0

(1) Yields all based on a common method of handling fields for each district.

(2) Only one crop harvested in these districts.

(3) Estimated average yields for double row culture and for fields on best soils, 2400 quarts per acre estimated average yield for single row culture and for districts where largest acreages are 960 quarts per acre.

(4) Source: Cost of Production Statistics of Strawberries in Southern and Eastern States.

Source: Cost of Statistics of Strawberry Production in Southern and Eastern States.

(2) In Tennessee. Table XXIV shows that the yields decreased continuously from the first crop season to the third, in both East and West Tennessee, and only from the second crop season to the third in the Bowling Green area, in Kentucky, which is adjacent to the Portland area in Tennessee. In the Eastern area 85 crates, or 2040 quarts, were produced per acre the first season. This declined to 75 crates the second season, and to 50 crates the third. The western area reported the largest decrease in the second year. The production was 75 crates the first season, 50 crates the second season, and 40 crates the third season.

Table XXIV.

Estimated Yields per Acre for First, Second, and Third Seasons
in Two Tennessee and One Kentucky Area

	East Tennessee		West Tennessee		Bowling Green, Kentucky, Area (1)	
	Quarts	Crates	Quarts	Crates	Quarts	Crates
First season	2040	85	1800	75	1920	80
Second season	1800	75	1200	50	1920	80
Third season	1200	50	960	40	1200	50

(1) Data fairly representative of the Portland area in Tennessee.

Source: Cost of Production Statistics of Strawberries in Southern and Eastern States.

The decrease in the Bowling Green area of Kentucky, which is similar to the adjacent Portland area, occurred only in the third season. This decrease was from 80 crates to 50 crates.

The percentage decrease from the first season to the third was the greatest in the West Tennessee area. It was 46.6% as compared with 41.1% in the East Tennessee area, and 37.5% in the Bowling Green area.

This consistent decline in each of the areas, is due, probably in a small measure, to the failure of many of the growers to fertilize and cultivate the plants after the first crop has been harvested. It is the customary practice

to set the plants in the early spring and to cultivate them, more or less, during that growing season prior to the first harvest the following spring. Consequently, the crop is certain to receive some cultivation the first year, regardless of whether the grower continues this practice. However, some decrease occurs regardless of the cultural practices followed, which necessitates resetting of the field.

The results of questionnaires sent to growers show that 62 of the 87 returns contains data on cultivation practices that were followed after the first and second crop season. Forty-eight of the 62 farmers cultivated after the first crop, but only 33 of them reported any cultivation after the second crop. Stated in another way, 14 did not practice cultivation after the first season, and 29, or nearly one-half of those reporting, did not cultivate after the second season.

These returns also indicate that less cultivation is being practiced by the West Tennessee growers than by those in East Tennessee. Of the 25 reporting from the former, 12 did not cultivate after the first crop and 19 did not follow this practice after the second crop. On the other hand, only 2 out of 26 failed to cultivate after the first crop, and only 5 after the second crop. This probably was a contributing factor to the some greater decrease in yield in West Tennessee from the first to the third season. Cost of production data also indicate less cultivation in the Western area, as shown later in Chapter V.

Similar results are shown in regard to fertilization after the first and second crop. Of 29 farmers reporting from West Tennessee 12 fertilized the first year, and 7 made an application during the second year following the first crop, but only 2 applied any fertilizer after the second crop. The answer to this inquiry in the questionnaires returned by 9 growers in Sumner County, in the Portland area, showed that all fertilized their crop

the first year; but that only 6 followed this practice after the second crop, and only 1 after the second crop. The replies from the East Tennessee growers in regard to fertilization were too incomplete to be of any value.

The cultural practices, as indicated by these rather meager returns from growers, have been verified, partly, by informal interviews with some of the leading growers in the East Tennessee strawberry section. They state that it ^{is} not uncommon for growers to neglect the cultivation and fertilization of the strawberry fields after the first crop. This neglect is often encouraged by low prices.

Growers are continually confronted with the problem of the number of crops that they should harvest from a given planting. Their decisions, apparently are not always based on logical reasoning, but often on personal feeling, which sometimes amounts to gross indifference. Net profit is a sound basis for such a decision, and, undoubtedly, it is used by many growers. But, so often their data on cost of production are meager and incomplete. In this connection, the cost data presented in Chapter V will probably be of some value.

Classification of Farms on Basis of Yields per Acre. The data for this discussion were obtained from the cost of production survey, referred to previously. The farms surveyed were classified into six groups based on their yield per acre. These groups are composed of farms reporting the following yields: less than 1000 quarts; 1000 to 1999 quarts; 2000 to 2999 quarts; 3000 to 3999 quarts; 4000 to 4999 quarts; and 5000 quarts and over. These data include only farms in East and West Tennessee; and are for the years 1926, 1927, and 1928.

The number and percentage of farms in each group is shown in Table XXV. More farms were reported as having yields varying from 1000 to 1999 quarts

than in any other yield group, in both producing areas and in each of the three years. The percentage reporting yields in this group from the East Tennessee area varied from 36.3 to 53.1 for the 3 years. In West Tennessee yields in this group were reported by 49.2% of those reporting in 1928; by 42.4% in 1927; and by 46.6% in 1926. It is obvious, then, that approximately one-half of the farmers reporting in each of these areas had yields in this 1000 to 1999 quart group.

Table XXV
Strawberry Farms in East and West Tennessee Classified on Basis of
Yield per Acre, 1926, 1927, and 1928.

Tennessee Area	Total Number Farms Report- ing.	Farms Reporting									
		Less than 1000 qts.		1000 to 1999 qts.		2000 to 2999 qts.		3000 to 3999 qts.		4000 to 4999 qts.	
		No.	%	No.	%	No.	%	No.	%	No.	%
East											
1928	50	7	14.0	23	46.0	17	34.0	2	4.0	1	2.0
1927	32	2	6.1	17	53.1	11	34.4	1	3.2	1	3.2
1926	11	3	27.3	4	36.3	2	18.2	1	9.1	1	9.1
West											
1928	61	23	37.7	30	49.2	6	9.8	2	3.3	0	0
1927	40	13	32.4	17	42.4	7	17.5	3	7.5	0	0
1926	15	4	26.7	7	46.6	4	26.7	0	0	0	0

Source: Cost of Production Statistics of Strawberries in Southern and Eastern States.

A further comparison of these two areas, from data in this table, shows that neither area had any farms reporting yields above 4999 quarts; and that the Eastern area reported only one farm in ^{the} 4000 to 4999 quart group in each of the three years, while none were reported in this group in the Western area. Of the farms reported in the 2000 to 2999 quart group, the larger percentage was in the Eastern area in 1927 and 1928. On the other hand, the Western area had a larger percentage of the farms reported in the low group, of less than 1000 quarts. In fact, an examination of the above table shows that the Eastern area had about as high percentage of farms reporting yields

in the 2000 to 2999 quart group as was reported in the less than 1000 quart group in the Western area.

Apparently, high yields were reported by a larger percentage of the farms in East Tennessee than by those in West Tennessee. This condition is reflected in the higher average yields for all farms reported in the Eastern area, as shown by this cost of production survey.

Relation of Quantity Produced, Acreage, and Yield
per Acre in Tennessee, 1899 - 1929

Chart 6 shows the relationship between the quantity produced, acreage, and yield from 1899 to 1929 by 10 year periods. Census data were used for 1899, 1909, and 1919. The 1929 data were estimates of the United States Department of Agriculture. In order to put these phases on a comparable basis averages have been calculated and plotted on the chart for production, acreage, and yield. Thus the line XY represents three separate averages. Each phase, acreage, production, and yield, is plotted on a different scale, based on this line. This method of chart construction was developed largely by B. F. Lucas, Research Assistant in Agricultural Economics. The procedure is discussed in his thesis, *Sweet Potato Production and Marketing in Tennessee*.

This chart shows that the production trend followed that of acreage and yield, which was downward from 1899 to 1909, and then upward each of the two succeeding 10 year periods. The acreage trend has been shown in more detail at the beginning of this chapter.

The effect of both a large acreage and a high yield on production is clearly shown in the trend lines from 1919 to 1929. The 16,810 acres, yielding 1540 quarts per acre, produced approximately 25,867,000 quarts of strawberries in 1929. Thus the production line increased more rapidly

than that of either acreage or yield. This was a period of acreage expansion that has been discussed previously.

The total production may fluctuate, even with a constant acreage, due to fluctuations in yield per acre. Even with a fluctuating acreage the production may increase or decrease at a more rapid rate than acreage. Consequently it is desirable to have production data to supplement acreage data in determining the importance of given producing areas. In other words, an area may have a relatively high acreage but a relatively low production, or vice versa. Acreage data alone would not provide one with an adequate conception of a county's production.

Quantities Produced by Counties, 1899-1919

The average production data for the 20 year period, presented in Table XXVI, shows that the 5 leading counties were Gibson, Rhea, Hamilton, Crockett, and Lauderdale, listed in the order of their importance. Gibson and Hamilton decreased in production from 1899 to 1919. The rank of each had decreased to 3rd and 6th respectively.

According to this table, 10 other counties had an average production of more than 100,000 quarts and less than 1,000,000 quarts. Weakley, Davidson, Madison, and Knox Counties are the leading counties in this group. Of the 4, only Madison had a greater production in 1919 than in 1899.

Reference to Chart 5 shows that these counties increased in acreage from 1919 to 1924, the period of expansion. No production data are available by counties since 1919. As one would expect, the leading counties in strawberry acreage are also the principal counties in production. An examination of Table XXVI shows that with few exceptions these counties have the same rank in both acreage and production, according to the averages for the 20 year period from 1899 to 1919. The exceptions are Weakley and Lauderdale

Counties. The former had a rank of 5th in acreage and 6th in production; and the latter ranked 6th in acreage and 5th in production. In the less important counties the acreage and production ranks do not follow each other so closely as they do in these more important producing counties. At any rate these differences in the acreage rank and the production rank in a given county shows the effect of yield on production. Due to these differences in yield it is important that one know the production as well as the acreage. It is recognized that if the yields were uniform for all counties the acreage and production in a given area would have the same relative rank.

Table XXVI

Average Number of Acres and Quarts of Strawberries Produced from
1899 to 1919; and Number Quarts in 1899, 1909, and 1919.

Rank	County	Average No. Qts. 1899-1919 (a)	Ave. No. Acres 1899-1919	Number Quarts 1919	Number Quarts 1909	Number Quarts 1899
1.	Gibson	2,551,189	1997	1,968,003	1,626,474	4,059,030
2.	Rhea	3,091,135	1726	1,990,858	3,145,218	1,137,330
3.	Hamilton	1,309,466	1356	685,731	1,337,668	1,905,000
4.	Crockett	1,109,634	965	1,302,153	919,598	1,107,150
5.	Lauderdale	1,052,008	744	2,133,945	758,018	264,000
6.	Weakley	748,770	866	465,771	599,436	1,181,100
7.	Davidson	734,173	606	376,328	934,371	891,820
8.	Madison	649,025	493	734,413	570,391	642,270
9.	Knox	568,800	413	321,759	875,691	508,950
10.	Carroll	253,148	203	290,180	160,893	308,370
11.	Sumner	245,491	150	612,985	82,997	40,490
12.	Meigs	231,812	194	530,131	115,114	50,190
13.	Obion	198,638	135	75,155	122,700	395,060
14.	Shelby	169,606	129	133,616	184,032	211,170
15.	Haywood	154,988	126	412,216	30,908	21,840
16.	Hardeman	95,973	73	17,277	112,272	157,920
17.	Bradley	74,954	57	145,541	54,892	24,430
18.	Hamblen	62,225	53	17,052	121,924	47,700
19.	Tipton	45,285	38	102,480	8,004	25,370
20.	Henry	36,753	31	35,725	12,155	62,380
21.	Sullivan	36,364	31	62,483	34,989	11,620
22.	Blount	33,666	26	65,614	27,623	7,760
23.	Chester	30,202	24	12,197	14,700	63,710

(continued)

Table XXVI (continued)

Average Number of Acres and Quarts of Strawberries Produced from 1899
to 1919; and Number Quarts in 1899, 1909, and 1919

R a n k	County	Average No. Qts. 1899-1919(a)	Ave. No. Acres 1899-1919	Number Quarts 1919	Number Quarts 1909	Number Quarts 1899
24.	Fayette	29,521	26	24,873	26,681	37,010
25.	Roane	29,129	32	8,058	24,500	54,830
26.	Cheatham	26,373	26	5,114	50,176	23,830
27.	Morgan	21,078	23	42,301	3,973	16,960
28.	Rutherford	20,621	16	18,749	16,439	26,680
29.	Wilson	20,330	22	21,257	14,822	24,920
30.	Loudon	19,145	19	16,213	24,961	16,260
31.	Dyer	18,516	29	29,609	5,109	20,890
32.	Washington	16,927	21	18,800	16,450	15,530
33.	Williamson	16,892	22	12,945	17,271	20,450
34.	Campbell	16,581	20	42,923	4,580	2,240
35.	Montgomery	16,085	18	17,111	12,313	18,830
36.	Franklin	15,942	12	13,265	16,691	17,870
37.	Sevier	15,343	17	20,534	14,204	11,240
38.	Robertson	14,883	17	33,726	4,713	6,210
39.	McNairy	14,577	17	1,461	14,729	27,540
40.	Warren	12,893	36	20,035	5,544	13,100
41.	Bedford	12,633	10	9,729	12,251	15,920
42.	Greene	12,497	10	13,226	12,535	11,730
43.	Maury	12,332	16	6,457	18,789	11,750
44.	McMinn	12,158	14	18,010	13,675	4,790
45.	Lawrence	11,778	9	22,546	7,959	4,830
46.	Anderson	11,513	16	15,768	11,932	6,840
47.	Putnam	10,831	10	17,712	13,201	1,580
48.	Glaiborne	10,435	11	6,768	18,937	5,600
49.	Giles	9,020	9	2,586	14,244	10,230
50.	Carter	8,259	12	20,335	3,071	1,370
51.	White	8,036	9	8,153	10,445	5,510
52.	Hawkins	7,208	8	5,423	8,261	7,940
53.	Coffee	7,197	8	10,542	6,869	4,180
54.	Bledsoe	7,139	8	5,736	3,182	12,500
55.	Marshall	6,972	6	12,247	5,428	3,240
56.	Jefferson	5,734	5	6,582	3,222	7,400
57.	Lincoln	5,443	5	10,320	2,969	3,040
58.	Cocke	5,371	7	4,869	7,014	4,230
59.	Cumberland	5,070	5	2,069	6,551	6,590
60.	Monroe	5,055	6	3,050	6,744	5,370
61.	Dickson	5,008	6	8,245	4,223	2,550
62.	Marion	5,003	5	5,505	593	8,910
63.	Union	4,919	5	4,923	4,335	5,500
64.	Grainger	3,960	4	3,294	5,797	2,790
65.	Scott	3,778	3	3,325	1,909	6,100
66.	Benton	3,760	4	569	970	9,740
67.	Overton	3,743	4	7,227	1,741	2,260
68.	DeKalb	3,503	6	6,988	2,140	1,380
69.	Henderson	3,230	4	3,309	1,610	4,770
70.	Smith	3,035	3	3,698	3,277	2,130
71.	Cannon	2,356	3	4,097	1,712	1,260

(continued)

Table XXVI (continued)

Average Number of Acres and Quarts of Strawberries Produced from 1899
to 1919; and Number Quarts in 1899, 1909, and 1919

Rank	County	Average No. Qts. 1899-1919(a)	Ave. No. Acres 1899-1919	Number Quarts 1919	Number Quarts 1909	Number Quarts 1899
72.	Johnson	2,210	2	3,973	1,176	1,480
73.	Hickman	2,184	2	3,590	2,123	840
74.	Humphreys	2,086	2	2,021	1,639	2,580
75.	Houston	2,080	2	206	3,005	3,030
76.	Grundy	1,882	2	1,997	2,329	1,320
77.	Hancock	1,680	1	3,083	1,566	390
78.	Stewart	1,563	1	2,538	410	1,740
79.	Macon	1,260	1	926	184	2,670
80.	Jackson	1,173	2	2,643	647	330
81.	Wayne	1,132	1	1,117	2,080	200
82.	Fentress	1,081	2	2,205	487	550
83.	Unicoi	979	1	1,930	56	950
84.	Lewis	936	1	1,348	590	870
85.	Moore	923	1	1,363	337	1,070
86.	Decatur	804	1	1,528	765	120
87.	Sequatchie	740	1	1,056	995	170
88.	Trousdale	684	1	1,050	50	950
89.	Polk	654	1	845	738	380
90.	Hardin	649	1	1,397	451	100
91.	Perry	624	1	252	100	1,520
92.	Pickett	435	1	94	212	1,000
93.	Clay	304	(c)	(b)	853	160
94.	Van Buren	204	(c)	323	(b)	290
95.	Lake	(c)	(c)	(b)	(b)	(b)
State		13,051,443	11,062	13,130,904	12,339,584	13,683,840

(a) No production data reported by counties in 1924 census report.

(b) None reported.

(c) Less than 1 acre.

Due to slightly higher yields, the principal strawberry counties with a few exceptions have a greater percentage of the total state production than of the total state acreage. Table XXVII shows that in 9 West Tennessee counties the production percentage was 53.8 as compared with an acreage percentage of 52.1. Sumner and Davidson Counties had 7.3% of the production but only 8.8% of the acreage. In the East Tennessee group the acreage percentage was slightly greater.

A closer examination of this table shows that this was also true of

some of the counties in these groups. For instance, Hamilton County's acreage was 12.2% of the state total, while its production was only 10% of the state total. Seven and eight-tenths of the state production was in Weakley County as compared with only 5.7% of the state acreage. With the exception of Meigs County, every other county in these three groups had a larger percentage of the total production than of the total acreage.

Table XXVII

The Percentage of the State's Strawberry Acreage and Production in the Principal Producing Counties, 1899-1919

	Total Acreage, 1899, 1909, and 1919.		Total Production, 1899, 1909, and 1919	
	Number Acres	% of State Total	Number Quarts	% of State Total
<u>East Tennessee</u>				
Rhea	5,179	15.6	6,273,406	16.1
Hamilton	4,067	12.2	3,928,399	10.0
Knox	1,240	3.7	1,706,400	4.4
Meigs	582	1.8	695,435	1.7
Total	11,068	33.4	12,603,640	32.2
<u>West Tennessee</u>				
Gibson	5,991	18.1	7,653,507	19.5
Crockett	2,896	8.7	3,328,901	8.5
Weakley	2,599	7.8	2,246,307	5.7
Lauderdale	2,232	6.7	3,156,023	8.1
Madison	1,478	4.5	1,947,074	5.0
Carroll	608	1.8	759,443	1.9
Obion	405	1.2	595,915	1.5
Shelby	388	1.2	508,818	1.3
Haywood	379	1.1	464,964	1.2
Hardeman	218	0.7	287,919	0.7
Total	17,194	52.1	20,948,871	53.5
<u>Middle Tennessee</u>				
Davidson	1,820	5.5	2,202,519	5.6
Sumner	452	1.3	736,472	1.7
Total	2,272	6.8	2,938,991	7.3

This table also shows that 93% of the production was in these 16 counties during this 20-year period. Gibson had almost one-fifth; Rhea nearly one-sixth; and Hamilton one-tenth.

CHAPTER V.COST OF PRODUCTION.Collection of Data

Method of Collection. The data presented here were obtained by means of a field study made in 1928 by the Division of Farm Management and Costs of the United States Department of Agriculture, with the cooperation of the Department of Farm Management of the University of Tennessee, Division of Extension. This is a part of a study of the cost of production of strawberries made at that time by the U. S. Department of Agriculture in ten Southern and Eastern states, in which the respective state colleges cooperated. These data have been summarized in a mimeographed publication of the Bureau of Agricultural Economics entitled, Cost of Production Statistics of Strawberries in Southern and Eastern States.

Areas Studied, and Number of Records Taken. Two areas were studied in Tennessee, East and West. The Eastern area studied included Rhea, Hamilton, and Bradley Counties. The Western area included Crockett, Dyer, Gibson, Lauderdale, Madison, and Obion Counties. No data were obtained from the Portland area in Northern Middle Tennessee. However, data are available for the Bowling Green area in Kentucky, which is adjacent to the Portland area. The data for this area are probably fairly representative of the latter area, and for that reason will be presented in this chapter.

Fifty farms were studied in the Eastern area; and 61 were studied in the Western area. The number is not given for the Bowling Green area.

Items on Which Data Were Collected. One often finds that popular magazine and newspaper articles on the cost of production do not include

all of the costs, particularly such overhead expenses as taxes, interest, reserve for the depreciation of the patch, and the use of machinery and buildings. These data presented in this chapter include these costs, as well as the more observable costs for labor, power, materials, and perquisites for labor.

Explanation of Certain Terms.

Labor and Power. Man labor was charged to strawberries at the prevailing local day rates without board in 1928. Horse labor was charged at local day rates paid for the use of horses in 1928. In both areas in Tennessee man labor was charged at 15¢ per hour, and horse labor at 12.5¢ per hour. In the Kentucky area these charges were 20¢ and 15¢ respectively. Charges for the use of auto-trucks were estimated at 15¢ per mile.

Expense of Obtaining Harvest Labor. This includes expenses for transportation of labor, amounts paid "runners" for rounding up the harvest crew, and all other expenses incurred by the growers in obtaining harvest labor.

Perquisites Furnished Harvest Labor. Laborers are sometimes furnished food and fuel, and houses by the growers in addition to their regular compensation. The food and fuel were valued at farm prices; charges for the use of houses and furnishings include maintenance and interest on the capitalization.

Materials. They include crates, fertilizer, plants, mulching materials, manure, and other materials. They were charged at cost if purchased, and at farm value if furnished by the farm. Plants, which were largely furnished by the farm, were usually charged at their farm value in the field before digging. Mulching material was usually charged at its farm value before raking or collecting.

Interest. This item includes an interest charge on the value of land, machinery, and equipment used for growing strawberries.

Cultural Methods and Labor Requirements.

The bearing life of strawberry plants in the commercial producing areas in Tennessee is usually three years. The plants are set in the field in the early spring, usually in March or early April. They are cultivated throughout that growing season. The first crop is harvested the following spring, from the latter part of April to the first part of June — a little over one year after the planting.

The First Year Methods and Requirements. The preparation of the land for planting includes plowing, harrowing, discing (except in East Tennessee), and marking for planting, as shown in Tables XXVIII and XXIX. The harrowing operations were performed twice and the discing once. Only two horse implements were used, except in the Bowling Green area where 3 horses were used in discing. When 3 horses were used the rate of work per crew day was 5 acres as compared with 4 acres when 2 horses were used. In discing an acre of land with 3 horses there was a saving of one-half an hour of man labor, but it required one hour more of horse labor. The cost per acre for this operation was greater when done by the 3 horse crew. However, this should not be taken as conclusive evidence that it is uneconomical to use 3 horses. It will depend to some extent on the relative cost of man and horse labor. In the case above, it would have been cheaper to have used 3 horses if horse labor had been less than one-half that of man labor. Would the land be prepared in better condition by using the 3-horse disc? This would need to be given consideration in this connection.

Table XXVIII.

Common Methods and Estimated Amount of Labor and Power for Developing
an Acre of Strawberries Up to Harvesting, in Two Tennessee Areas

I. East Tennessee						
Operation	Size of Crew		Rate of Work	Number	Hours	Hours
	Number Workers	Number Horses	per Crew Day, in Acres	Times Operation is Performed	Man Labor	Horse Labor
<u>First Year</u>						
Plow	1	2	1.7	1	5.9	11.8
Harrow	1	2	8.0	2	2.5	5.0
Prepare beds	no data	no data	no data	1	4.1	5.9
Plant	" "	0	" "	1	40.0	0
Cultivate	1	1	3.0	6	20.0	20.0
Hoe or weed	1	0	.4	6	150.0	0
Miscellaneous	no data	no data			12.8	15.3
Total					236.3	58.0
<u>Second or Third Year</u>						
Cultivate	no data	no data	no data	no data	15.0	17.0
Hoe or weed	1	0	.5	3	80.0	0
Miscellaneous	no data	no data	no data	no data	8.6	10.7
Total					83.6	27.7
II. West Tennessee						
<u>First Year</u>						
Plow	1	2	2.0	1	5.0	10.0
Harrow	1	2	10.0	2	2.0	4.0
Disc	1	2	4.0	1	2.5	5.0
Prepare beds	no data	no data	no data	1	3.0	5.2
Plant	" "	0	" "	1	40.0	
Cultivate	1	1	3.5	7	20.3	20.3
Hoe or weed	1	0	.5	4	80.0	0
Miscellaneous	no data	no data	no data	no data	9.5	12.0
Total					162.3	56.5
<u>Second or Third Year</u>						
Now	No data	no data	no data	no data	2.5	4.0
Miscellaneous	" "	" "	" "	" "	3.0	2.0
Total					5.5	6.0

Table XXIX.

Common Methods and Estimated Amount of Labor and Power for Developing
an Acre of Strawberries Up to Harvesting for Three Years in
the Bowling Green Area in Kentucky (1)

Operation	Size of Crew		Rate of Work per Crew Day, in Acres	Number Times Opera- tion is Performed	Hours of Man Labor	Hours of Horse Labor	Miles Auto Operated
	Number Men	Number Horses					
<u>First Year</u>							
Plow	1	2	2.0	1	5.0	10.0	
Harrow	1	2	10.0	2	2.0	4.0	
Disc	1	3	5.0	1	2.0	6.0	
Mark	1	2	12.0	1	.8	1.6	
Plant	no data	no data	no data	no data	27.5		
Cultivate	1	1	4.0	10	25.0	25.0	
Hoe or weed	1	no data	.67	4	60.0		
Mulch	no data	" "	no data	1	7.5	5.0	
Miscellaneous	" "				14.0	4.0	5.0
Total					143.8	55.6	5.0
<u>Second or Third Year</u>							
Cultivate	1	1	4.0	5	12.5	12.5	
Hoe or weed	1	no data	.67	2	30.0	no data	
Mulch	no data	" "	no data	1	7.5	5.0	
Miscellaneous	" "	" "	" "	no data	14.0	4.0	5.0
Total					64.0	21.5	5.0

(1) Based on cost studies of the Agricultural Experiment Station of the University of Kentucky and a reconnaissance study at the end of the 1928 season. Costs are based on 1928 rates for labor and farm power and for fields planted in March and April. Labor was charged at 20¢ per year, horse work at 15¢ per hour and use of truck at 15¢ per mile.

There is a small difference in the amount of plowing and harrowing done per day per crew in the two Tennessee areas. In West Tennessee the rate per crew day was 2 acres for plowing and 10 acres for harrowing, while in East Tennessee the rate was 1.7 acres and 8 acres respectively. The size of the crew was the same. Apparently the East Tennessee growers were less efficient, for it required 0.9 of a man hour and 1.8 horse hours more for them to plow an acre than for the growers in West Tennessee to do the same work. To harrow an acre it also required one-half an hour of man labor and one hour of horse

labor more. The rate of work for these two operations were the same for West Tennessee and the Bowling Green area. The difference in the rate for discing has been explained.

Planting includes labor for digging and preparing home grown plants, and for setting all plants. This operation required 40 man hours in each of the Tennessee areas, but only 27.5 man hours in the Bowling Green area. This difference is partly due to the few plants set per acre in the latter area. Only 4000 plants were set in this area as compared with 5500 and 6500 set in West and East Tennessee area respectively.

The fields were cultivated an average of 10 times in the Kentucky area, as compared with 6 times in East Tennessee and 5 times in West Tennessee. One-horse cultivators or harrows were used. With this equipment one man cultivated 4 acres, 3.0 acres and 3.5 acres in each respective area. This rate per crew day is reflected in the total number of hours used for cultivation. For instance, the Kentucky growers cultivated the crop twice as many times as the West Tennessee growers but used only about 25% more labor. The West Tennessee growers cultivated one time more than those in the Eastern area but used only .3 of an hour more of man and horse labor. This apparently more thorough cultivation in West Tennessee and in the Bowling Green area seems to have been one factor in reducing the amount of labor for hoeing and weeding.

More labor was used for hoeing or weeding than for any other operation. In East Tennessee this operation required 150 man hours, or about $\frac{2}{3}$ of the total. In West Tennessee it required 80 hours, or approximately one-half of the total; while for the Bowling Green area it required only 60 hours, or about $\frac{2}{5}$ of the total. The hoeing operation was performed 6 times in East Tennessee, 4 times each in West Tennessee and the Bowling Green area. It is not known why this difference exists. Could it be due

partly to a difference in weather conditions? It is common for wide variations to occur even in the same area in different years because of such differences. The relatively small number of hours required in the Bowling Green area may be due partly to the more thorough cultivation as indicated by the larger number of times the fields were cultivated, as mentioned above. An examination of the rate of work per crew day in Tables XXVIII and XXIX shows that in the East Tennessee area one man hoed .4 of an acre per day as compared with .5 of an acre in West Tennessee and .67 of an acre in the Bowling Green area. This was partly the cause for the larger number of hours required to hoe an acre the first year in the Eastern area.

Miscellaneous labor includes such operations as hauling and applying fertilizer, hauling crates, and miscellaneous operations (1). There is very little difference in the amounts of labor for these operations in the three areas. In the Bowling Green area auto-trucks were substituted to some extent for horses for hauling. The labor for hauling crates is not a charge against the development of the strawberry patch. It is included here since it was tabulated in miscellaneous labor group by the Bureau of Agricultural Economics.

According to Tables XXVIII and XXIX mulching was practiced only by the growers in the Bowling Green area. However, occasionally a grower in East Tennessee mulches, according to information secured on a recent field trip through the producing areas in that section of the state.

The lack of cultivation by the West Tennessee growers apparently had but little effect on the decrease in yields from the first to the second and third seasons, according to data shown previously in Table XXIV on yields by crop seasons. As shown there the percentage decrease was but little greater than that in East Tennessee where cultivation was practiced. However, the yields were greater in each of the three crop seasons in East

(1) Brodell, A. P., op. cit.

Tennessee, which probably were partly due to more thorough cultivation.

Second or Third Year Methods and Requirements. The data in Tables XXVIII and XXIX, under the heading "second or third year", apply to either years. In other words the strawberry patches received the same cultivation during the second and third years.

These tables show that less labor was applied during these years than during the first year. The amount in West Tennessee was almost negligible. The operations included mowing, hauling fertilizer and crates, and applying fertilizer (2). The plants were neither cultivated nor hoed. All of the operations required only 5.5 man hours and 6 horse hours. Contrasted with this were the 83.6 man hours and 27.7 horse hours used in East Tennessee and the 64.0 man hours and 21.5 horse hours used in the Bowling Green area. The plants were cultivated and hoed in these two areas. In the Kentucky area they were cultivated 5 times and hoed twice. In the East Tennessee area they were hoed 4 times. No data are available on the number of cultivations in this area, but since the man and horse hours required were slightly greater than in the Kentucky area one could safely assume that at least as many cultivations were given. As occurred in the first year one man hoed more per day in the Bowling Green area.

More labor was required for the first year largely because this was a period of development. During this year the land was prepared for setting the plants, the plants were set in the field, and were cultivated and hoed from early spring throughout the growing season. During the second and third years it was necessary to cultivate and hoe only after early June, following the harvesting of the berries. Apparently this was being done only in East Tennessee and in the Kentucky area.

By no means do all of the producers in East Tennessee cultivate and hoe their strawberry plants during the second and third year. Many grossly

(2) About 75% of the fields on the farms studied were mowed or raked the second and third seasons after planting.

neglected their patches following the 1928 and 1929 crops. They apparently had become somewhat discouraged by low prices received for their berries in these two seasons. The percentage of the growers in this class is not known. The information was secured in conversation with some growers and agricultural workers in that area.

Comparison of These Areas with Kentucky Standards. In the preceding sections the cultural methods and the amount of labor required to perform the various operations have been presented. In this section the actual conditions will be compared with a standard set up for Kentucky growers. No standard labor requirements have been set up for planting and cultivating strawberries in Tennessee, ^{so far as is known.} However, such needs for planting and cultivating this crop in Kentucky are presented in Table XXX. These data have been taken from Kentucky Experiment Station Bulletin Number 255, Strawberries and Farm Profits in Western Kentucky.

In regard to these data in this table Mr. J. B. Hutson, the author of the above bulletin, says:

The needs suggested here are not the amounts of labor used or the operations performed on any farm or the average for any group of farms. They are intended rather as suggested standards of attainments in performing the operations necessary in planting and cultivating strawberries.

Possibly not many farmers perform these operations in the exact order listed. Many farmers substitute some other operation for some of these suggested here. Possibly many of the most efficient farmers are not able to perform some of the operations within the time suggested because of a small acreage. Yet on the whole it is believed that most of the growers will be able to get good yields of berries by performing the operation and approximating the standards suggested.

He states further "that the man labor and horse work suggested will provide for more thorough cultivation than strawberries usually receive. With such cultivation strawberries should yield from 80 to 150 crates per acre annually."

Table XXX.

Man Labor and Horse Work Necessary in Planting and Cultivating Strawberries in Kentucky (Acre Basis)

Operations	Equipment	Hours of Work		Acres in 10-Hour Day
		Man	Horse	
<u>First Year</u>				
Plowing	2-horse walking plow or	5.	10.	2.
	3-horse waling plow	3.6	10.7	2.8
Disking	6-ft. disk and 3-horse	1.7	5.0	6.0
	or 8-ft. disk and 4-horse	1.2	5.0	8.0
Harrowing	12-ft. harrow and 4 horses	.4	1.6	24.0
	or 9-ft. harrow and 3 "	.6	1.7	18.0
Marking off	Corn planter	.8	1.2	16.0
Marking off	Garden plow	1.2	---	8.0
Planting	By hand	20.0	---	.5
Plow and harrow	1-horse plow or harrow (8 times over)	20.0	20.0	4.0
Hoeing	Hand hoe (3 times over)	60.0	---	.5
Fertilizing	1-horse drill	3.3	3.3	3.0
Mulching	2 men and 2 horses	10.0	10.0	2.0
<u>Second Year</u>				
Plow and harrow	1-horse plow or harrow (4 times over)	10.0	10.0	4.0
Hoeing	Hand hoe (2 times over)	40.0	----	.5
Mulching	As first year	10.0	10.0	2.0
<u>Third Year</u>				
Plow and harrow	As second year	10.0	10.0	4.0
Hoeing	As second year (1 time over)	20.0	----	.5
Mulching	As first year	10.0	10.0	2.0

Source: Kentucky Agricultural Experiment Station Bulletin No. 255.

An examination of this table shows that different sizes of the same kind of equipment are listed, together with the number of hours required to perform a given operation with each kind. For instance, the plow equipment consists of both 2-horse and 3-horse plows. Standards for both 3-horse and 4-horse discs and harrows are set up. Table XXVIII and XXIX also show the number of horses used with each kind of equipment in East and West Tennessee and the Bowling Green area. From this standpoint the data in these Tables XXVIII, XXIX, and XXX for different areas are on a comparable basis. In

other words, that element of knowing the labor required to perform a given operation without a knowledge of the size of the equipment used, has been eliminated.

The following paragraphs show a comparison of the labor needs as set up by the Kentucky standard with the actual labor required. While this comparison involves areas in two different states it is believed that cultural practices and labor requirements are sufficiently similar to warrant it. At any rate the actual labor used in some operations in Tennessee is not very different from the standards set up in Kentucky.

An examination of the first year operations, as shown in Tables XXVIII, XXIX, and XXX, shows the following similarities and differences between the standard requirements and the actual labor required to perform each operation in the three areas under consideration. The plowing operation in West Tennessee and the Bowling Green area required the same labor per acre as set up by the Kentucky standard, for a 2-horse plow; that is, 3 man hours and 10 horse hours. Almost 1 extra man hour and 2 extra horse hours were required for this operation in East Tennessee. There are no comparable data for discing and harrowing since 2-horse equipment were used in the two Tennessee areas as compared with three-horse ^{and four-horse} equipment in Kentucky.

Planting required 40 hours of man labor in Tennessee or twice the amount shown as necessary in Kentucky, according to Table XXX (4). The Bowling Green farmers planted an acre in 27.5 hours, which is only 7.5 hours greater than this standard. Have the Kentucky farmers developed a technique in planting that has resulted in this comparatively low labor requirement? This may be true to some extent. However, a large part of the difference between the Kentucky standard and the actual time required in the Tennessee area is due to the larger number of plants set per acre in the latter areas. Only 4,500 plants are set per acre in Kentucky as compared with 6,500 in East

Tennessee and 5,500 in West Tennessee.

Approximately the same number of hours were required for cultivation in the two Tennessee areas as was set up as a standard in Kentucky. However, with the 20 hours of ^{man} labor the growers in East and West Tennessee cultivated an acre 6 and 7 times. According to Table XX it should be cultivated 3 times with the same equipment, a one-horse plow or harrow.

A further examination of this table shows that only 60 hours should be necessary to hoe or weed an acre. It required 150 hours in East Tennessee, 80 hours in West Tennessee, and 60 hours in the Bowling Green area. The Tennessee growers cultivated 6 times and 4 times respectively, while the standard requirement was only 3 times.

An examination of Tables XXIX and XXX shows that during the second and third years the East Tennessee farmers cultivated an average of 15 hours as compared with 10 hours that are necessary, as set up by the Kentucky standard. This 10 hours would involve 4 cultivations.

An acre in East Tennessee was hoed 3 times while the standard requirement was only 2 times. The rate per man per day was the same. As previously shown, no cultivation or hoeing was practiced on the West Tennessee farms studied.

The labor requirements for cultivation the third year were the same as for the second year in each area. But the standard requirement for hoeing was 20 hours as compared with 40 hours for the second year. This is only one-third the time actually used for hoeing in East Tennessee, and two-thirds of the time used in the Bowling Green area for that operation.

Can Amounts of Labor Be Reduced? From this preliminary study of these labor requirements it is not believed that the amounts of labor can be greatly reduced in the Tennessee areas. The growers might increase the rate of work per day in cultivating, from 3 acres in East Tennessee and 3.5 acres

in West Tennessee to about 4 acres, which was the rate per day in the Bowling Green area. But, could the size and topography of the fields be limiting factors? There is also some possibility of decreasing the time required to set the plants, assuming the Kentucky requirement of 20 hours to be a reasonable one. It is true, as previously mentioned, that less plants are set per acre in Kentucky, but the percentage difference in the number set in these areas is not as great as the percentage difference in the labor requirements for setting. In other words, some savings might be made by using more efficient methods in planting.

One would hesitate to recommend less cultivation and hoeing without more adequate data. From the available data, it is doubtful if such decreases would prove profitable. However, there is some possibility of securing a saving in East Tennessee by hoeing less and cultivating more. The hoeing operation is performed more times and the cultivation less times there than in the other areas, as has been shown. At any rate, it is usually considered a good policy to substitute as much hand hoeing as possible for cultivation.

It seems that on an average the fields are fairly well cultivated during the second and third season in both East Tennessee and the Bowling Green area. In fact it has been shown that they have equalled, and surpassed in some instances, the standards required for Kentucky. This is not true of West Tennessee where only mowing is practiced. Would some cultivation and hoeing during the second and third seasons be profitable there?

These data are averages of all farms studied. One would likely be safe in assuming that there are some growers doing just about what they should do in the way of caring for their strawberry fields, in each of the areas. On the other hand, there are others who could undoubtedly improve their methods and increase the amount of labor per acre, with profit to themselves.

However, in a discussion of labor requirements for any crop one should not lose sight of their relation to profits. It is commonly recognized that profits are the principal motives back of the various farm practices. Any increase in labor per acre could be recommended only in the light of probable profits.

Cost of Development per Acre.

It was mentioned in the preceding section, that the usual life of the strawberry plants in this state is 3 years, and that a little over 1 year intervenes the time of planting and the first harvest. It is the purpose of this section to show the total and the various item costs of developing an acre of strawberry plants during this year prior to the first harvest. This cost figure is essential in determining the annual depreciation on the field, which should be prorated to each crop harvested, if strict cost accounting is to be kept with each of the three crops.

The cost data presented here are for two areas in Tennessee, East and West, and for the Bowling Green area in Kentucky. As has been mentioned previously, this latter area is adjacent to the Portland area in Tennessee.

The total cost in each area does not include the cost of certain items that are listed as "others", in Cost of Production Statistics in Southern and Eastern states, for the first year's expense. These other costs were not included in Tables XXI, XXXII, and XXXIII because it was not known definitely whether or not these were development costs. In fact, it is doubtful if much of these costs can be charged against development, since an examination of the various costs for the second and third seasons shows that these "other" costs also occur then, and in almost the same amounts as in the first year. If these "other" costs were development costs, would they not have failed to occur in the second and third year costs? See footnotes 5, 4, and 2 to Tables XXXI, XXXII, and XXXIII, respectively.

The total cost of development was greatest in the Eastern area. Tables XXXI, XXXII, and XXXIII and Charts 8 and 9 show that, including interest, the total cost was \$59.74 as compared with \$46.75 in the Western area and \$55.92 in the Bowling Green area. The cost in this Kentucky area would have been \$47.34, or near that of the West Tennessee area, had the labor charges been the same as in the Tennessee areas (see footnotes to Tables XXXII and XXXIII).

An analysis of these tables and charts shows that man and horse labor were the largest items of expenditure. In fact the labor item absorbed 71.5% of the total expenditure in East Tennessee and amounted to \$42.69. In West Tennessee the amount was \$31.41, or 67.2% of the total. Reference to Tables XXXI and XXXII will show that the principal difference between the two areas was in the amount of labor used in hoeing and weeding, as shown previously in Tables XXVIII and XXIX. The labor cost of \$37.10 in the Bowling Green area was about midway between those of the other two areas. However, the amount of labor expended was less than that of either of these areas. Cultivation was the only operation for which more labor was expended in the Bowling Green area, except labor for mulching. Mulching was not reported as being practiced in the two Tennessee areas.

The expenditure for hoeing and weeding was greater than that for any other item in each of the areas. In East Tennessee it was \$22.50, or 37.6% of the total; in West Tennessee, \$12, or 25.6%; and in the Bowling Green area, \$12, or 21.4%. The amount of labor expended in hoeing in the latter area was less than that for either of the two Tennessee areas, but the amount used in cultivating was greater, as mentioned above. It is probable that the greater amount of time spent in cultivating lessened the amount necessary for hoeing or weeding, as indicated in a previous section.

Chart 8. Distribution of Cost of Developing an Acre of Strawberries Up to Harvest in 3 Areas in Dollars

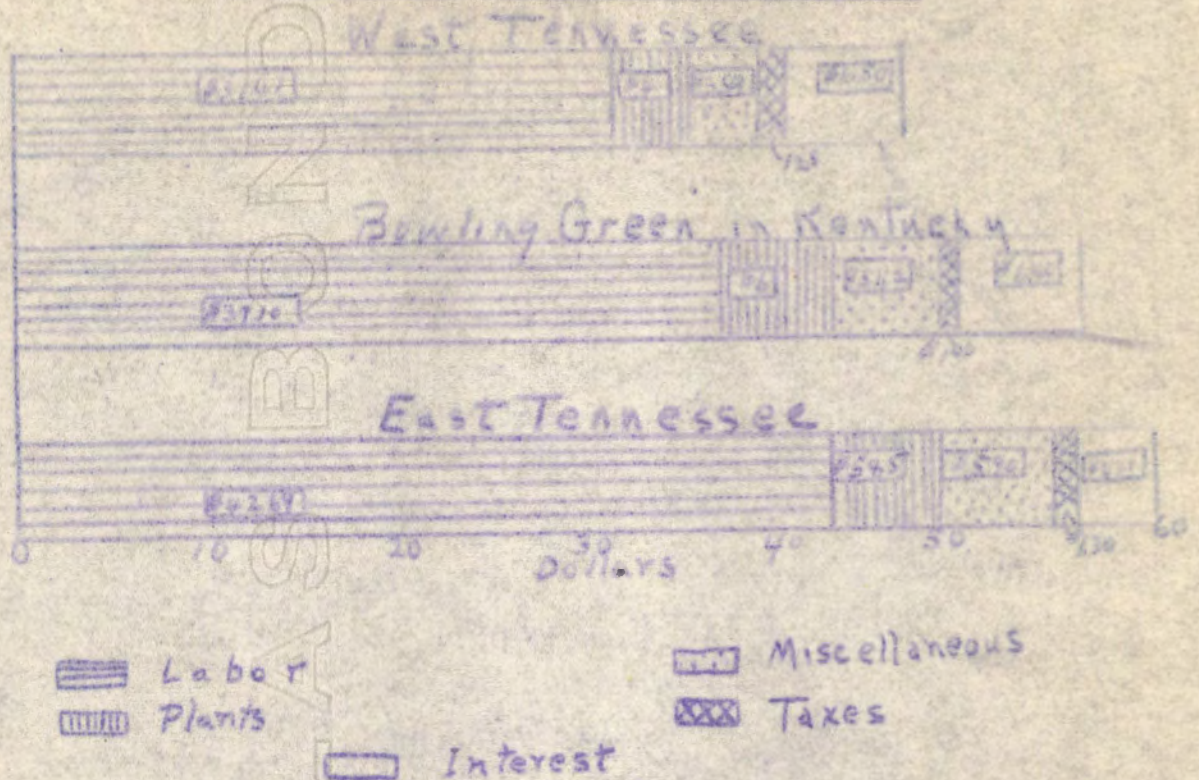


Chart 9. Percentage Distribution of Cost of Developing 1 Acre of Strawberries Up to Harvest Time in 3 Areas.



Table XXXI.

Cost of Developing an Acre of Strawberries Up to Harvesting inEast Tennessee in 1928 (1)

	Number Hours		Cost or Value		Total Cost or Value	% of Total Cost
	Man	Horse	Man Labor	Horse Labor		
<u>Labor and farm power</u>						
Prepare land	13.5	22.7	2.02	2.84	4.86	8.1
Prepare beds						
Plant (2)	40.0	0	6.00	0	6.00	10.1
Cultivate	20.0	20.0	3.00	2.50	5.50	9.2
Hoe, or weed	150.0	0	22.50	0	22.50	37.6
Miscellaneous (3)	12.8	15.3	1.92	1.91	3.83	6.4
Total	236.3	58.0	35.44	7.25	42.69	71.5
<u>Materials</u>						
Fertilizer, 240 lbs.(4)					3.60	6.1
Plants, 6500					5.85	9.7
Total					9.45	15.8
<u>Other Costs</u>						
Use of machinery					2.30	3.9
Taxes					1.30	2.2
Interest					4.00	6.6
Total					7.60	12.7
Grand total including interest (5)					59.74	100.0
Grand total excluding interest					55.74	

(1) Based on 1928 rates for labor and farm power and for fields planted in March and April. Man labor charged at 15¢ per hour and horse labor at 12½¢ per hour.

(2) Includes labor for digging and preparing home grown plants, and for setting all plants.

(3) Includes applying and hauling fertilizer, hauling crates, and miscellaneous operations.

(4) Only one-third of the acreage was fertilized after the first year.

(5) Some costs have been listed in the tabulations for the first year on cost of production statistics as "other costs". These were not included here because it was not known definitely whether they were development costs. These costs were: materials \$2.00 and miscellaneous \$3.50. This total of \$5.50 added to the total above gives a grand total of \$65.24.

Table XXXII

Cost of Developing an Acre of Strawberries Up to Harvesting in West
Tennessee in 1928 (1)

	Number Hours		Cost or Value		Total	% of
	Man	Horse	Man	Horse	Cost or	Total
			Labor	Labor	Value	Cost
<u>Labor and farm power</u>						
Prepare land	12.5	24.2	1.87	3.02	4.89	10.5
Plant (2)	40.0	0	6.00	0	6.00	12.8
Cultivate	20.3	20.3	3.05	2.54	5.59	12.0
Hoe or weed	80.0	0	12.00	0	12.00	25.6
Miscellaneous (3)	9.5	12.0	1.43	1.50	2.93	6.2
Total	162.3	56.5	24.35	7.06	31.41	67.2
<u>Materials</u>						
Fertilizer, 75 lbs.					1.33	2.8
Plants, 5500					4.00	8.6
Total					5.33	11.4
<u>Other costs</u>						
Use of machinery					2.26	4.8
Taxes					1.25	2.7
Interest					6.50	13.9
Total					10.01	21.4
Grand total including interest (4)					46.75	100.0
Grand total excluding interest					40.25	

(1) Based on 1928 rates for labor and farm power and for fields planted in March and April. Man labor was charged at 15¢ per hour and horse labor at 12½¢ per hour.

(2) Includes labor for digging and preparing home grown plants, and for setting all plants.

(3) Includes hauling fertilizer and crates, applying fertilizer and for miscellaneous operations. Only about 25% of the growers fertilized their fields the first year.

(4) The grand total would have been \$54.45 if "other" costs were added as follows: materials \$2.00, and miscellaneous \$3.70. These were not included in the above tabulation because it was not known definitely whether or not they were development costs.

Table XXXIII

Cost of Developing an Acre of Strawberries Up to Harvesting in Bowling
Green Area in Kentucky (1)

	Number Hours		Cost or Value		Total	% of
	Man	Horse	Man	Horse	Cost or	Total
			Labor	Labor	Value	Cost
<u>Labor and farm power</u>						
Prepare land	9.8	21.6	1.96	3.24	5.20	9.3
Plant	27.5	0	5.50	0	5.50	9.8
Cultivate	25.0	25.0	5.00	3.75	8.75	15.7
Hoe or weed	60.0	0	12.00	0	12.00	21.4
Mulch	7.5	5.0	1.50	.75	2.25	4.1
Miscellaneous	14.0	4.0	2.80	.60	3.40	6.1
Total	143.8	55.6	28.76	8.34	37.10	66.4
 <u>Materials</u>						
Fertilizer, 200 lbs.					3.00	5.4
Plants, 4000					6.00	10.7
Total					9.00	16.1
 <u>Other costs</u>						
Use of machinery					2.42	4.3
Taxes					1.00	1.8
Interest					6.40	11.4
Total					9.82	17.5
 Grand total including interest (2)						
					55.92	100.0
Grand total excluding interest					49.52	

(1) Based on cost studies of the Agricultural Experiment Station of the University of Kentucky, and on a reconnaissance study at the end of the 1928 season. Costs are based on 1928 rates for labor, farm power, materials, and other items.

(2) The grand total would have been \$62.38 if "other" costs were added as follows: materials \$2.00, and miscellaneous \$4.46. They were not included in the above tabulation because it was not known definitely whether or not they were development costs.

The cost of plants varied slightly between the 3 areas. This was due, partly, to the difference in the number of plants per acre. The growers in East Tennessee used an average of 6500 plants per acre as compared with 5500 plants used by growers in West Tennessee, and 4000 plants by growers in the Bowling Green area. Number of plants is not the only factor, since fewer plants in the latter area cost more money than a larger number of plants in the other areas. This is due largely to the price that was paid per 1000 plants. For instance, about 50% of the plants were purchased and the remainder were home grown in the Kentucky area. Those purchased cost an average of \$2.50 per 1000 plants. Home grown were charged at \$0.50 per 1000 in the field before digging. In West Tennessee about 85% of the plants were home grown. The remainder were purchased. Those purchased cost an average of \$2.00 per 1000 plants. Home grown plants were charged at 50¢ per 1000 plants in the field before digging. In East Tennessee about 25% of the plants were purchased and 75% were home grown. Plants purchased cost an average of \$2.10 per 1000 plants. Home grown plants were charged at the same price as were those in the other two areas.

More fertilizer was used by the growers reporting in East Tennessee. They reported 240 pounds, costing \$3.60, as compared with 200 pounds in the Bowling Green area costing \$3.00 and only 75 pounds in West Tennessee, costing \$1.35. The latter area also used less fertilizer the two succeeding crop years.

The total cost for materials, plants and fertilizer, in East Tennessee was almost twice as large as in West Tennessee. There was very little difference in these costs in the East Tennessee area and in the Bowling Green area. These costs were 15.8% of the total in the Eastern area, 11.4% in the Western area, and 16.1% in the Bowling Green area.

Other costs including interest, taxes, and use of machinery were \$10.01 in West Tennessee, \$7.80 in East Tennessee, and \$9.82 in the Bowling Green area. The lower cost in the Eastern area was due largely to the lower interest charge on the investment. The charges for the use of machinery and taxes were about the same for each of the three areas.

It is doubtful if the total cost of developing an acre of strawberries can be materially decreased. Little decrease could be expected in the cost of plants and fertilizer, except by a downward trend in prices. In fact the amount of fertilizer used might profitably be increased. There is little chance for a reduction in the charges for interest, taxes and use of machinery. Labor costs cannot be reduced very much as has been indicated previously in the discussion on labor requirements. Small savings might be affected by greater labor efficiency rather than by decreasing the number of times the different operations are performed. The growers studied in West Tennessee might profitably increase their labor costs by giving more attention to the cultivation of their fields during the second and third crop years.

Tennessee Costs Compared with Those of Arkansas and Missouri. The total cost figures presented in Table XXXIV for Arkansas and Missouri are not strictly comparable with Tennessee totals shown previously in Tables XXXI and XXXII, since the cost of fertilizer has not been included except for White County, Arkansas, and southwest Missouri. This cost for the latter area has been included in the cost for other material. However, labor for applying fertilizer is reported for each of the other Arkansas areas in Cost of Production Statistics for Southern and Eastern States. In fact it is stated in Bulletin No. 218 of the Arkansas Agricultural Experiment Station that some growers use fertilizer but that the cost was not included in the tabulations on cost of production.

As was mentioned previously, in connection with the cost of development in Tennessee, certain items of cost have been included in "other" costs. These "other" costs have been included in Table XXXIV for Arkansas and Missouri. Two totals are given in this table — one, including and the other excluding these "other" costs. With the exception of the fertilizer cost listed under the cost of other material in southwest Missouri, it does not appear that these costs, at least not all of them, are development costs for the same reasons as stated in a previous section. However, one has the privilege of using either or both totals for comparative purposes.

Table XXXIV

Comparative Costs of Developing an Acre of Strawberries Up to
Harvesting in Arkansas and Missouri

	Northwest Arkansas		Southwest Arkansas		White Co., Arkansas		Southwest Missouri	
	Amt.	Expense	Amt.	Expense	Amt.	Expense	Amt.	Expense
Man Labor Hrs. (1)	176	\$35.20	197	\$29.55	217	\$38.01	170	\$40.78
Horse " "	89	11.12	129	16.19	68	8.50	108	13.54
Total		46.32		45.74		46.51		54.32
Fertilizer		no data	125	2.50		no data		(2)
Plants	3750	4.69	3640	5.92	5500	4.75	3500	3.50
Use of machinery		3.60		5.18		2.72		4.20
Taxes		.58		.63		.65		.55
Interest		5.60		5.15		4.42		8.58
Grand Total Ex- cluding Other Costs		\$60.79		\$65.12		\$59.05		\$71.15
Other Costs								
Materials		2.00		1.80		2.00		7.80(3)
Miscellaneous		2.80		3.20		2.80		3.00
Total		4.80		5.00		4.80		10.80
Grand Total In- cluding Other Costs		\$65.59		\$70.12		\$64.85		\$81.95

(1) Labor charges per hour: Arkansas, 15¢ for man labor; 12.5¢ for horse labor. Missouri, 24¢ for man labor; 12.5¢ for horse labor.

(2) Included in cost of other materials.

(3) Includes fertilizer cost. This was \$2.21 in 1926 according to Missouri Experiment Station Bulletin #262, p. 51.

Source: Cost of Production Statistics of Strawberries in Southern and Eastern States.

An examination of Table XXXIV shows that Missouri had the highest per acre development cost. The cost was \$73.36 provided the 1926 cost of fertilizer is added to the total cost, excluding "other" costs (5). This total is strictly comparable with similar totals for East and West Tennessee and the Bowling Green area, that were shown in Tables XXVII¹ and XXIX, and the total for Southwest Arkansas. The totals for these four areas were \$59.74, \$46.75, and \$55.92, and \$65.12 respectively. With no fertilizer costs reported the total costs for Northwest Arkansas and White County, Arkansas, are about the same as that of East Tennessee, but about \$15 greater than that of West Tennessee.

An analysis of these costs in Arkansas and Missouri show that the labor costs are slightly higher than in East Tennessee and considerably higher than in West Tennessee. West Tennessee reports fewer man hours and horse hours than any of these areas. East Tennessee reports a larger number of man hours but fewer horse hours than the areas in Arkansas and Missouri. This is due largely to the fact that the growers in Arkansas and Missouri states cultivate their fields more and hoe less than do the growers in either East or West Tennessee, as shown in Tables Numbers 19, 21, 23, 25, 27, and 29 in Cost of Production Statistics of Southern and Eastern States. The greater labor cost in Missouri is due, partly, to the 24¢ man labor charge per hour as compared with the 15¢ per hour charge in the other areas.

A further analysis of Table XXIV, and Tables XXXI and XXXII, previously shown, reveals a lower tax expense in Arkansas and Missouri, but a higher machinery cost. The latter would be expected to accompany the larger number of horse hours used, as reported in these states. Interest charges are about the same with the exception of the Missouri interest cost of \$8.58, which is from 50% to 100% higher than in the Tennessee areas.

(5) See Footnote 3, Table XXXIV.

It is recognized that comparisons of total costs of development in different areas must be considered in relation to cultural practices. Cost of production in Florida or California would not be comparable with that in Tennessee. More intensive cultivation is practiced there. Some strawberry fields are irrigated in California, which increases the cost per acre. In Florida the total cost of production is charged against only one year instead of being prorated to three years as in Tennessee. But in Arkansas and Missouri practices are more similar to those in Tennessee. The life of the fields are usually three years; and more extensive field culture, especially in Arkansas, is practiced as in this state. For these reasons it is thought the cost data presented here are fairly comparable.

Total Costs, and Cost per Crate and per Quart.

Tables XXXV, XXXVI, and XXXVII show these costs for each of three years in East Tennessee, West Tennessee, and the Bowling Green area respectively. The total and average costs are also shown in Chart 10. The greatest expense in each of the areas occurred during the first year. Including interest, this was \$177.84 in East Tennessee, \$148.80 in West Tennessee, and \$182.28 in the Bowling Green area. The second and third year costs for the first area were, \$129.75 and \$99.00 respectively; for the second area, \$94.26 and \$69.34 respectively; and for the third area, \$152.62 and \$111.74 respectively.

The cost of development is included in the first year's expenses which accounts for its being much larger. If this were prorated equally to each of the three years, as should be done to put each of the three crop year's expense on a comparable basis, the first year's expense would be near that of the other two years. After making the adjustment for depreciation of the patch the expenses for the first, second, and third crop seasons are

respectively: \$138.01, \$149.66, and \$118.91 for East Tennessee; \$117.63, \$109.94, and \$84.92 for West Tennessee; and \$145.00, \$171.26, and \$130.38 for the Bowling Green area (5).

In making these adjustments for depreciation each of the 3 years was charged with $1/3$ of the development cost. The first year was credited with all of the development cost, and then charged with its prorata share of the depreciation. This is probably not the fairest method; for, the first year's labor then will have charged against it only the prorata part. On the other hand, each of the second and third year's labor account is charged with their prorata share, together with the cost of cultivating and hoeing done prior to each respective harvest. In other words, it seems that the labor charge against the first crop should be more than the prorata share contained in the depreciation figure. But this would involve a determination of the amount of the first year's labor that should be charged directly to the first crop. Probably an estimation could be made, based, to some extent, on the amount of labor charged directly to the second crop. In other words, one could assume that the first crop should be charged directly with at least as much labor cost as is charged directly against the second crop (not including the depreciation charge). Using this method would result in a depreciation charge less than that given in the footnote on page 2, since part of the first year's labor charge will have been charged directly to the first crop year and would not therefore appear in the annual depreciation charge.

At any rate, the total annual cost as shown in the preceding table can be used in arriving at the amount of money that will be necessary to produce and market an acre of strawberries each of the three years. As has been indicated, one should be prepared to spend considerably more the first year than during either of the other two years.

(5) The annual depreciation charges ($1/3$ of the development costs) were: \$19.91 in East Tennessee; \$15.58 in West Tennessee; and \$18.64 in the Bowling Green area.

Table XXXV.

Estimated Amount and Cost of Developing and Operating an Acre of Straw-
berries, Eastern District, Tennessee (1)

	First Year		Second Year		Third Year		Total Ex-
	Amt.	Ex-	Amt.	Ex-	Amt.	Ex-	pense for
		pense		pense		pense	3 Years
<u>Pre-harvest labor</u>		Dolls.		Dolls.		Dolls.	Dolls.
<u>and power:</u>							
Labor (hours)	236.3	35.44	83.6	12.54	83.6	12.54	60.52
Horse work (hours)	58.0	7.25	27.7	3.46	27.7	3.46	14.17
Total		42.69		16.00		16.00	74.69
<u>Harvest labor and power:</u>							
Picking (crates)	85	51.00	75	45.00	50	30.00	126.00
Packing (crates)	85	12.75	75	11.25	50	7.50	31.50
Haul to car (crates)	85	3.50	75	7.50	50	5.00	21.00
Supervision		2.00		2.00		2.00	6.00
Total		74.25		65.75		44.50	184.50
<u>Materials:</u>							
Fertilizer (pounds)	240	3.60	100	1.50	100	1.50	3.60
Crates (24-qt. size)	85	29.75	75	26.25	50	17.50	73.50
Plants	6500	5.85					5.85
Miscellaneous		2.00		2.00		2.00	6.00
Total		41.29		29.75		21.00	91.95
<u>Miscellaneous:</u>							
Exp. of obtaining							
harvest labor		2.60		2.60		2.60	7.80
Perquisites for							
harvest labor		5.00		5.00		5.00	15.00
Machinery		2.30		1.10		1.10	4.50
Building		1.00		1.00		1.00	3.00
Taxes		1.30		1.30		1.30	3.90
Other		3.50		3.25		2.50	9.25
Total		15.70		14.25		13.50	43.45
Total all costs not in-							
cluding interest		173.84		125.75		95.00	394.59
Interest charges		4.00		4.00		4.00	12.00
Total including int.		177.84		129.75		99.00	406.59
Est. yield per acre							
(24-qt. crates)	85		75		50		
Cost excl. of int.							
F.O.B. local station							
(per quart)		.085		.070		.079	.073
Cost incl. interest							
F.O.B. local station							
Per quart		.087		.072		.082	.081
Per 24-qt. crate		2.09		1.75		1.98	1.94

(1) Costs based on 1928 rates for labor, horsework, materials, and other items and on a common method of developing and handling bearing fields. Fields studied were from 1/8 to 65 acres, averaging about 11 acres. Bearing life of fields estimated to be three years.

Table XXXVI.

Estimated Amount and Cost of Developing and Operating an Acre of Strawber-
ries, Western District, Tennessee (1)

	First Year		Second Year		Third Year		Total Ex- pense for 3 Years
	Amt.	Ex- pense	Amt.	Ex- pense	Amt.	Ex- pense	
		Dolls.		Dolls.		Dolls.	Dolls.
<u>Pre-harvest labor</u>							
<u>and power:</u>							
Labor (hours)	162.3	24.35	5.5	.83	5.5	.83	26.01
Horse work (hours)	56.5	7.06	6.0	.75	6.0	.75	8.56
Total		31.41		1.58		1.58	34.57
<u>Harvest labor and power:</u>							
Picking (crates)	75	54.00	60	43.20	40	28.80	126.00
Packing (crates)	75	4.50	60	3.60	40	2.40	10.50
Haul to car (crates)	75	6.00	60	4.80	40	3.20	14.00
Supervision		2.00		2.00		2.00	6.00
Total		66.50		53.60		36.40	156.50
<u>Materials:</u>							
Fertilizer (pounds)	75	1.33	75	1.33	75	1.33	3.99
Grates (24 qt. size)	75	26.25	60	21.00	40	14.00	61.25
Plants	5500	4.00					4.00
Miscellaneous		2.00		2.00		2.00	6.00
Total		33.58		24.33		17.33	75.24
<u>Miscellaneous:</u>							
<u>Expense of</u>							
<u>obtaining harvest</u>							
labor		1.60		1.60		1.60	4.80
Perquisites for		1.00		1.00		1.00	3.00
harvest labor							
Machinery		2.26		.24		.24	2.74
Building		1.00		1.00		1.00	3.00
Taxes		1.25		1.25		1.25	3.75
Other		3.70		3.16		2.44	9.30
Total		10.81		8.25		7.53	26.59
<u>Total all costs not</u>							
<u>including interest</u>							
Interest charges		142.30		87.75		62.84	292.90
Total including interest		6.50		6.50		6.50	19.50
Estimated yield per acre		148.80		94.26		69.34	312.40
(24 qt. crates)	75		60		40		
<u>Cost exclusive of interest</u>							
F.O.B. local station							
Per quart		.079		.063		.065	.070
Per 24 qt. crate		1.90		1.46		1.57	1.67
<u>Cost including interest</u>							
F.O.B. local station							
Per quart		.083		.067		.072	.074
Per 24 qt. crate		1.98		1.57		1.73	1.79

Table XXXVII.

Estimated Amount and Expense of Labor, Horse Work, Materials and Other Items
for Developing and Operating an Acre of Strawberries, Franklin and
Bowling Green Area, Kentucky (1)

Item	First Year		Second Year		Third Year		Total Ex- pense for 3 Years
	Amt.	Ex- pense	Amt.	Ex- pense	Amt.	Ex- pense	
<u>Pre-harvest labor</u>							
<u>and power:</u>							
Labor (hours)	143.6	28.75	64.0	12.80	64.0	12.80	54.36
Horse work (hours)	55.6	8.34	21.5	3.23	21.5	3.23	14.80
Auto or truck (miles)	5.0	.75	5.0	.75	5.0	.75	2.25
Total		37.85		16.78		16.78	71.41
<u>Harvest labor and power:</u>							
Picking (crates)	80	62.40	80	62.40	50	39.00	163.80
Packing (crates)	80	12.00	80	12.00	50	7.50	31.50
Haul to car	80	4.80	80	4.80	50	3.00	12.60
Total		79.20		79.20		49.50	207.90
<u>Materials:</u>							
Fertilizer (pounds)	200	3.00	125	1.88	125	1.88	6.76
Crates (24 qt. size)	80	27.20	80	27.20	50	17.00	71.40
Plants	4000	6.00					6.00
Straw (tons)	.75	6.75	.75	6.75	.75	6.75	20.25
Miscellaneous		2.00		2.00		2.00	6.00
Total		44.95		37.83		27.63	110.41
<u>Miscellaneous:</u>							
Expense of obtaining harvest labor		5.00		5.00		5.00	15.00
Machinery		2.42		.96		.96	4.34
Building		1.00		1.00		1.00	3.00
Taxes		1.00		1.00		1.00	3.00
Other		4.46		4.46		3.47	12.39
Total		13.88		12.42		11.43	37.73
<u>Total all costs not including</u>							
interest		175.88		146.23		106.34	427.45
Interest charges		6.40		6.40		6.40	19.20
Total including interest		182.28		152.63		111.74	446.65
Estimated yield per acre (24 qt. size crates)	80		80		50		
<u>Cost excl. of interest,</u>							
<u>F.O.B. local station</u>							
Per quart		.092		.076		.088	.085
Per 24 qt. crate		2.20		1.83		2.11	2.04
<u>Cost Incl. interest,</u>							
Per quart		0.95		.079		.093	.089
Per 24 qt. crate		2.23		1.91		2.23	2.13

(1) Costs based on 1928 rates for labor, horsework, materials and other items and on a common method of developing and handling bearing fields. Fields studied were from 1 to 20 acres in size averaging about 3 acres. Bearing life of fields estimated to be three years. In the Paducah district of Kentucky.

Chart 10 shows that the average cost for the three seasons is highest in the Bowling Green area. There it is \$148.88 as compared with \$135.53 in East Tennessee, and \$104.13 in West Tennessee. This area also had a higher cost in each of the 3 years.

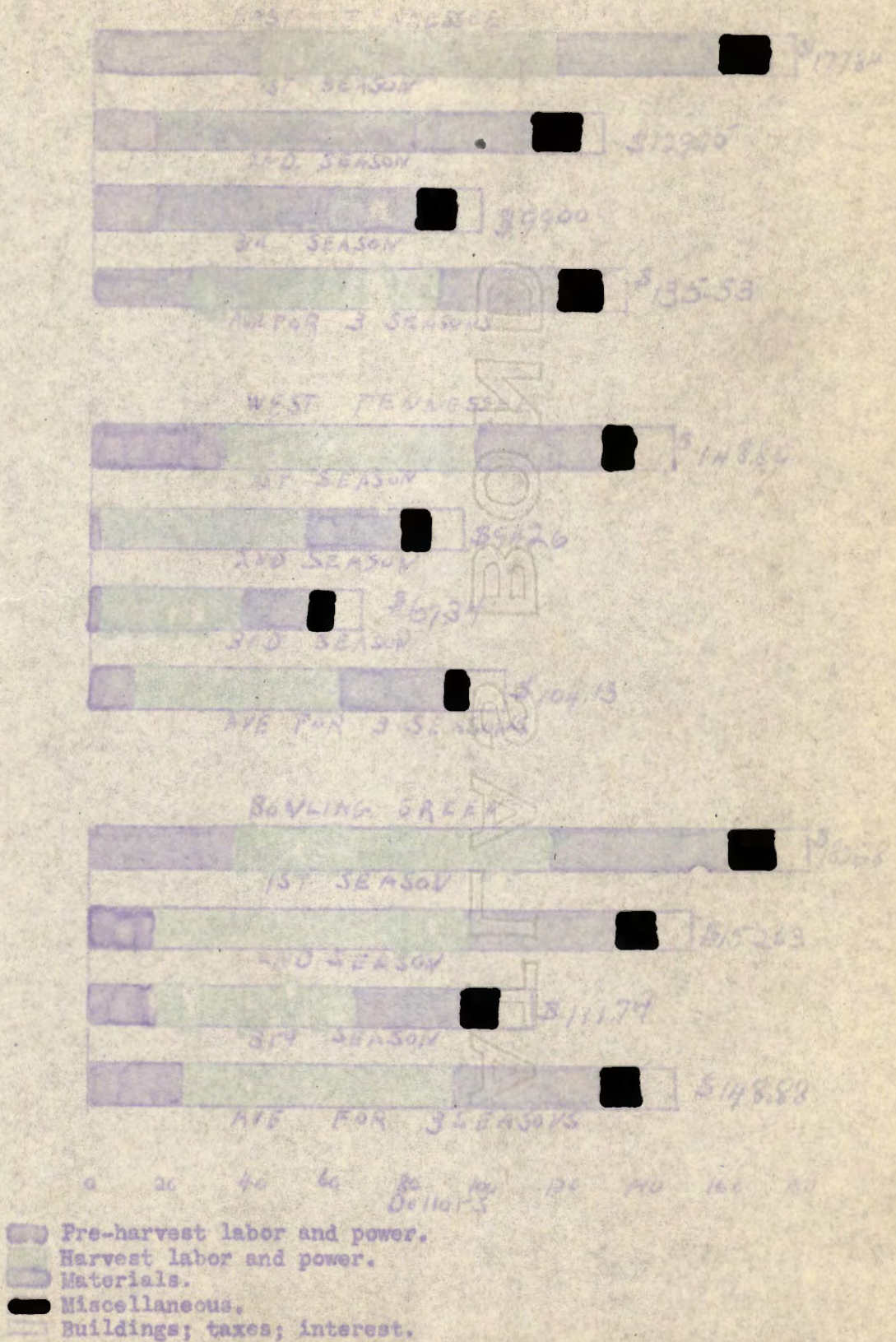
The cost per crate was higher each year in the Kentucky area, as shown in the three previous tables. The harvesting cost, overhead cost and total cost of materials (other than crates) were greater. One exception was the larger overhead cost per crate in West Tennessee (Table XL). The West Tennessee farmers studied reported the least cost per crate. This was largely due to their low labor cost the second and third years. However, a low cost per crate does not necessarily mean the greatest net profit.

Each area shows the highest cost the first year, and the lowest cost the second year, as figured from data in this table. Using the total cost adjusted for the annual depreciation of the patch, it is found that the first year's cost is less than that of either of the other two years. The per crate costs for the first, second, and third years respectively were as follows: East Tennessee, \$1.62, \$2.00, and \$2.38; West Tennessee, \$1.56, \$1.85, and \$2.12; and the Bowling Green area, \$1.81, \$2.14, and \$2.60. A continued increase is noted in the cost per crate. This is due apparently to the decrease in the yield per acre as shown in Table XXXVII. The cost per crate for harvesting would change but very little with changing yields. However, the cost per crate for labor and overhead expenses fluctuates more widely with fluctuations in yields since these total labor and overhead expenses are usually more constant than the total annual harvest costs, regardless of the yield.

The following sections contain an analysis of the various costs, except those concerned with the development of the patch.

Cost of Harvesting. Harvesting costs represent approximately two-thirds

Chart 10. Distribution of the Estimated Costs of Producing Strawberries in Three Areas



of the total cost as shown by averages for three crop seasons in Table XXXVIII and Chart 11. In East Tennessee the average harvest cost was \$93.60 as compared with the average of \$135.53 for the costs of all items. In West Tennessee these costs were \$75.19 and \$104.13, respectively, and in the Bowling Green area they were \$98.10 and \$148.88, respectively.

An analysis of these average harvesting costs shows that labor and power represents approximately two-thirds; and that the cost of picking represents by far the largest part of the labor cost. This indicates that the smaller grower who has family labor can survive a low price period much better than the grower who must rely entirely upon hired labor. There have been times in Tennessee, especially true during the 1929 shipping season, when the returns did not pay all harvesting costs. The grower who used family labor could ship profitably as long as the returns covered cost of crates and other cash charges, and left something for their labor.

Picking is done largely by contract labor. The cost per quart varies from an average of 2 1/2¢ in East Tennessee to 3 1/4¢ in the Bowling Green area. The average is 3¢ in West Tennessee as shown in Table XXXVIII. On a 24-quart crate basis the cost is 60¢, 72¢, and 78¢ for each respective area. There are variations in the cost in the same general area. For instance, only 2¢ per quart is paid for picking in some areas in East Tennessee as compared with 2 1/2¢ per quart noted above.

Packing costs include charges for checking, grading, placing cups in crates, and preparing crates for hauling to the shipping point. This required 15¢ per crate in East Tennessee and in the Kentucky area, and only 6¢ per crate in West Tennessee. It is probable that the growers in the latter area did not give as much attention to grading and packing as in the others. However, no data are available on their grading and packing practices in this area. Grading and packing in East Tennessee is done on both contract and a per day basis.

Table XXXVIII.

Average Harvesting Costs for Three Crop Seasons in Three Areas.

	East Tennessee			West Tennessee			Bowling Green		
	Ave. har-vest cost	Har-vest cost per crate	% of all costs	Ave. har-vest cost	Har-vest cost per crate	% of all costs	Ave. har-vest cost	Har-vest cost per crate	% of all costs
<u>Labor and power:</u>									
Picking	\$42.00	\$0.60	31.0	\$42.00	\$0.72	40.3	\$54.60	\$0.78	36.7
Packing	10.50	0.15	7.7	3.50	0.06	3.4	10.50	0.15	7.0
Haul to car	7.00	0.10	5.2	4.67	0.08	4.5	4.20	0.06	2.8
Supervision	2.00	0.03	1.5	2.00	0.03	1.9	no data		
Total	61.50	0.88	45.4	52.17	0.89	50.1	69.30	0.99	46.5
<u>Materials:</u>									
Crates	24.50	0.35	18.1	20.42	0.35	19.6	23.80	0.34	16.0
<u>Miscellaneous:</u>									
Expense of ob-taining harvest labor	2.60	0.04	1.9	1.60	0.03	1.5	5.00	0.07	3.4
Perquisites for harvest labor	5.00	0.07	3.7	1.00	0.02	1.0	no data		
Total	7.60	0.11	5.6	2.60	0.05	2.5	5.00	0.07	3.4
Total harvest cost ⁽¹⁾	\$93.60	\$1.34	69.1	\$75.19	\$1.29	72.2	\$98.10	\$1.40	65.9
Total (all costs)	\$135.53	\$1.94	100.0	\$104.13	\$1.79	100.0	\$148.88	\$2.13	100.0

(1) One dollar is charged against each crop in each area for use of buildings according to Table XXXV, XXXVI, and XXXVII, taken from Cost of Production Statistics of Strawberries in Southern and Eastern States. This should likely be a charge against harvesting for the use of packing sheds. If so, another dollar would need to be added annually to the total harvesting cost in each area.

The cost of hauling to the shipping point varied from 6¢ per crate in the Bowling Green area to 10¢ per crate in East Tennessee. Supervision of each of picking and packing cost 3¢ per crate in the two Tennessee areas. No charge for this was reported for the Kentucky area.

The cost of crates, at 35¢ each, represents from 25% to 30% of the harvesting cost. Miscellaneous expenses, such as perquisites for labor and expense of obtaining harvest labor varied from 5¢ per crate in West Tennessee to 11¢ per crate in East Tennessee. The Kentucky area reported an expense

of 7¢ per crate for obtaining harvest labor but reported no perquisites.

The total average harvesting cost per crate was \$1.34 for East Tennessee, \$1.29 for West Tennessee, and \$1.40 for the Kentucky area. The differences were due largely to a different contract rate for picking, and, to a lesser extent, to a difference in costs for packing and hauling to the car.

Chart 11. Percentage Distribution of Average Harvest Cost of Three Seasons Compared with All Other Costs



There was but very little change in the cost of harvesting per crate from year to year, as shown in Table XXXIX. The cost per crate in East Tennessee increased from \$1.31 the first bearing season to \$1.39 the third. The increase in West Tennessee was from \$1.29 to \$1.32; and in the Bowling Green area, from \$1.39 to \$1.43. Labor costs ^{per crate} for picking, packing, and hauling to the car, and cost of crates remained the same regardless of the changes in yield. These costs would vary only with price changes of crates

and in contract rates for labor. And, as has been mentioned, the labor is largely on a contract basis, with the probable exception of hauling. The cost per crate for supervision and for the miscellaneous items increases, as the yield per acre decreases. These total costs are more constant regardless of changes in yields. Consequently the cost per crate for these items varies inversely to the change in yields. At any rate, an increase in yields per acre of strawberries will not result in any significant decline in the total harvesting cost per crate and vice versa. Any material decrease in the cost of production will have to come from a greater efficiency in pre-harvest operations instead of from harvest operations.

These data on costs in Tennessee show that producers, depending entirely upon hired labor for harvesting their crop, had better let the berries remain in the patch than to harvest them if the f. o. b. shipping point price is only around \$1.30 to \$1.40 per crate. Only farmers who harvested all or part of their crop by family labor could afford to harvest with prices lower than these. However, about 23% of the harvest labor cost was non-cash on the farms studied in East Tennessee, and about 11% on those in West Tennessee.

Apparently there is little chance for lowering the harvesting costs, except by lowering the contract rate for picking and packing and the cost of crates. Very little saving could be expected from this source except by a general decline in the price level which would likely be accompanied by a decline in berry prices. A saving of 2 or 3 cents per crate has been made on crates by cooperative purchasing in East Tennessee. As has been indicated previously, the cost per crate for supervision and miscellaneous items might be decreased some by an increase in the volume of the crop. It apparently does not cost as much per crate to supervise the harvesting of a small crop as a larger one. The same is true of the expense of ob-

taining harvest labor. Where grading and packing is done on a per day basis, as is common in parts of the East Tennessee area, there is probably a chance for reducing these costs per crate. This will likely be true of growers who have become more experienced in this phase of harvesting. It was found in Kentucky that some of the variations in the total cost per crate in 1921 was due to variations in cost of supervising, grading, and packing. Many growers there from whom data were taken, were practically without experience. These costs were reduced slightly as these growers gained more experience (6).

Table XXIX.

Comparative Costs per Crate of Harvesting Strawberries Produced
in Each of Three Bearing Seasons (1)

Area	No. crates picked	Labor costs per crate					Cost of each empty crate	Misc. cost per crate (2)	Total cost per crate
		Pick- ing	Pack- ing	Haul- ing to car	Su- per- vi- sion	To- tal			
<u>East Tennessee</u>									
1st season	85	\$0.60	\$0.15	\$0.10	\$0.02	\$0.87	\$0.35	\$0.09	\$1.31
2nd season	75	0.60	0.15	0.10	0.03	0.88	0.35	0.10	1.33
3rd season	50	0.60	0.15	0.10	0.04	0.89	0.35	0.15	1.39
<u>West Tennessee</u>									
1st season	75	0.72	0.06	0.08	0.03	0.89	0.35	0.04	1.28
2nd season	60	0.72	0.06	0.08	0.03	0.89	0.35	0.04	1.28
3rd season	40	0.72	0.06	0.08	0.05	0.91	0.35	0.06	1.32
<u>Portland Area</u>									
1st season	80	0.78	0.15	0.06	no	0.99	0.34	0.06	1.39
2nd season	80	0.78	0.15	0.06	da-	0.99	0.34	0.06	1.39
3rd season	50	0.78	0.15	0.06	ta	0.99	0.34	0.10	1.43

(1) Based on data in Tables XXXV, XXXVI, and XXXVII.

(2) Includes expense for obtaining harvest labor and perquisites for labor.

Pre-Harvest Labor Costs (Other Than Development). As has been mentioned previously, the pre-harvest labor cost the first year was greater

(6) Hutson, J. B. Strawberries and Farm Profits in Western Kentucky. Kentucky Agricultural Experiment Station Bulletin No. 255.

than that of either the second or the third year due to the extra expense in getting the field developed to the bearing age. As shown in Table XXXVII this labor for each the second and third years cost \$16.00 in East Tennessee, \$1.58 in West Tennessee, and \$16.78 in the Bowling Green area. Less labor was used in the Western area. As shown in a previous section, no cultivation or hoeing is done there. Fewer hours of labor are used in the Kentucky area than in Western Tennessee, but the cost is slightly greater due to the higher man and horse labor charge per hour.

The total labor cost for the 3 seasons was slightly greater in East Tennessee, even though the man labor charge per hour was 25% less than in the Kentucky area.

Fertilizer Costs. The growers, from whom data were collected, in West Tennessee used less fertilizer on the average than did those in the other two areas. Only 225 pounds per acre were used for the three bearing years, equally distributed to each year. Those in East Tennessee used 440 pounds -- 240 pounds the first year and 100 pounds each of the other two years. The total in the Kentucky area was 450 pounds -- 200 pounds the first year and 125 pounds each of the other two years. The cost per pound was the same for the two latter areas, but the cost per pound was slightly higher in West Tennessee. Was less fertilizer used there because of a probably higher quality fertilizer?

It is not apparent that total costs could be reduced profitably by decreasing fertilizer costs. Assuming that yields per acre are increased by the use of the right kind of fertilizers some strawberry growers might expect to lower their cost of production per crate by using more fertilizer. As has been pointed out, harvest costs will not be materially decreased by an increase in yields, but the cost per crate for pre-harvest cultivation, the depreciation on the patch, and for such overhead items as interest, taxes could be decreased by larger yields.

Overhead Costs. The largest single item of overhead costs was interest on the investment. For the farms studied, this amounted to \$4 per acre in East Tennessee, \$6.50 in West Tennessee, and \$6.40 in the Kentucky area, as is shown in Table XL. This is the same for each year in each area. The charge for taxes per acre was \$1.30, \$1.25 and \$1.00 for each respective area. These amounts were also the same for the 3 years in a given area. The use of buildings represented a cost of \$1.00 each year in each of the areas. The cost for the use of machinery was greater the first year when the strawberry patch was being developed. The decrease per year was approximately in proportion to the decrease in the number of hours that machinery was used. Had part of the first year's machinery cost been distributed to each of the other two years, as part of the depreciation of the patch, there would have been less difference in the total yearly machinery cost between the first and second years.

Table XL.

Comparison of Overhead Expenses per Acre of Strawberries in Three Areas During Three Bearing Seasons

	Total costs					Over-head costs per crate (cents)	% over-head is of total costs
	Machin-ery	Build-ings	Taxes paid	Interest charge	Total		
<u>East Tennessee</u>							
1st season	\$2.30	\$1.00	\$1.30	\$4.00	\$8.60	10.1	4.8
2nd season	1.10	1.00	1.30	4.00	7.40	9.9	5.7
3rd season	1.10	1.00	1.30	4.00	7.40	14.8	7.4
<u>West Tennessee</u>							
1st season	2.26	1.00	1.25	6.50	11.01	14.7	15.0
2nd season	.24	1.00	1.25	6.50	8.99	15.0	9.5
3rd season	.24	1.00	1.25	6.50	8.99	22.5	12.7
<u>Bowling Green</u>							
1st season	2.42	1.00	1.00	6.40	10.82	13.5	6.0
2nd season	.96	1.00	1.00	6.40	9.36	11.7	6.1
3rd season	.96	1.00	1.00	6.40	9.36	18.7	8.4

The cost per crate for these fixed charges is affected by the yield per acre. This is particularly noticeable for the second and third years. The declining yield from the second to the third year was accompanied by an increase in the cost per crate, as shown in Table XL. See Tables XXXV, XXXVI, and XXXVII for yields in crates. The decrease in yield to 40 crates in West Tennessee resulted in a cost per crate of 22.5¢ for fixed costs, which is almost 1¢ per quart. The average for the East Tennessee area studied was lower than in each of the other two areas. The interest charge was about 50% lower in the former.

Cash and Non-Cash Expenses

The cash items have been considered in this discussion as those for which cash or its equivalent has been paid (7). The non-cash items are those for which no cash outlay was made.

The importance of the non-cash items is not usually understood. Often growers do not include these items when considering production costs, but confine their consideration to only the items for which there has been an actual cash expenditure. As a result, many producers think they are producing at a profit, when in fact, their costs are far above any possible market price. It is the purpose of this section to show the relative importance of these cash and non-cash expenses in relation to the total expenditures. The items classed as strictly non-cash in Table XLI were horse labor, supervision of packing and grading, and interest. The strictly cash expenses were also few. They were for such items as fertilizer, crates, taxes, and obtaining harvest labor. There was a larger number of items for which only a part of the cost represents an outlay of cash or its equivalent. They were man labor for harvest and pre-harvest operations; hauling crates to the shipping point; miscellaneous materials as plants, straw for mulching, and others; buildings; perquisites for labor; and some other

(7) Cash expenses are considered here as cash or its equivalent.

Table XLI

A Comparison of the Total Cash and Non-Cash Expenses in the Production of Strawberries for
Three Bearing Seasons

	East Tennessee			West Tennessee			Bowling Green, Ky.		
	Amount actually paid out in dol-	Amount of costs for which no cash or its e- quivalent was paid	% of total cost paid in cash or its e- quivalent	Amount actually paid out in dol-	Amount of costs for which no cash or its e- quivalent was paid	% of total cost paid in cash or its e- quivalent	Amount actually paid out in dol-	Amount of costs for which no cash or its e- quivalent was paid	% of total cost paid in cash or its e- quivalent
Pre-harvest labor and power:									
Labor (hours)	\$41.55	\$33.14	55.6	\$13.71	\$20.86	39.7	\$23.79	\$47.62	33.3
Horse work (hours)	41.55	13.97	68.7	13.71	12.30	52.7	21.54	32.82	39.6
Auto or truck (Miles)	0	14.17	0	0	8.56	0	0	14.80	0
	0	0	0	0	0	0	2.25	0	100.0
Harvest labor and power:									
Picking (crates)	149.86	34.64	81.2	140.49	16.01	89.8	174.19	33.71	83.8
Packing (crates)	118.44	7.56	94.0	124.74	1.26	99.0	147.42	16.38	90.0
Haul to car (crates)	21.42	10.08	68.0	7.35	3.15	70.0	23.62	7.88	75.0
Supervision	10.00	11.00	47.6	8.40	5.60	60.0	3.15	9.45	25.0
	0	6.00	0	0	6.00	0	no data	no data	no data
Materials:									
Fertilizer (pounds)	86.51	5.44	94.1	69.89	5.35	92.9	89.91	20.50	81.4
Crates (24-qt. size)	6.60	0	100.0	3.99	0	100.0	6.76	0	100.0
Plants	73.50	0	100.0	61.25	0	100.0	71.40	0	100.0
Straw	3.41	2.44	58.3	1.65	2.35	41.3	5.00	1.00	83.3
Other	0	0	0	0	0	0	3.75	16.50	18.5
Miscellaneous:									
Machinery	3.00	3.00	50.0	3.00	3.00	50.0	3.00	3.00	50.0
Building	31.08	24.37	56.1	20.59	25.50	44.7	32.04	24.89	56.3
Taxes	3.38	1.12	75.1	2.06	.68	75.2	3.25	1.09	74.9
Exp. of obt. labor	1.50	1.50	50.0	1.50	1.50	50.0	1.50	1.50	50.0
Perquisites for	3.90	0	100.0	3.75	0	100.0	3.00	0	100.0
obtaining labor	7.80	0	100.0	4.80	0	100.0	15.00	0	100.0
Interest	7.50	7.50	50.0	1.50	1.50	50.0	0	0	0
Others	0	12.00	0	0.50	19.50	0	0.20	19.20	0
	7.00	2.25	75.7	6.98	2.32	75.1	9.29	3.10	76.0
Total	309.00	97.59	76.0	244.68	67.72	78.3	319.93	126.72	71.6
Total cash and non-cash	\$406.59			\$312.40			\$446.65		
Cash cost per crate	\$1.48			\$1.40			\$1.52		

miscellaneous items.

An analysis of this table shows that 76.0% of the total costs were cash costs for the East Tennessee farms studied, 78.3% for those in West Tennessee, and 71.6% for those in the Bowling Green area. In other words, approximately three-fourths of the total cost were cash expenses and one-fourth were non-cash expenses.

A further examination of the table reveals that a little over two-thirds of the pre-harvest man labor was hired labor, on the farms studied in East Tennessee. The farmers studied in West Tennessee hired a little over one-half of their pre-harvest labor, while those in the Kentucky area hired about two-fifths. The cash outlay was \$41.55, \$13.71, and \$23.79 for each respective area. No horse labor was hired in either area.

Of the total picking costs from 90% to 99% were paid in cash or its equivalent. West Tennessee was highest with 99%. The strawberry acreage on these farms studied varied from less than 1 acre to 65 acres. Since it requires from 3 to 6 adult pickers to harvest an acre of strawberries yielding 80 crates (8), it is obvious that, on the average, family labor could not be depended upon for harvesting a very large percentage of the crop. Apparently a larger percentage of the grading, packing, and hauling to the shipping point is done by family labor. None of the labor for supervision was reported hired, according to Table XLI.

Approximately one-half of the cost of plants were cash-costs in the two Tennessee areas. As was mentioned in connection with the cost of development, part of the plants were furnished by the farm. The same was true of straw used for mulching in the Kentucky area. All fertilizers and crates were purchased.

Interest is probably rarely calculated in the cost of production by

(8) Hutson, J. B. op. cit., p. .

producers, since it is one of so-called "invisible" costs. On the other hand, the expenditures for taxes and obtaining harvest labor will likely be included, since they are strictly cash items.

About one-half the total cost of use of buildings and perquisites for labor were cash costs. Approximately three-fourths of the total cost of the use of machinery was a cash cost.

On a per crate basis the cash costs were: for East Tennessee, \$1.48; for West Tennessee, \$1.40; and for the Kentucky area, \$1.52. Not including any of the labor costs, the actual cash-cost per crate would have been 57¢, 52¢, and 58¢ for each respective area. In other words, these would have been the average cash-costs per crate had the farmers, on the farms studied, had enough family labor to grow and harvest the crop, without the help of any hired help.

These data in Table XLI also show that the average farmer, in these farms studied, during 3 seasons spent in cash a total of \$309 in East Tennessee, \$244.83 in West Tennessee, and \$319.93 in the Kentucky area. This should help one in anticipating the cash needs in growing and harvesting an acre of strawberries for 3 bearing seasons under these conditions. There were undoubtedly many variations on the different farms, depending largely upon the proportion of the labor that was hired.

Size of Farms in Relation to Per Cent of Labor Hired

Table XLII shows that the largest percentage of labor, for each operation in East Tennessee, was hired on the farms with strawberry acreages of 6 acres and over. It is noticed that there is but little difference in the per cent hired for picking on the farms with this acreage and on those with 3 to 6 acres. The farms with less than 3 acres had a considerably less percentage of labor hired. However, on comparing the two groups of farms, with

with less than 3 acres and with 3 to 6 acres respectively, it is found that the percentage of labor hired was not consistently greater on the farms with the larger acreage. For some operations the farmers on the smaller farms hired a greater per cent of their labor.

Table XLII
Per Cent of Labor Hired for Different Operations in Growing Straw-
berries on Farms with Different Acreages of Bearing Straw-
berries, Eastern Tennessee

	1928 Acreage of berries per farm			All farms % Labor hired
	Less than 3 acres % Labor hired	3 to 6 acres % Labor hired	6 acres & over % Labor hired	
Plow	24	11	83	66
Harrow	33	11	81	66
Disc	0	33	85	77
Bed	38	15	80	66
Cut or pull plants	24	27	93	73
Plant	51	15	83	68
Miscellaneous				68
Cultivating	24	11	83	67
Hoe or weed	24	17	84	69
Fertilizing	46	14	86	72
Haul fertilizer	67	33	89	80
Picking	74	93	95	94
Packing	15	46	74	68
Haul crates	0	33	35	34
Hauling	0	19	54	48

Source: Cost of Production Statistics of Strawberries in Southern and Eastern States.

Table XLIII shows that there is very little correlation between large acreage per farm and high percentage of hired labor. For some of the operations, the farmers with the smaller average acreage hired a larger percentage of their labor than those with the larger average acreage. There was very little difference between the three groups of farms in the percentage of labor hired for picking and hoeing, which operations required the largest amount of man labor.

Table XLIII

Estimated Amount of Labor Hired for Different Operations in Growing Straw-
berries on Farms with Different Acreages of Bearing Strawber-
ries, Western Tennessee

Operation	1928 Acreage of berries per farm			
	Less than 3 acres	3 to 6 acres	6 acres & over	All farms
	Labor hired	Labor hired	Labor hired.	Labor hired
Plow	48	30	36	37
Harrow	51	27	44	41
Disc	43	38	35	36
Bed	42	31	24	28
Plant	72	54	85	78
Mow	67	0	15	13
Apply fertilizer	0	60	42	40
Haul fertilizer	0	0	40	40
Cultivate	40	48	37	40
Hoe or weed	51	48	50	50
Pick	95	100	99	99
Pack	38	74	71	70
Haul crates	67	23	0	15
Haul berries	67	38	64	60
Miscellaneous				45

Variations in Cost of Production

The original survey records were not available, so that it has been impossible to determine the variation in the cost of production on the farms studied (9). However, one would be safe in assuming that differences exist -- that some growers produce more cheaply than others.

Some farmers are more efficient managers than others and consequently have a lower production cost and larger profit. The difference in the cost of a single item may mean the difference between profit and loss. Often the difference in planting and cultivating costs alone are large enough to determine profits or losses.

In this connection Mr. J. B. Hutson of the Kentucky Experiment Station stated that:

(9) The tabulations of the cost of production survey data were made by the Bureau of Agricultural Economics at Washington.

Some farmers devote twice as much labor to cultivating an acre of strawberries as others. While those using the largest amount of labor do not always get the largest yields, yet, as a rule, those who cultivate most thoroughly get the largest yields. A careful analysis of the data available suggests that most growers could increase their profits from strawberries by giving the growing crop more careful attention (10).

Mr. Hutson made a study of some successful and some unsuccessful growers and found that the planting and cultivating cost of one unsuccessful grower was about 90 cents per crate, whereas his more efficient neighbor was getting berries of the same quality ready for harvest at 40 to 50 cents per crate. The unsuccessful grower failed to give the crop attention when needed. Undoubtedly he would have increased his total net returns had he concentrated the same labor on a smaller acreage (11).

In Missouri the cost per acre varied from \$60.18 to \$220.68; and a variation per crate of \$1.35 to \$4.64^{was reported}. The cost per crate for the fields having comparable yields varied from 53¢ to \$1.56 (12).

Such variations are likely due in a large part to differences in cultural practices. A small amount of labor wisely directed and applied at the proper time gives better returns than a greater amount applied later.

The greater amount of labor does not always mean greater profits. In Missouri it was found that the growers who hoed and weeded their patches after they had reached bearing age, although having a greater yield per acre, had a 25% greater cost per crate than those who did not hoe or weed.

In Missouri the average cost per crate varied directly with the increased yield. The growers with yields of 10.0 to 19.9 crates had a per crate cost of \$4.21, while those with a 90 crate yield had a per crate cost of \$1.75.

Variations were found also on the farms studied in the Willamette Valley in Oregon (13).

(10) Hutson, J. B., op. cit., p. 146.

(11) Ibid, p. 151 and 152.

(12) Missouri Experiment Station Bulletin No. 262.

(13) Costs and Practices in Strawberry Production in the Willamette Valley. Oregon Experiment Station Bulletin 245, pp. 18 and 19.

It is possible for a grower to apply so much capital and labor that, although yields are increased, the profits are below that of growers who apply smaller amounts. However, from an examination of Table XI showing the average yields per acre for all of the states, it is seen that Tennessee ranks fairly low. The growers could undoubtedly improve this situation profitably.

Factors Affecting Cost of Production

The following factors affected the cost of producing strawberries in the Willamette Valley according to a recent study made of the cost and practices of strawberry production (14). These were: yield, variety, cultivation, fertilizing, number of plants per acre, selection of planting stock, size of planting, value of land used for berry production, labor requirements, and insect and disease pests. It was found there that yield and labor efficiency were of major importance.

It is probable that these factors have caused some of the variations in the cost on Tennessee farms. It is also likely that labor efficiency and yield have had the greatest influence. It is generally known that with a given total cost per acre an increase or decrease in yield will cause the cost per crate to change inversely. At any rate the cost per crate on the East and Middle farms studied increased as the yields decreased. However, it should be remembered that yields have very little affect on the cost of harvesting per crate, as indicated previously.

Cost in Relation to Net Returns per Crop Season

Since it is customary for most growers to harvest three crops from each planting of strawberries it is of importance to know the net returns per season. Table XLII below shows the net profits from an acre of straw-

(14) Oregon Experiment Station Bulletin No. 215, op. cit., p. 18-34.

berries for each of the 3 bearing seasons in East Tennessee. The actual costs have been used, after adjusting for depreciation of the patch (see p.139, total costs). The price of \$2.00 per crate for each season has been assumed. Consequently this does not show actual profits for these respective seasons, but what profits might have been expected if these prices had prevailed.

Table XLII

Net Profits per Acre of Strawberries in East Tennessee per Season When:

I. Three Crops Are Harvested

	Yield in Crates	Price per Crate	Cost per Crate	Total Cost	Gross Returns	Net Profits
First season	85	\$2.00	\$1.62	\$138	\$170	\$32
Second season	75	2.00	2.00	150	150	0
Third season	50	2.00	2.38	119	100	-19
Total	-	-	-	\$407	\$420	\$13

II. Two Crops Are Harvested (1)

First season	85	\$2.00	\$1.74	\$147.87	\$170	\$22.13
Second season	75	2.00	2.13	159.62	150	-9.62
Total	-	-	-	\$307.49	\$320	\$12.51

(1) Depreciation adjusted for two crops.

This table shows a net profit of \$32 the first year; no profit the second year; and a loss of \$19 the third year. A profit of \$13 was made for the 3 years. Should the farmer have harvested only the first two years? If he had done so what would his profits have been? With the same price of \$2, the total profits for the 2 seasons would have been \$12.51 instead of \$32 as some would think at first. (The profit made the first 2 years when they were harvested 3 seasons.) With only two bearing years one-half of the depreciation must be charged against each year (15). This automatically increases the total cost per season for cost of the first two seasons over the cost per season when 3 crops were harvested. Had the crop been plowed up at the end of the first

(15) The method of distributing the depreciation used here as shown on pp. 139 and 140.

harvest the farmer would have lost \$7 -- the difference between \$177.74, the first year's cost, and \$170, the total revenue for the first year.

These profits per season of course will be governed largely by prices. For instance, with a price of \$2.50 per crate the 3rd season instead of \$2, the total returns would have been \$25 greater. This would have given a net profit of \$6 instead of a \$19 loss. Thus a net profit of \$12 for the 3 years would have been received instead of a \$13 loss.

Apparently the decision as to whether to harvest the 3rd season depends to some extent on the price that season. It may have paid better to have plowed up the patch after the second harvest. However, the farmer would need to be a pretty good predictor of prices in order to make such decisions.

ATLAS BOND

Chapter VI.

INFLUENCE OF SOME PRODUCTION AND HARVESTING PRACTICES ON QUALITY
AND APPEARANCE OF STRAWBERRIES.

It is the purpose of this chapter to bring to the attention of the reader some of the practices in production and harvesting that apparently have some effect upon the quality and appearance of strawberries. In regard to the importance of these two factors on marketing, J. W. Strowbridge of the United States Department of Agriculture says:

The strawberry must be considered as a delicacy at all times, and as such, the consumer must be tempted by quality and appearance to use them, as necessity will never influence the demand for production. A united effort by the industry as a whole to deliver to the consumer at all times well-graded stock in prime condition should tend to increase consumption, which is the main basis for expansion of the industry (1).

With strawberries, as with other highly perishable farm commodities, there is likely to be a great variation in the quality and condition of the commodity offered for sale. With such commodities the consuming public is well aware of the fact that they do not always get good quality products. Strawberries of good quality are very attractive and satisfying to consumers, while poor quality berries are not always in demand at prices which are profitable to the producer. Regardless of the keenness of competition, quality is a factor which will place any strawberry producing region in a favorable position. The producers that have products of high quality have a distinct advantage. Many growers producing strawberries are not giving enough attention to the cultural and harvesting practices that are necessary for best results. Real quality improvement must come through both cultural and handling practices. The following quotation from

(1) Strowbridge, J. W. op. cit., p. 104.

a letter published in the Tennessee State Horticultural Society Bulletin may give an idea of what a particular quality or type of strawberry may mean to the consumer.

We seek your cooperation in stimulating the production of strawberries in your state, especially the strawberries of the Klondike variety. We find that this variety is best suited to our needs, being firm, acid, and a very good shipper. We contemplate making a large pack of strawberries next year in your state and propose to make quite a few car shipments to Rochester. We think that in your state there are great possibilities for increasing the acreage of strawberries. From our experience last year throughout the country, the supply was not equal to the demand and of all berries that were picked in various states, we found the Klondike berries grown in Tennessee to be the best we have packed (2).

This indicates that there is likely to be a demand if the product is the kind and quality wanted by the consumer.

The following are some of the factors that have some influence on quality and appearance: varieties, mulching, fertilization, picking, grading and packing, and hauling to car. The discussion below, relating to each is not based upon any original research by the writer, but is only a review and analysis of some of the literature on the subject.

Selection of the Variety

It is recognized that the selection of a suitable variety is one of the most essential steps in securing berries of satisfactory quality and appearance. The first step in the selection of the variety is to have a clear conception of the kind of plant and fruit desired. The grower should have in mind his "ideal strawberry". Of course, the ideal has not yet been obtained, for improved varieties are being introduced from time to time. In this connection J. W. Strawbridge says that:

It is important in a commercial sense to know the varieties of strawberries grown for market in the different districts, for the trade, as a rule, is familiar with the distinctive market qualities of the principal varieties. The producer should learn the important qualities of the different varieties adapted to his

locality and should select for growing those that conform to the requirements of his prospective market.

Regardless of the probable variations in the requirements of the market the consumers in general desire berries of good quality and appearance. The following are some of the variety characteristics that affect quality and appearance. They are discussed below.

Firmness. This characteristic is highly desirable in strawberries for shipment but not necessarily for local consumption. This has been generally recognized by commercial producers and plant breeders, so that production for distant markets has been confined necessarily to those varieties with the best shipping qualities. The Klondikes and Aromas, the most widely grown varieties in Tennessee, have been among the best shippers in the United States. The Blakemore, which is now being grown experimentally here, produces firmer berries than either the Klondike or the Missionary (3).

Firmness can now be measured by a plunger devise developed by the U. S. Department of Agriculture, according to J. H. Clark, Associate Pomologist. It was found by tests that firmness is only one of the factors that govern the shipping qualities of strawberries. Varieties that differed widely in their shipping qualities were very similar in firmness of flesh (4).

Shipping quality is considered more important in commercial varieties than high flavor. Juiciness, solidity of core, texture of skin, position and abundance of seed and an inherent ability to stand rough treatment after picking, all help to determine whether a variety is a good or a poor shipper. These are not necessarily correlated with firmness, but firmness is the most important factor in shipping quality. The only sure way of determining the shipping quality of a new variety is to ship it.

The first early improved variety, the Early Scarlet, was criticized be-

(3) U. S. D. A. Circular 93, The Blakemore Strawberry.

(4) New Jersey Agriculture, June 1930; article, Pressure Tests of Strawberries, by J. H. Clark.

cause of its poor shipping qualities. The industry did not expand in keeping with the increasing population due to this limiting factor. However, the introduction of the Honey, which was a larger berry and a better shipper, improved this condition.

Every new variety as it was introduced was looked upon as the "perfect variety" until experience in growing it disclosed some weakness or limitation.

Color. This has been found to be the most important single factor in the sale of American fruit, according to F. G. Robb of the Bureau of Agricultural Economics. The readiness with which strawberries sell to the consumer may be influenced materially by their color and attractiveness. Regardless of whether the consumer wants a light red or a dark red berry the color should be uniform and bright. Berries which are uniform in color are more attractive than berries that are poorly colored.

Dark red varieties show bruises less than lighter colors. However, some dark red varieties are dull in appearance and do not sell well, as do the brighter colored ones.

The public may change from time to time in its demands, and various markets will differ to some extent at any one time.

A study of Illustration No. 1 reveals the fact that some varieties change color under changed condition to a much more marked degree than others. For example, the fruit of the U. S. D. A. Number 845 variety is a light yellow when fresh, light scarlet after storage, light brown when crushed, and dark brown when preserved. The Dunlap variety has very dark reddish brown fruit when fresh, changing to brown after storage, to dark reddish brown when crushed, and to brownish black when preserved. The Blakemore variety is bright scarlet while fresh, scarlet after storage or crushing, and reddish brown when preserved. Consequently the Blakemore is superior to any of the other varieties so far as color under all conditions is concerned, with the exception of the fruit of

Illustration Number 1.

Circular 93, U. S. Dept. of Agriculture

PLATE 2

	U.S.D.A. No. 845	HOWARD 17	BLAKEMORE No. 682	CHESA- PEAKE	AROMA	U.S.D.A. No. 655	KLONDIKE	MISSIONARY DUNLAP		
COLOR OF FRESH BERRIES	1	2	3	4	5	6	7	8	9	10
COLOR OF BERRIES AFTER STORAGE	11	12	13	14	15	16	17	18	19	20
COLOR OF CRUSHED BERRIES	21	22	23	24	25	26	27	28	29	30
COLOR OF PRESERVED BERRIES	31	MISSIONARY TYPE	32	BLAKEMORE TYPE	33	MISSIONARY TYPE	MISSIONARY TYPE	MISSIONARY TYPE	MISSIONARY TYPE	34

L. C. C. KRIEGER, PHX

COLORS OF 10 STRAWBERRY VARIETIES

(For explanatory legend see page 3.)

EASTERN OFFSET INC. BALTIMORE

U. S. D. A. No. 845 variety which is possibly the better colored than any other after it has been stored, though while fresh, or when crushed or preserved it is not attractive. The color of the Blakemore varies only slightly under the various conditions, except when preserved; and under this condition it is more attractive in color than any of the other nine varieties shown in this chart.

It is important that the color of ripe strawberries remain attractive until they are consumed. Some varieties while fresh are attractive in color but before reaching the consumer they change to an objectionable dull or dark color.

Size. Many consumers prefer large berries, but producers have learned that the largest berries are not good shippers. Large berries are very often soft and poorly shaped and hence they are more easily damaged. Then, the distance from market may be the deciding factor in selecting a variety. If the berries are to be transported only a short distance the very large and soft berries may be used. On the other hand, very long hauls, in order to be successful, require varieties producing smaller and firmer fruit.

Varieties vary greatly in producing berries of uniform size and shape. It is important that the berries be uniform in size throughout the season and uniform at any particular picking. Some varieties produce much more uniform fruit than others, which of course is a point in their favor.

In 1869 a prominent strawberry breeder predicted that strawberries would be produced "as large as pineapples"(5). Such a development might be possible, but it is not practical. However, any new varieties should become popular that would produce larger berries without losing their carrying qualities.

The Honey was the first of the early large-fruited varieties of North American origin and for many years it captured most of the prizes at straw-

(5) Journal of Horticulture, Vol. VI, page 29.

berry exhibitions because of its size and beauty (6).

In 1878 James Smith of Des Moines, Iowa, reported that a specimen was measured by the New York State Horticultural Society that proved to be $14\frac{1}{2}$ inches in circumference and nearly 5 inches in diameter. Due to the irregularities on the surface of the berry it appears larger than it really was. The heaviest berry ever grown weighed $4\frac{3}{4}$ ounces (7).

Shape. The standard shapes at present vary somewhat from long-conic to round-conic, or nearly round. Rounded berries which have a regular and smooth surface are much preferred over varieties with pointed tips. Berries which are irregular in shape or have pointed tips are not as attractive in the pack and are more likely to be damaged in handling than rounded berries with smooth surfaces.

No varieties produce fruit of uniform shape. However, each variety has a dominant type of shape. Illustration No. 2 shows the variations in shape of the Blakemore. The first berries ripened by a plant are usually more irregularly shaped than the later ones.

Calyx. The importance of this characteristic will be determined by the use and treatment to which the berries are to be subjected. A large calyx is a disadvantage if the berries are to be hauled long distances, or subjected to hauling which causes them to settle. Berries from which the calyx is removed do not carry or keep well, but may be satisfactory for immediate canning or processing.

The housewife prefers berries which are easily capped. A small calyx which remains green and attractive in contrast to the red fruit is preferable in commercial varieties.

Seeds. The strawberry has a great number of seeds which directly influence the color and shipping quality. The seeds should not be crowded

(6) Fletcher, S. W., op. cit.

(7) Ibid.

Illustration Number 2.

4

CIRCULAR 93, U. S. DEPARTMENT OF AGRICULTURE

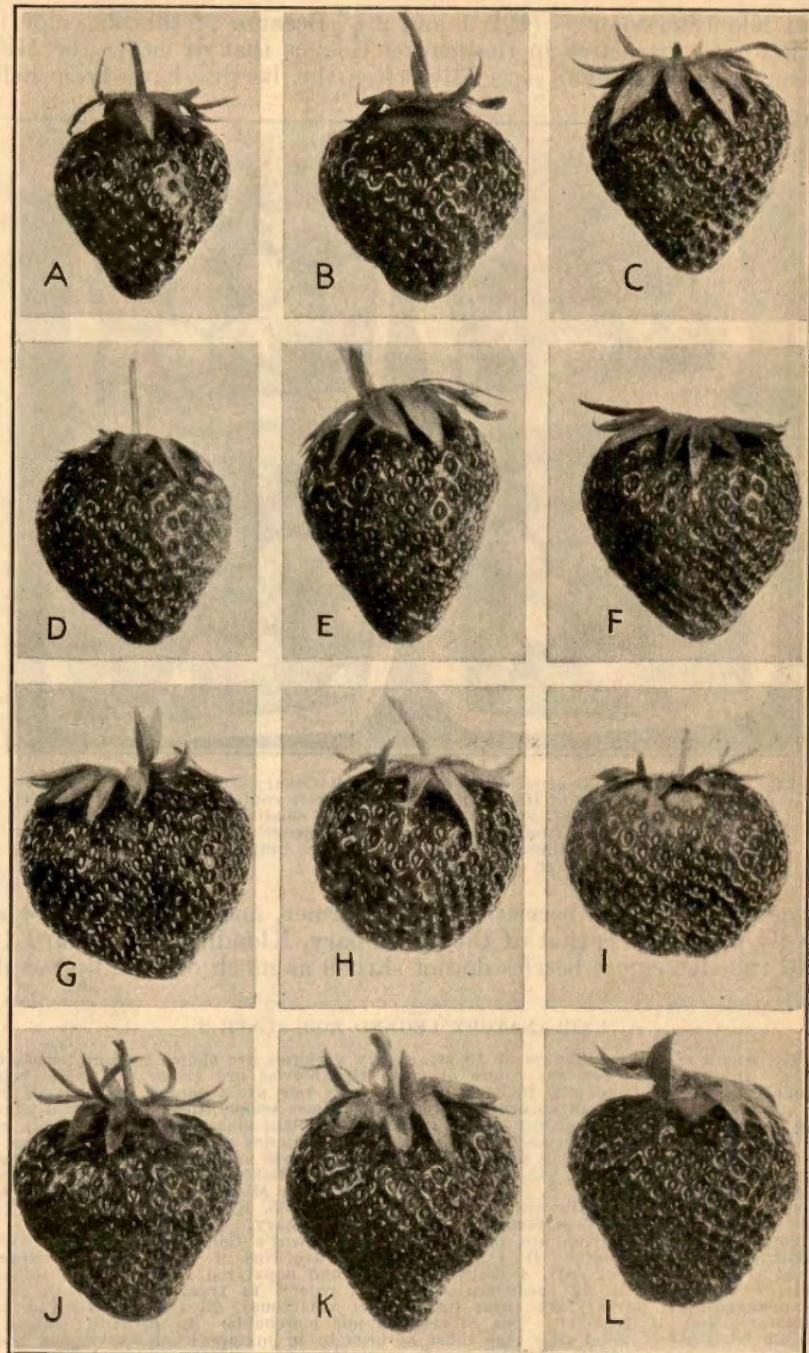


FIGURE 2.—Variations in the shape of the Blakemore strawberry. On vigorous plants the primary berries are commonly similar in shape to that shown at G, while the later berries are more typical, as shown in B, C, and D. In New Jersey many of the berries resemble B, C, and D, but have a blunt end as in I. Though various shapes are shown, the variety actually is relatively uniform in this respect.

together at the apex of the berry, because such a condition gives an unattractive appearance. Varieties with light colored seeds are more attractive when canned or preserved. Berries in which the seeds are near the surface carry better than berries which have the seeds in pits.

Flavor. The flavor is determined largely by the amount and proportion of sugar and acid. Some of the best dessert varieties contain 5% sugar and 1% of free acid. The modern consumer demands a berry which is not very sweet. The varieties which are classed as sub-acid appeal most strongly to the average palate. So far as known by the writer, the soil upon which a variety is grown does not affect its flavor, but climate and rainfall modify flavor as well as firmness and color.

Mulching

Mulching is sometimes practiced by strawberry growers for various reasons, such as, protection of plants from damage by freezing, protection from weeds, conservation of moisture, to influence time of ripening, and to keep the berries clean. It is the relation of mulching to the cleanliness of the berries that will be discussed here in connection with appearance of the marketable product.

The consumer objects seriously to dirty fruit and the consumer must be pleased. Dirty fruit is of poorer quality and sells poorly, whereas bright clean berries should command a much better price. However, no comparative price data are available. At any rate, net profit from the mulching practice is of the greater importance. In other words, the grower must take into consideration the cost of mulching as well as the price advantage.

Mulching is not as essential to the cleanliness of the berries grown on a gravelly hillside as those grown on clay loam soil or soil of similar texture. Berries are said more likely to become dirty when grown on level land.

Mulching is not practiced extensively in either the East Tennessee or

the West Tennessee producing area. Of the 50 farms and 61 farms surveyed in each respective area none reported this practice (8). It is reported that a great many growers in the Portland area mulch their plants. The growers in the adjacent Bowling Green area follow this practice which is a further indication that some of those of the Portland area do the same.

The amount of mulching for fruit protection depends upon several conditions, particularly the nature of the soil, the amount of rainfall expected, and the variety of berries. Sandy soil or soil covered with small pebbles does not need mulching as badly as clay or loam soils. Upstanding varieties with stiff stems keep most of the berries clean while spreading varieties do not.

Use of Fertilizers

The application of potash seems to have improved the quality of strawberries in some experiments conducted. An Oklahoma strawberry grower, in cooperation with the county agent, experimented with three plots of berries. The results of their experiment are quoted from Better Crops as follows:

Three uniform plots were selected and to one plot 653 pounds of a 4-10-4 fertilizer per acre were applied in February. To another plot 653 pounds of a 4-10-4 plus 108 pounds of muriate of potash were applied; and to the third plot no fertilizer was applied. There was a marked difference in the yield and quality of the berries. The plot receiving the extra potash produced 220 crates of marketable berries and required only 87 berries to make a quart, with only 3 per cent culls. The plot receiving only the 4-10-4 produced 197 crates per acre of marketable berries, requiring 110 berries to make a quart, with 7 per cent culls. The plot receiving no fertilizer produced only 139 crates per acre, requiring 132 berries per quart, with 10 per cent culls. Berries were graded for culls at the middle of the harvesting season by Mr. C. B. Shelton, field agent for the Oklahoma State Market Commission.

The keeping qualities of the berries were tested, as Mr. Hayman sent berries from each plot to the Home Economics Department of the A. & M. College unidentified. At the end of five days, Miss Grace Steininger, food specialist, reported only 29 per cent edible berries from the no-fertilizer plot, 31 per cent from the 4-10-4 plot, and 46 per cent good berries from the plot receiving the potash in addition to the regular fertilizer (9).

(8) Brodell, A. P., op. cit.

(9) Better Crops, December 1929.

This experiment indicates better carrying qualities of the berries produced with the extra potash. These berries would likely have a better appearance after reaching the market due to this quality plus their larger size. Brown (10) found that during extremely warm weather during a large part of the season plants that had received an application of potash produced firmer berries but not more attractive than those which had received applications of nitrogen. However, in years of cooler seasons there was practically no difference in firmness, size, and appearance of the berries. Loree (11) says that there is no indication that fertilizer treatments materially affect the texture, moisture content, or the quality of strawberries.

However, it was found by Chandler (12) that application of nitrogen to plants in the spring before the crop was harvested produced soft berries and poor in color and quality. Similar results were found by Bailey (13).

There is a belief among some growers that the use of potash produces berries not only with better carrying qualities but also with a better color (14).

Picking

Time of Picking. Picking must be done before the berries become over-ripe or they will damage in shipment. Varieties differ in the frequency with which they need to be picked. Usually the berries should be picked every other day, but certain varieties may be left three days between pickings, while still others should be picked daily (15). The time required for the berries to reach the market must be considered. For long distance shipping the fruit should be $3/4$ red to full color. The berries of a variety that

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- (10) Brown, G. G., Oregon Agr. Exp. Sta. Bul. 159. 1919.
 - (11) Loree, R. E., Michigan Agr. Exp. Sta. Technical Bul. 170. 1925.
 - (12) Chandler, W. H., Missouri Agr. Exp. Sta. Bul. 113. 1913.
 - (13) Bailey, L. H., Cornell University Agr. Exp. Sta. Bul. 139. 1901.
 - (14) Particularly, T. L. Ennis, manager of the Blount County Fruit and Truck Growers Association.
 - (15) Strawberry Culture, Eastern United States, Farmers Bul. 1028, p. 37.

tends to be soft should be harvested before they are full red.

George M. Darrow of the U. S. Department of Agriculture says that "if the berries are picked in the early morning when they are relatively cool, and put at once in the shade, they will keep much better and have a much better appearance on the market than if picked at midday when the berries are warmer, or if left in the sun after picking" (16).

At the height of the season, when the berries are ripening rapidly if they are not picked every day there will be many overripe and soft berries picked the following day, and especially is this true during rainy weather. Water soaked strawberries become soft in a few hours and will not carry well even under refrigeration. On the average every third or fourth day during the harvest season is a rainy day, and in some years, at this time of the year, there may be rain and cloudy weather for several days in succession. Under these conditions losses are sometimes heavy. The Cooperative Marketing Association at Armona, Tennessee, has to some extent overcome this condition, the manager states. During the past two seasons the manager has insisted on the members picking the ripe berries every day regardless of weather conditions. He reported that this practice has given good results. When picking was done during a rain the berries were graded and packed while wet, care being taken that they were kept out of the sunlight, in case sun should begin shining. They were loaded in a refrigerated car as soon as possible.

According to questionnaire returns from 85 strawberry producers in Tennessee only 41 of the producers picked the berries every day; 35 picked on alternate days and 2 picked at irregular intervals. Seven did not report.

Number of Pickers. An adequate number of pickers is essential; often as many as 15 per acre being required. However, this number will vary with

(16) Farmers Bulletin No. 1028, op. cit., p. 38.

the production per acre and the weather conditions. At least there should be enough pickers to keep ripe berries picked daily or at least every other day, or there will likely be some overripe fruit picked later. Some supervision of pickers is ordinarily necessary, especially for inexperienced pickers. Ordinarily one person can supervise from 20 to 30 pickers.

Some growers encourage their pickers to remain throughout the picking season by paying a bonus of $1/4$ to $1/2$ a cent per quart. Of eighty-one Tennessee strawberry producers reporting only 9, or 11.1 per cent, pay a bonus. It is not necessary to pay this bonus in some communities in Tennessee because the pickers usually all live in the community or nearby, and are likely to work throughout the picking season anyway. In communities where the picking is done by transient labor there is a chance of losing several pickers when the best picking season is over. To avoid this some growers withhold $1/2$ cent per quart for all berries picked until the picking season is over, and only those pickers who worked the entire harvesting season are paid the $1/2$ cent per quart for all the berries that they have picked. Whether or not this is the best plan must be decided by the strawberry grower himself. The thing that he wants to avoid is having a considerable part of the late ripening berries remain in the field because of a lack of pickers.

Efficiency in Picking. The quality of berries delivered for packing depends, to a large extent, upon the efficiency of the person in charge of the pickers. Desirable berries are often ruined by carelessness or inexperience in picking. It is the foreman's duty to see that every row is picked clean, and that overripe, green, or otherwise defective berries are not put into the baskets. He must also prevent trampling of plants by pickers.

Pickers should be taught the right method of picking. It is done best by the use of the thumb and fore finger, each berry being pinched off with a stem about one-fourth of an inch long. By this method the calyx and short

stem remain on the berries until they are prepared for consumption. It is said that they not only add to the attractiveness but aid in preventing damage in transit.

Many of the strawberries produced in Tennessee are picked by children. A picking supervisor in the Armona district stated that boys and girls under 12 years of age, as a rule, were not good pickers, due to their careless work. Such careless pickers not only are objectionable because of their careless picking methods but because they are less careful in protecting the plants and immature berries.

The berries should be placed, rather than dropped, into the cups. Some pickers bruise or squeeze the berries by holding too many in the hands at one time. Such berries, and those without the hull or cap, do not carry well to the market, as mentioned above.

Care must be used in seeing that the picking is done thoroughly as the rows are gone over. Ripe berries which are not gathered may become over-ripe and soft before the next picking time.

Some strawberry producers, in order to improve the quality of berries, have each picker to carry two sets of cups, one for good berries and one for poor or questionable berries. By the use of this method the quality is likely to be more uniform, unless careful grading is practiced at the packing shed. If the pickers are paid the same price per quart for all berries picked, regardless of whether they are good or poor berries, there is some encouragement for careful work.

An effort should be made to keep up the spirit and morale of the pickers. This will inspire them to better work. Some strawberry producers and marketing associations have a picnic at the end of each season to which all the pickers are invited. This tends to develop a good spirit and an interest in the work.

Care Immediately After Picking. The berries should be carried to the packing shed immediately after picking, as a protection from the sun. If kept in the shade they will have a better appearance when they arrive on the market. Some growers use carriers with a relatively small capacity so that the berries can be taken to the packing shed sooner after picking than would be possible if larger size carriers were used.

The importance of keeping the berries cool is indicated by the following statement by Mr. Darrow:

Experiments have shown that for each rise in temperature of about 15°F., the life of the berry, other things being equal, is decreased one-half; that is, if the strawberry will keep for 8 days in good condition at a temperature of 40°F., it will keep for only four days at a temperature of 55°F.; only two days at a temperature of 70°F.; and only one day at a temperature of 85°F. (17).

Grading

The importance of standardized grading is well indicated by the following quotation:

Well-defined standardized grades, properly and consistently used, promote honesty and fair dealing, and discourage the careless and unscrupulous packer. They enable the conscientious grower and shipper to realize a premium for care, honesty, and good judgment. They provide a common language with which to describe quality, maturity, size, and all factors that determine the value of a given shipment. They serve as a convenient, fair, and equitable basis for sales, for quotations to buyers, for inspection at shipping points, and in receiving markets, for adjustment of claims, for cooperative pooling, for financing, and for reporting and comparison of market prices (18).

In the determination of strawberry grades the factors of greatest importance are size and quality. However, other considerations are very important. Berries must be firm enough to carry to the market in good condition. All berries which might interfere with good keeping or with the attractiveness of the pack should be discarded. This will include overripe, moldy, water soaked, unripe, sandy and otherwise unattractive or damaged berries. Different varieties differ in size, shape, appearance, and keeping

(17) Farmers Bul. No. 1028, op. cit., p. 38.
tin No. 1560.

(18) U.S.D.A. Farmers Bulletin

quality. Therefore they should not be mixed. Berries of some varieties may be handled without damage, whereas tender varieties, especially if overripe, may be considerably damaged.

If the laborers are intelligent and careful, pan grading may prove very satisfactory. In some sections of the Ozark regions, where the Aroma is grown principally, a thorough method of grading is practiced. Each basket of berries is emptied into a specially constructed grading pan, and the undesirable berries are sorted out as the fruit is poured from the pan back into the basket. This type of grading eliminates all the berries that are considered undesirable. Strawberries of the Aroma variety will withstand considerable handling and have been pan-graded during several seasons in Southwest Missouri with good results.

The pan-graded product must be sold for a considerably higher price than the ungraded product; and the producer must receive the increase in price before he will be compensated for his efforts.

Whether or not the berries are hand graded, they should be classified at the packing shed. The filled baskets should be separated according to quality grade and size, and placed in crates accordingly. Such classification should be based on well defined standards, and the crates should be marked accordingly, for the benefit of the various handlers and dealers.

Every association or concern which handles strawberries should be familiar with the requirements of the various grade and standards. And some system should be worked out whereby the producers may be educated as to the standard requirements and their advantages. Producers and handlers should realize that they must play fair and furnish a quality product if they expect to continue in the business.

Some of the labor required in grading might be eliminated by leaving the undesirable berries in the patch and by producing good sized berries by proper fertilization. Some leading growers say that they do not need to grade

very much -- that only a very small percentage of their crop is No. 2's or culls.

Packing

Proper placing of the berries in the small boxes and packing them in the crates adds to their appearance on the market. Its importance is indicated and the method outlined in the following quotation from Farmers Bulletin No. 1560:

Strawberry boxes, when properly filled, are neither slack nor so full that the berries are likely to be crushed; they are full enough to look attractive and they are still well filled after being transported to the market and sold and delivered to the consumer. At the same time there is danger of filling the boxes so full that the cover will crush many berries. Usually growers fill their boxes well, but there are still a few who appear to think they can save berries by slack packing, and thus increase their own profits. The grower who does this loses, eventually. Slack-packed berries are as difficult to sell as those which are beginning to decay. The box must contain no leaves, sticks, or other trash. Boxes in the second, third, or fourth layer of the crate must be as well filled as those in the top layer.

Some sections cling to the practice of "facing" or placing the berries in the top layer on their sides, all pointed one way, or placing them with the stem of the berry down, in order to add to the attractiveness of the package. This makes an attractive package of fruit, and there seems to be no harm in the practice until the tendency to "top," or to put the best berries on the face of the box creeps in. Many shipping associations claim that unless strawberries are very high in price, the extra labor cost of "facing" the boxes of berries is not warranted. "Topping" or placing the best berries in the top layer of the box and the poorer or smaller berries in the bottom of the box should not be practiced. The face of a box of berries should be a fair sample of the entire contents of the box, and the contents of the top boxes in a crate should represent fairly the entire contents of the crate.

Careful supervision at the packing shed by the grower, a member of his family, or a reliable employee, is of vital importance if a satisfactory grade and pack is to be secured. It is especially necessary if the field supervision is incompetent or if the berries are to be graded or classed at the packing shed.

Work at the packing shed includes receipting for the berries delivered by the pickers, grading or classifying, packing, placing boxes in the crate, marking, and nailing on the covers. When the acreage is small, all of this work may be performed by the grower or some member of his family, but when the acreage is large, frequently one person's time is occupied in receipting for fruit delivered by the pickers. Some growers have this person act in the capacity of inspector to note the quality of the berries delivered by each picker, and to note whether the boxes are properly filled. The number of laborers required at the packing shed will depend upon the quality of the berries, the thoroughness

of the grading, and the number of pickers in the field.

Transportation to Shipping Point

The berries should be hauled to the station and put under refrigeration as soon as possible. It is essential that the berries be hauled with a minimum of jarring if they are to reach there in good condition. Motor trucks are now being used extensively for hauling from the farm to the loading shed. Some use spring wagons. The load should be covered with a tarpaulin to protect it from rain, sun and dust. One inexperienced farmer near Evensville, in Rhea County, hauled his berries several miles in a wagon without springs. They were badly bruised upon reaching the shipping point, and consequently did not carry well en route to the central market.

Chapter VII.

ORIGIN OF AND TOTAL CARLOT SHIPMENT OF STRAWBERRIESShipments by States

The strawberry shipments of the United States can be divided in four groups according to the season when they are shipped -- those coming from the early shipping section, from the second-early section, from the intermediate section, and from the late section. Map No. 22 shows the different states that are located in each of these sections.

In Chart 12 the per cent of the total United States shipments coming from each section is shown. In 1918 the intermediate section was the most important, supplying over 45% of the total shipments. This section declined in importance until in 1921 the second-early section passed it. After 1922 these two sections have shown the usual seasonal fluctuations with a slight downward trend after 1925. The late section is peculiar in that it has shown a downward trend since 1920. This downward trend was due to a combination of, decreased acreage in some of the states, the great increased use of the motor truck as a means of transportation to the nearby markets, and to the rapid increase of acreage in the other sections. The early section has shown a very marked upward trend for the entire period. In 1918 this section was third in place of importance, with only 12% of the total shipments. In 1929 it had passed the intermediate group which was first in 1918, and shipped 32% of the total shipments.

Chart 13 shows the total carlot shipments for the United States from 1918 through 1929. There was a slight decrease in the number of cars shipped in 1919 and 1920 as compared with 1918. 1921 showed an increase of 3666 cars over the previous year's shipments. In 1922 there was an even greater increase

Map 22. Principal States Shipping Strawberries by Rail, 1923

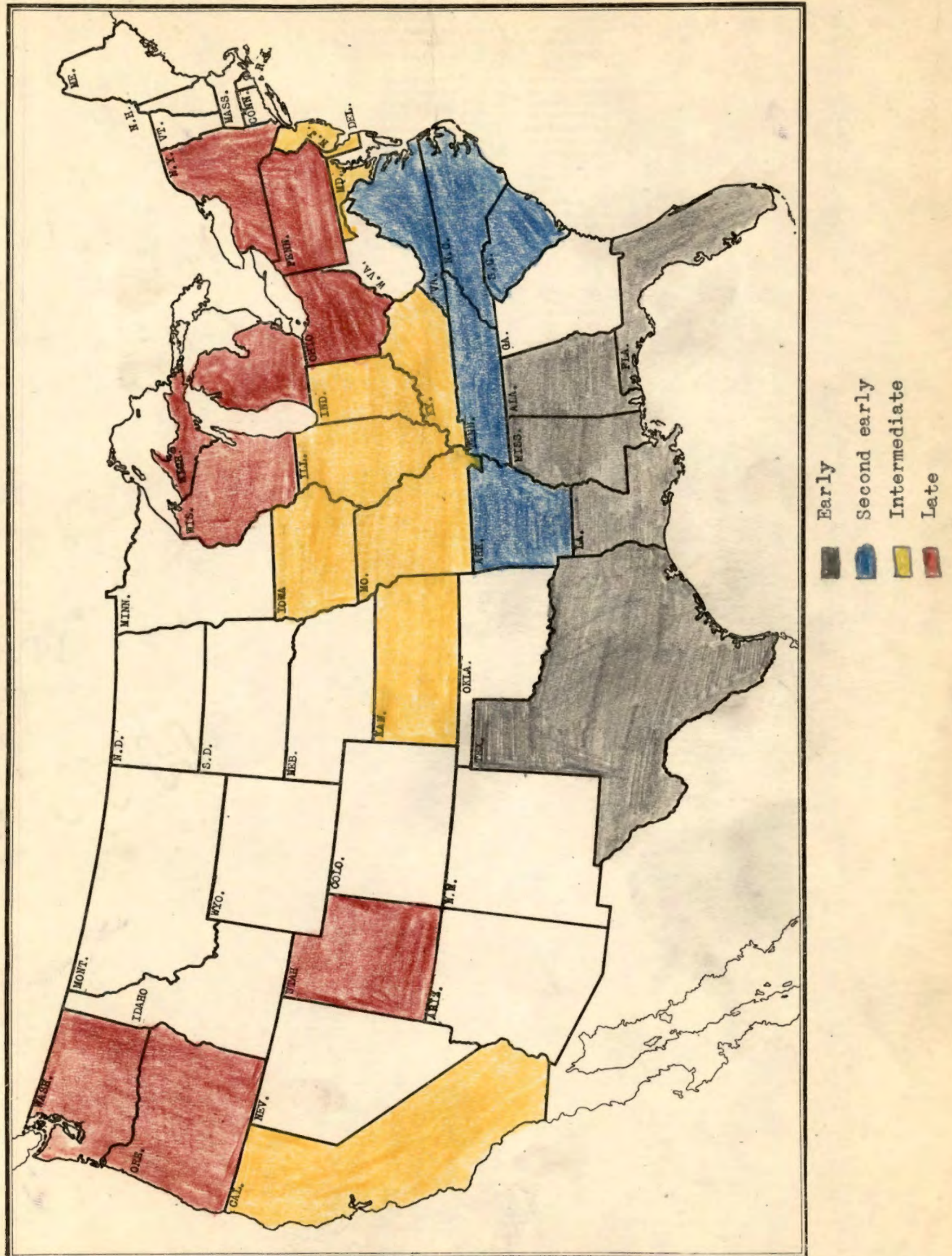
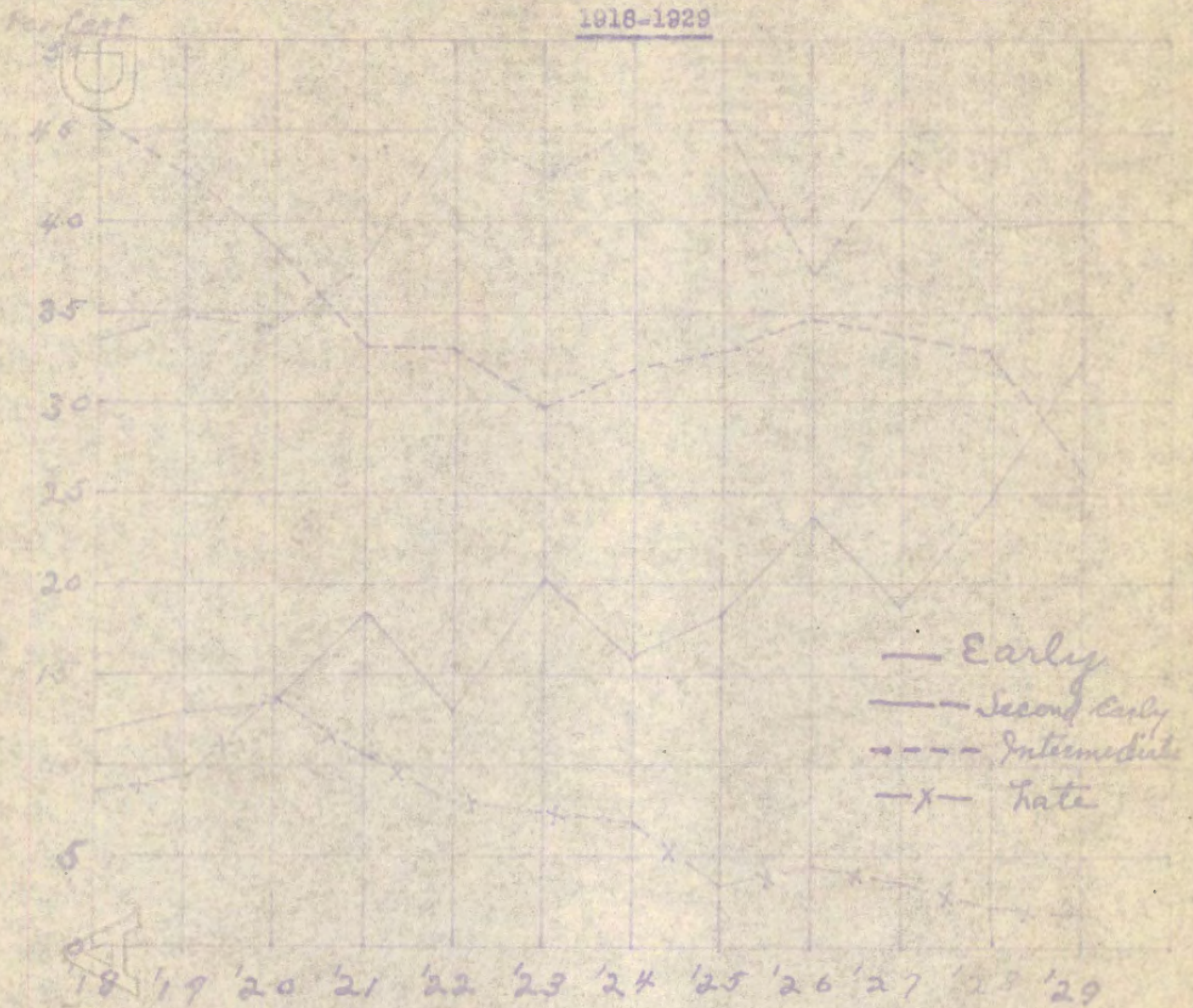


Chart 12.

Per Cent of Strawberries Shipped in Carlots from the Four Areas,

1918-1929



over the 1921 shipments, 7896 more cars being shipped. In 1923 there was a decrease of 960 cars as compared with the previous year. In 1924 not only was this decrease made up but there were 205 more cars shipped than in the year 1922. The year 1925 saw a decline of 6710 cars shipped. After 1925 there was an increase in each year's shipments until the shipments for 1929 amounted to 19,380 cars and surpassed the previous high year of 1924 by 414 cars.

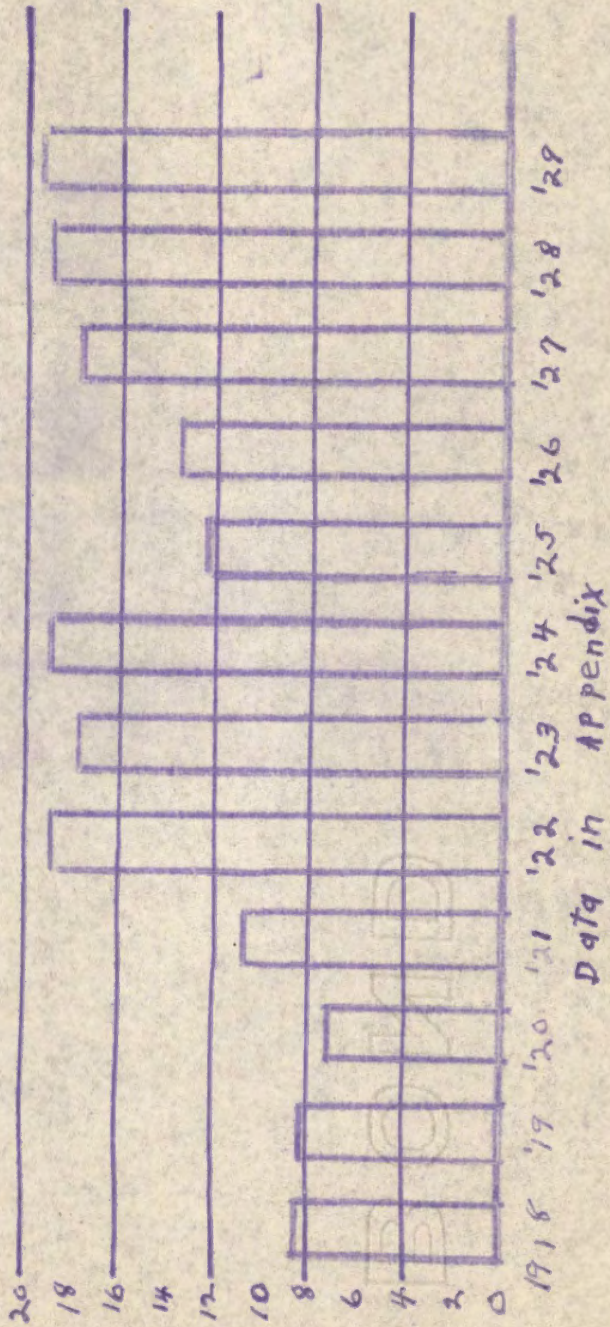
Maps 23, 24, and 25 show the change in point of origin of the shipments over this period from 1918 to 1929. There was a marked increase in the carlot shipments from Missouri, Kentucky, Arkansas, North Carolina, Florida, and Louisiana for each of the four-year periods. Tennessee, Virginia, Delaware, Maryland, Michigan, New York, Washington, and Wisconsin increased after the first four-year period but they showed decreases after the second four-year period. New Jersey is alone, among the more important states, in that it has had a continuous decrease for the period.

Table XLIII shows the ten leading states in number of carlot shipments in order of their rank for each of three different periods. During the four-year period, 1918 through 1921, the ten leading states shipped 79.2% of the total shipments. During the second period, 1922 through 1925, the ten leading states shipped 84.1% of the total shipments; while 87.2% of the total shipments came from the ten leading states for the last period, 1926 through 1929. There has been an increasing concentration of the carlot shipment of strawberries from the more important states.

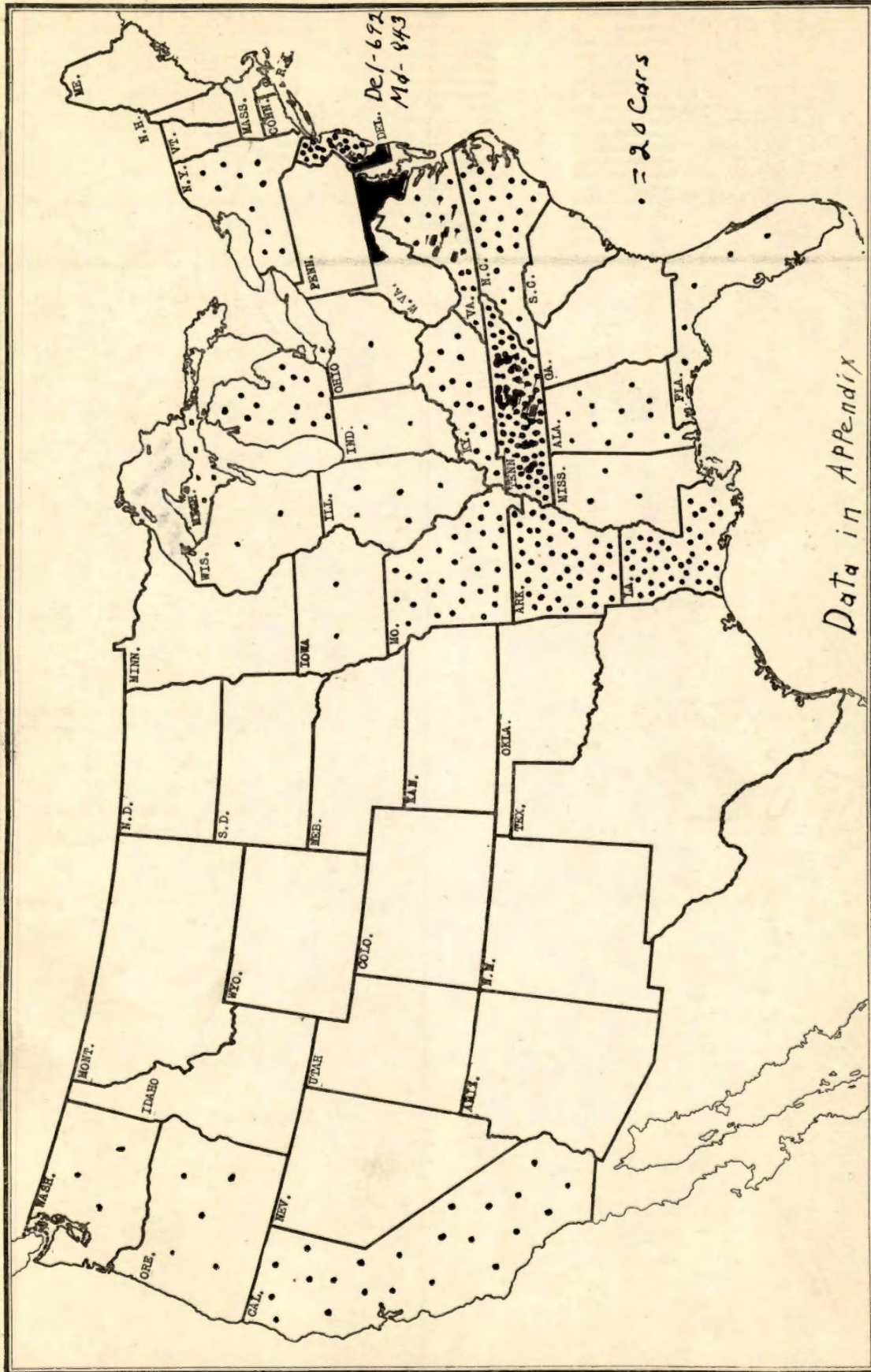
Chart 13.

Total Carlot Shipments of U. S. Strawberries, 1918-1929.

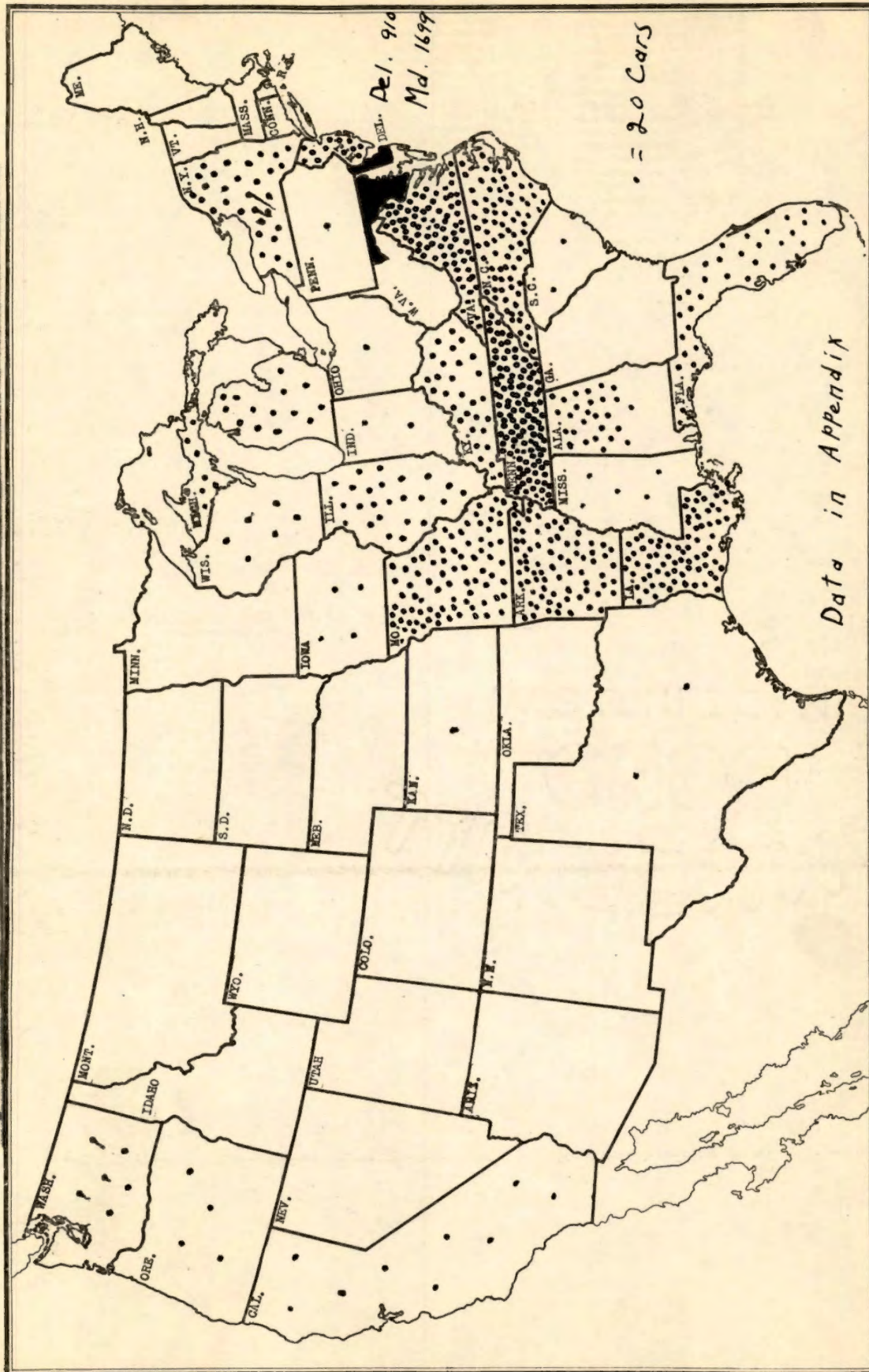
Thousand
CtS.



Map 23. Average Number Carlot Shipments of Strawberries, 1918-1921 Inclusive



Map 24. Average Number Carlot Shipments of Strawberries, 1922-1925 Inclusive.



Map 25. Average Number Carlot Shipments of Strawberries, 1926-1929 Inclusive

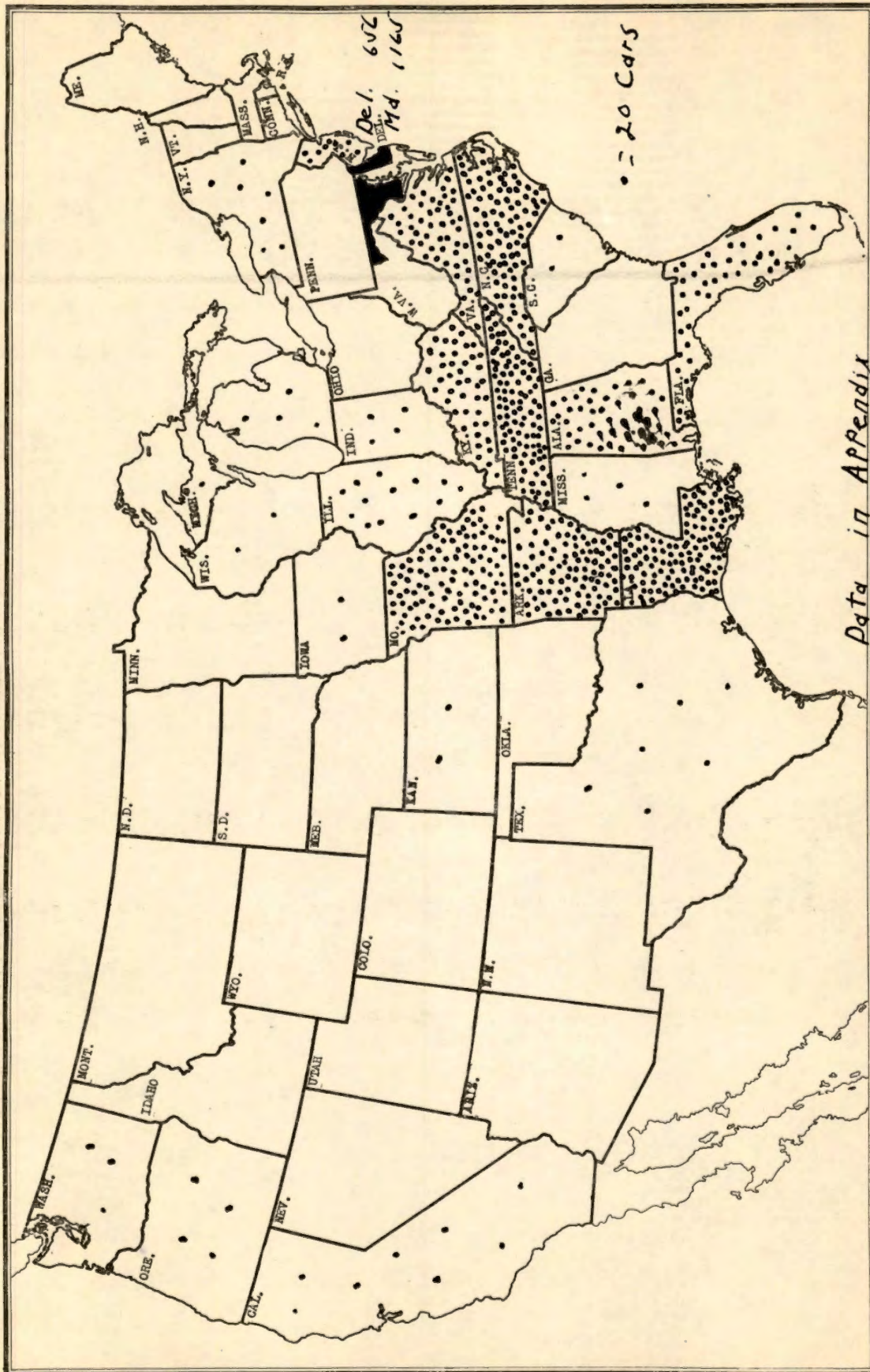


Table XLIII.

Ten States Shipping the Largest Average Number Carloads of Strawberries
During Each of the Three Four-Year Periods

Rank	State	Ave. No. Shipped, 1926-1929 Inclusive	State	Ave. No. Shipped, 1922-1925 Inclusive	State	Ave. No. Shipped, 1918-1921 Inclusive
1.	Louisiana	2428	Tennessee	2863	Tennessee	1330
2.	Tennessee	2080	Maryland	1699	Arkansas	856
3.	Missouri	2033	N. Carolina	1612	Louisiana	848
4.	Arkansas	1983	Louisiana	1549	Maryland	844
5.	N. Carolina	1869	Arkansas	1528	Delaware	692
6.	Maryland	1165	Virginia	1513	Missouri	599
7.	Virginia	1033	Missouri	1330	N. Carolina	484
8.	Alabama	929	Delaware	911	California	440
9.	Kentucky	872	Florida	654	Michigan	391
10.	Florida	784	Kentucky	594	Virginia	375
Total		15,176		14,253		6,859

Shipments from Tennessee

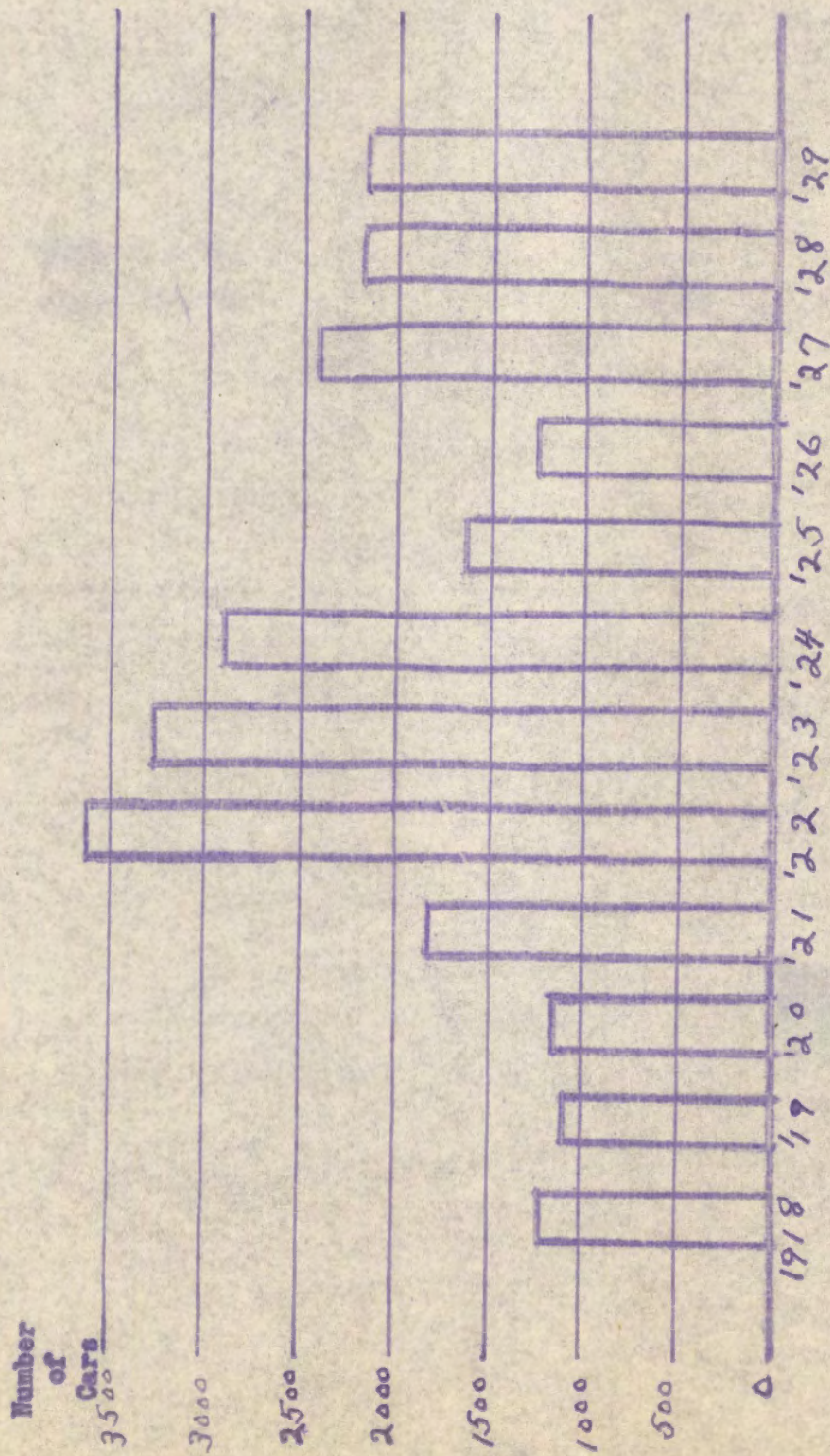
Total Shipments. For the four-year period from 1926 to 1929 Tennessee ranked second in importance in the average number of carlot shipments of strawberries. Louisiana, which ranked first, had an average of 348 more cars than Tennessee. From 1918 to 1925 Tennessee had a larger average number of carlot shipments than any other state. For the four-year period, 1922 through 1925, Tennessee averaged 1164 carloads more than Maryland, its nearest competitor; while for the four-year period, 1918 to 1921, this state outdistanced its nearest rival, Arkansas, by 474 carloads. In the year 1929, the last year for which data are available, Tennessee ranked third in total shipments. Arkansas was able to pass Tennessee in point of importance as a shipped by only two cars (see table above and Appendix D).

The Arkansas berries are on the market at the same time as the Tennessee berries and give the Tennessee crop keen competition. If the Arkansas shipments continue to increase in the future as they have in the past Tennessee may again have to give away and take a place lower down in the list of shippers.

Chart 14 shows the yearly carlot shipments of Tennessee berries. The peak was reached in 1922 when 3634 cars of berries were shipped. This was the year of the peak production. This represented an increase of 1795 cars over the 1921 shipments, or an increase of about 100%. The year 1923 and 1924 were ones of slightly decreasing volume while the year 1925 showed a decrease of 1265 cars. There was a further decrease in 1926. There were only 1253 cars shipped then, which was only 154 cars more than the low year of 1919. This was a low production year. In 1927 there was an increase of 1172 cars over the previous year. The shipments for the next two years were not quite so great.

Twice during the period from 1918 to 1929 there was a great increase in the carlot shipments over the previous year. In 1922 there was an increase of 97.6% over 1921, and in 1927 there was an increase of 93.5% over the 1926 shipments. Following 1922 there was a slight decrease in each of the next two years' shipments which was followed by a marked decrease in 1925. The low point was reached in 1926, and then the big increase in 1927. There are only two years' data available since 1927 and they both show slight decreases in shipments. If the movement follows the cycle from 1922 to 1927 there will probably be a marked falling off in the 1930 shipments followed by even lower shipments in 1931. The 1932 shipments will probably show a very large increase over the 1931 shipments. Shipments which closely follow production will fluctuate to some extent with price fluctuations. With normal yields in 1930 the production would have been decreased, due to decrease in acreage following two years of relatively low prices. The higher prices in 1930 will likely encourage a larger acreage planting in 1931, which will not come into bearing until 1932. Hence the prediction of probable increases in that year.

Chart 14.

Total Carlot Shipments of Tennessee Strawberries, 1918-1929

Origin of Shipments in Tennessee. There are three distinct shipping areas for Tennessee berries -- East Tennessee with Rhea, Hamilton, Bradley, McMinn, and Roane as the principal counties (19); West Tennessee with Lauderdale, Crockett, Madison, Gibson, and Weakley as the principal counties; and Middle Tennessee with Sumner as the principal shipping county. The East and West Tennessee areas are in the second-early maturing section. While Tennessee is listed as a second-early state the maturity dates of the strawberry crop in the Middle Tennessee are almost the same as in the intermediate states (see Chart 17). This area, as mentioned previously, is an extension of the Bowling Green area in Kentucky.

Table XLIV gives the number of cars shipped from the principal shipping points in the state from 1920 through 1929, Dayton, Portland, Spring City, Ripley, Humboldt, Jackson, Sale Creek, Evensville, Bells and Halls were the ten most important shipping points, in the order named. For the period, 1920 through 1929, 54.8% of the carlot shipments from Tennessee were from these ten shipping points. However, data on the origin of all shipments are not available, the shipments from some of the minor shipping points having been grouped together as shown in Table XLIV.

Maps 26, 27, 28, and 29 show the geographic distribution of carlot shipments by counties for four years, 1920, 1922, 1926, and 1929. With the exception of 1929 these years were selected for charting because of their wide variations in shipments. The years of extremely small shipments were 1920 and 1926. The peak shipments occurred in 1922, as shown in previous Chart 13. In 1920 Rhea County was the leading county in shipments and was still leading in 1929, with Sumner County only 43 cars behind. For the 10-year period 1920 to 1929 the leading counties and the average number of cars shipped were: Rhea, 512; Lauderdale, 306; Gibson, 303; Sumner, 361; Crockett, 146; Hamilton, 136; Madison, 100; Weakley, 91; Carroll, 43; and Obion, 43.

(19) Meigs, one of the leading producing counties, has no shipping point.

Table XLIV

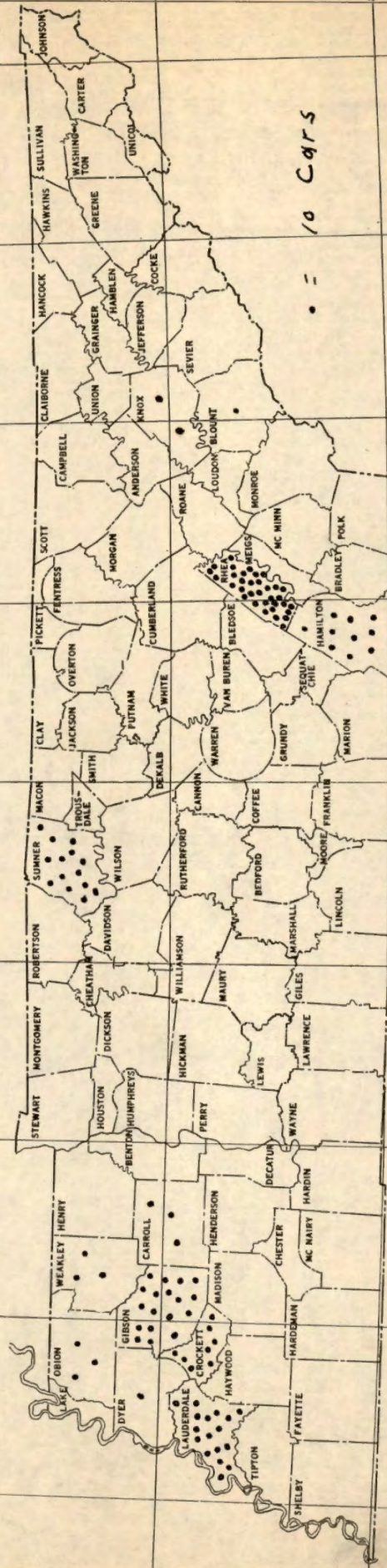
Carload Shipments of Strawberries - State, County, and Shipping Points, for Years 1920 - 1929

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
Tennessee	1150	1839	3634	3279	2902	1637	1253	2425	2180	2151
Blount	7	4	11	18	13	8	1	20	34	62
Maryville	0	0	3	10	0	0	0	11	16	28
Others	7	4	8	8	13	8	1	9	18	34
Bradley	0	0	71	79	54	25	10	32	25	25
Cleveland	0	0	71	69	54	25	10	32	25	25
Charleston	0	0	0	10	0	0	0	0	0	0
Carroll	29	17	65	49	75	26	24	59	46	42
McKensie	0	0	8	10	13	3	0	0	8	9
Trezevant	29	17	51	37	52	22	0	0	18	16
Others	0	0	6	2	10	1	0	0	20	17
Chester	0	0	8	10	14	4	0	0	7	5
Henderson	0	0	8	10	14	4	0	0	7	5
Crockett	75	86	265	186	231	129	86	163	124	119
Alamo	0	0	33	13	31	15	19	45	46	42
Bells	35	53	125	111	120	74	54	83	54	54
Crockett Mills	0	0	0	11	18	11	0	0	50	3
Friendship	0	1	23	10	16	8	0	0	6	0
Gadsden	40	32	84	41	41	21	13	35	24	20
Others	0	0	0	0	5	0	0	0	0	0
Davidson	2	1	17	1	0	0	0	0	0	0
Nashville	2	1	17	1	0	0	0	0	0	0
Dyer	13	35	82	67	64	30	16	28	11	7
Dyersburg	13	13	37	36	35	15	14	13	12	0
Newbern	0	22	43	31	29	14	2	15	9	7
Others	0	0	2	0	0	1	0	0	0	0
Gibson	178	213	516	384	487	217	204	351	221	256
Bradford	16	16	36	28	31	11	6	13	7	9
Dyer	22	11	38	40	51	19	14	20	11	18
Fruitland	10	14	27	15	26	10	3	17	7	18
Gibson	0	0	12	7	8	14	19	1	5	6
Humboldt	70	95	183	123	181	82	77	136	91	106
Medina	24	22	57	42	42	14	20	37	15	20
Milan	18	29	90	78	81	29	41	69	39	36
Rutherford	8	11	29	21	29	76	11	24	27	11
Trenton	10	15	41	30	38	22	13	34	19	32
Others	0	0	5	0	0	0	0	0	0	0
Hamilton	95	189	140	199	153	117	75	153	134	110
Boyce	13	39	3	61	19	12	1	18	14	18
Rathburn	11	32	2	32	26	4	12	44	34	26
Sale Creek	71	113	134	100	84	84	47	77	74	66
Others	0	5	1	0	24	17	0	0	12	0
Haywood	0	0	20	34	57	44	11	14	25	31
Brownsville	0	0	20	27	44	39	10	14	25	31
Others	0	0	0	7	13	5	1	0	0	0
Knox	17	8	10	7	0	14	10	7	6	11
Knoxville	17	8	10	7	0	14	10	7	6	11
Lauderdale	169	305	650	554	498	215	147	190	187	148
Curve	41	36	99	73	54	29	23	36	31	33
Gates	61	85	137	84	69	37	18	29	21	18
Halls	20	71	117	131	113	52	23	37	36	33
Henning	5	26	61	63	55	16	10	9	5	10
Ripley	42	87	236	203	207	81	73	80	94	54
McKinn	0	0	13	46	29	5	0	0	0	27
Others	0	0	13	46	29	5	0	0	0	27
Madison	13	122	176	135	151	82	63	103	79	79
Jackson	13	122	167	127	143	82	63	103	79	78
Others	0	0	9	8	8	0	0	0	0	1
Obion	32	25	42	56	63	40	30	55	45	40
Kenton	16	23	42	45	47	26	21	45	34	25
Others	16	2	0	11	16	14	9	10	11	15
Rhea	344	531	780	705	513	372	209	560	529	564
Dayton	179	274	357	286	209	148	84	197	185	187
Evansville	52	69	132	144	85	51	32	112	113	140
Graysville	0	22	27	31	18	0	0	0	0	0
Pennine	5	15	0	10	30	16	10	42	54	29
Spring City	108	151	264	234	171	157	83	209	177	208
Roane	0	7	26	74	46	7	0	11	23	23
Harmon Junction	0	7	26	66	33	7	0	11	23	23
Others	0	0	0	8	13	0	0	0	0	0
Robertson	0	8	23	25	0	10	0	0	4	0
Sadlers	0	8	17	25	0	10	0	0	0	0
Others	0	0	6	0	0	0	0	0	4	0
Shelby	0	0	32	13	25	8	0	0	11	1
Kerryville	0	0	12	4	0	0	0	0	0	0
Millington	0	0	12	9	23	8	0	0	11	1
Others	0	0	8	0	2	0	0	0	0	0
Sumner	141	245	431	449	212	201	288	556	572	521
Fountain Head	0	26	56	60	29	23	31	53	66	54
Mitchelsville	25	59	82	87	46	48	68	134	106	114
Portland	116	160	277	248	111	107	147	246	275	296
Westmoreland	0	0	16	54	26	23	43	123	125	57
Tipton	2	9	48	24	19	7	0	0	0	0
Atoka	0	0	12	2	0	0	0	0	0	0
Covington	2	9	36	22	19	7	0	0	0	0
Weakley	27	31	785	110	149	70	69	100	96	79
Dresden	0	0	0	15	49	19	0	0	0	0
Greenfield	18	17	40	27	28	13	20	19	19	19
Martin	0	0	13	18	63	38	12	18	18	13
Sharon	9	14	132	50	9	0	37	63	59	47
Other Counties	6	3	23	54	49	6	10	23	1	1

Source:

1920 to 1923, Statistical Bulletin No. 8, U. S. D. A.
 1924 to 1925, " " No. 19, U. S. D. A.
 1926 to 1927, " " No. 27, U. S. D. A.

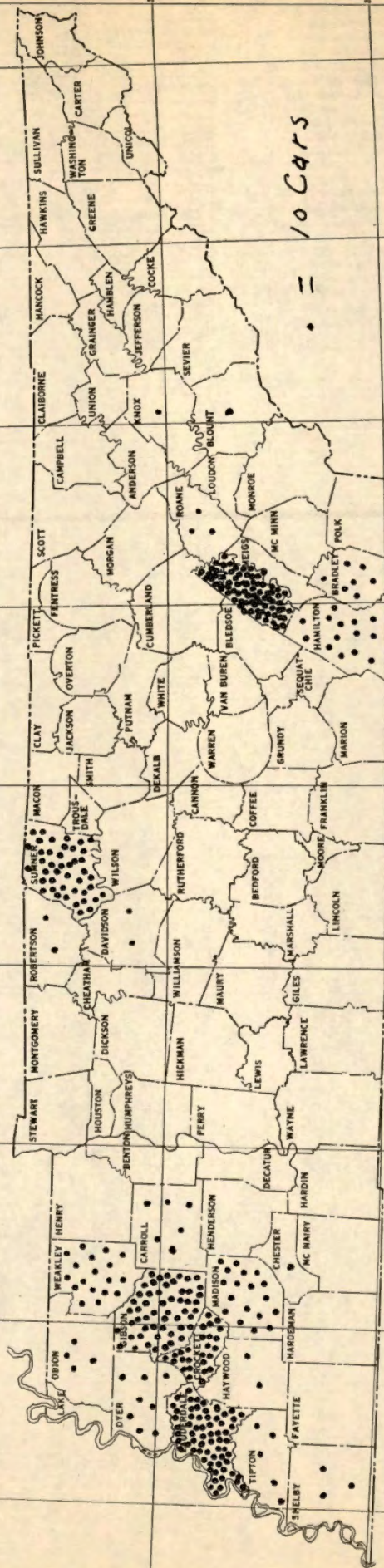
Map 26. Carlot Shipments of Tennessee Strawberries, 1920.



RAND McNALLY
LETTER SIZE OUTLINE MAP
TENNESSEE

SCALE
0 10 20 30 40 50 Miles
Copyright by Rand McNally & Company, Chicago
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Map 27. Carlot Shipments of Tennessee Strawberries, 1922

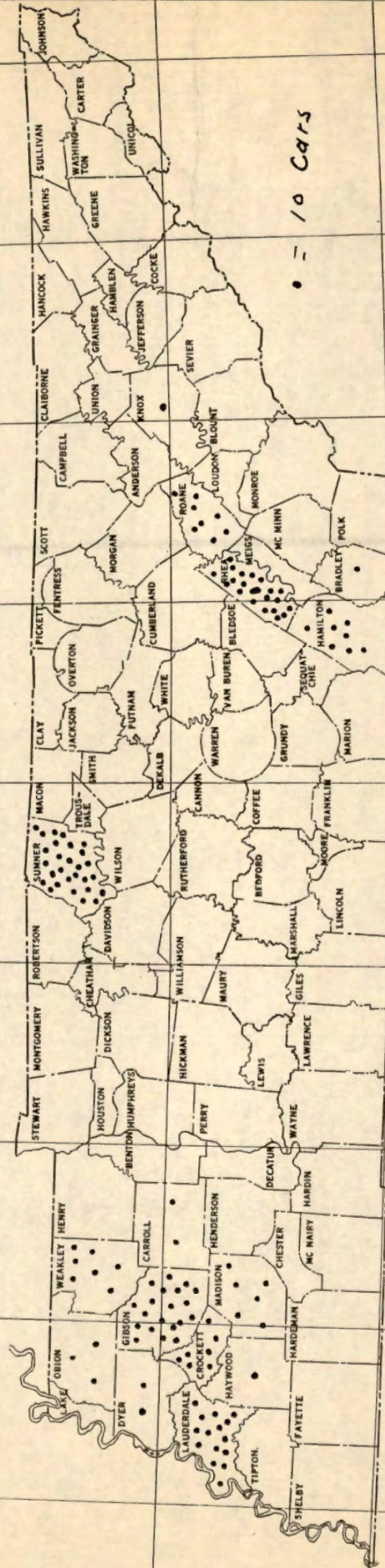


. = 10 Cars

RAND McNALLY
LETTER SIZE OUTLINE MAP
TENNESSEE

SCALE
0 5 10 20 30 40 50 60 70 Miles
Copyright by Rand McNally & Company, Chicago
MADE IN U. S. A.

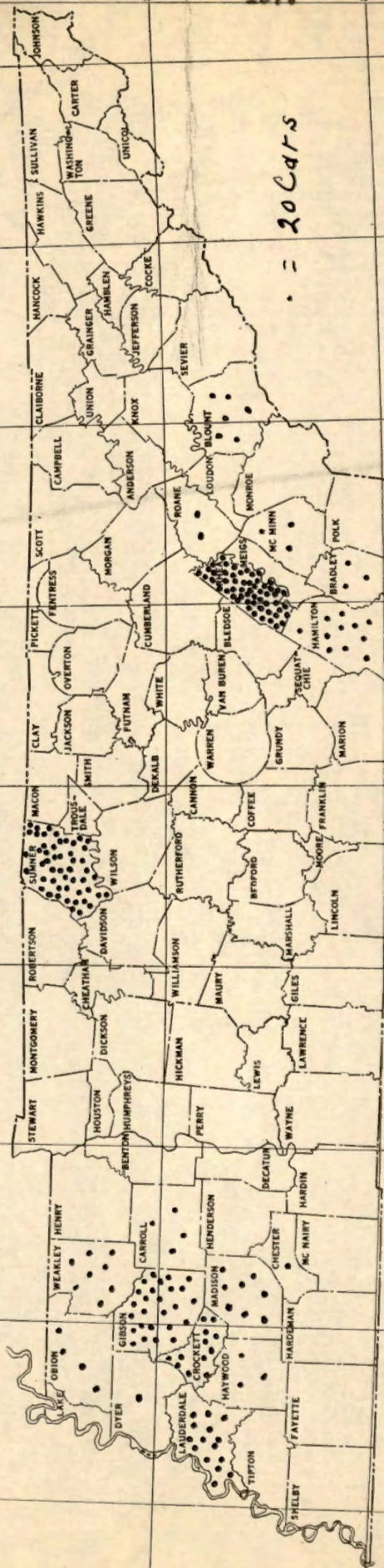
Map 28. Carlot Shipments of Tennessee Strawberries, 1928



RAND McNALLY
LETTER SIZE OUTLINE MAP
TENNESSEE

SCALE
0 5 10 20 30 40 50 60 70 Miles
Copyright by Rand McNally & Company, Chicago
MADE IN U. S. A.

197.



RAND McNALLY
LETTER SIZE OUTLINE MAP

TENNESSEE

SCALE.

60 70 Miles

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MADE IN U. S. A.

SUMMARY

Importance of the Crop

The strawberry crop of the United States had an average annual farm value of \$3,379,000 from 1918 to 1927. It is one of the principal cash crops in parts of southern and south central East Tennessee, in north central Middle Tennessee, and in many of the West Tennessee counties, particularly those in the central, west central and northwestern part of that area.

Varieties Grown

The principal varieties grown are: the Aroma in East and Middle Tennessee, and the Klondike in East and West Tennessee. The Premier, Missionary, Excelsior, and probably others, are produced in relatively small quantities. The Blakemore, a recently developed variety, has been introduced into Tennessee in an experimental way.

Tennessee's Position as a Strawberry

Producing State

Strawberries are grown in every state in the Union. The crop is of commercial importance in thirty states. In 1929 the states reporting more than 5000 acres, listed in the order of their importance, were: Louisiana, Missouri, Arkansas, Tennessee, Maryland, Oregon, Virginia, Washington, Michigan, New Jersey, Kentucky, North Carolina, and Alabama. Tennessee has never ranked lower than fourth during the period for which data are available. It had a larger acreage than any other state in 1909, 1919, 1920, 1922, 1923, 1924, and 1925. Its decline in rank has not been due to a decrease in acreage, but to the more rapid increase in the states that have gotten ahead.

Expansion in Acreage, 1920-1930

Tennessee has shared in the expansion of the strawberry acreage in the country as a whole since 1920. According to census reports the U. S. acreage nearly doubled from 1919 to 1924. The increase was from 119,395 acres to 193,175 acres. The same reports show that Tennessee's acreage increased approximately one and one-half times during this period, or from 10,876 acres to 24,628 acres. Severe fluctuations have characterized the acreage changes since 1924, the peak year. The low years since that time were 1926 and 1930, when 13,730 acres and 13,450 acres were reported respectively (1). The high year after 1924 was 1928. Large production or overexpansion and poor quality berries were largely responsible for the acreage decline in 1929 and 1930. One may expect an increased number of acres planted in 1931 due to satisfactory prices in 1930 for quality berries.

Yield per Acre

Tennessee is one of the lowest states in yields per acre, ranking 40th in average yield for the 3 census periods 1899, 1909, and 1919, and 22nd among the 28 commercial producing states in the average for the 7-year period, 1920 to 1926 inclusive. Of the second-early states only South Carolina and Arkansas have had lower yields for the years that data are available - the former in 1919 and the latter in 1899, 1919, 1924, and 1926.

There is a fairly close correlation between commercial producing areas within Tennessee and high yields. However, there are a few counties that produce commercially that have yields below 1000 quarts per acre. There are also some non-commercial areas in which relatively high yields are obtained.

Acreage Trends in Tennessee Counties

While the state acreage was increasing the acreages in some counties were decreasing. The decreases were confined largely to counties of minor importance

in commercial production. Commercial producing counties varied considerably in their trends. In some the increases have been consistently upward since 1899. There have been considerable fluctuations in others but the general trend has been upward, with a few exceptions. The exceptions were Gibson and Hamilton Counties, which reported a larger acreage in 1899 than in 1924. Each commercial producing county reported an acreage increase from 1919 to 1924, the expansion period noted above. Data by counties are not available since 1924.

Strawberry production has developed more recently in the Portland area, in Middle Tennessee, than in either the West Tennessee or the East Tennessee areas.

Percentage Crop Area in Strawberries

Strawberries occupy a relatively small percentage of the total crop area, even in the commercial areas. Of 25 counties with the highest percentage in 1924, Chester ranked lowest with 0.1% and Rhea County ranked highest with 8.33%. Each of these 25 counties reported an increase in 1924 over 1919.

Acres of Strawberries per Farm

The average strawberry acreage per farm was relatively small. The smallest average acreage was less than 0.1 of an acre and the largest was 7 acres. The average in the commercial producing counties was 2 acres and above. Five to 10 acres per farm are not uncommon in these areas. The highest acreage reported by any farm was approximately 200 acres.

Cost of Production

The costs of developing an acre of strawberries from the time of planting up to harvest for the growers reporting were: \$46.75 in West Tennessee; \$59.74 in East Tennessee; and \$55.92 in the Bowling Green area. These costs are slightly lower than those in the 3 producing areas in Arkansas. The development cost in Missouri was more than 50% greater than in Tennessee, due largely to

higher labor costs.

The total cost per crate, including the depreciation on the patch, increased continuously from the first to the third crop season in each area. The growers in the Kentucky area had the highest cost, followed by those in East Tennessee and West Tennessee in the order named.

It is not likely that the average cost per crate can be lowered very much. Harvest costs per crate are almost constant. It will not likely prove profitable to reduce labor in cultivating and hoeing, except possibly by a greater efficiency in its use. In fact some growers might profitably increase the amount of labor used; this is more likely true of those in West Tennessee who neither cultivate nor hoe their crop after the first crop is harvested. Some can profitably use more fertilizer per acre. Better attention to the patch by employing more intensive methods would result in higher yields and lower cost per crate, if done efficiently. Higher yields may result in still higher costs. It is the net return per hour of labor that is of the greatest importance.

Cash-costs represent about three-fourths of the total cost. The cost of picking, for taxes and for materials were largely cash costs.

Factors Affecting Quality and Appearance of Strawberries

The following are some of the more important factors that affect the quality and appearance of strawberries: (1) Those relating to some characteristics of the berries, as, carrying qualities, color, size, shape, size of calyx, seeds; (2) those relating to production practices, as, mulching and use of fertilizers; and (3) those relating to harvesting the crop, as, picking, packing, and grading; and (4) hauling to the station.

It is commonly recognized that quality and appearance affect the price of the commodity. But yet, many growers continue to be careless in their production and handling practices that affect the quality, and more particularly the appearance, of the berries.

Total Carload Shipments

Tennessee is one of the leading shippers of strawberries. Of the 10 leading states in average carlot shipments for three four-year periods from 1918 to 1929, this state has ranked first in the first two periods and second in the third. Approximately 3600 carloads were shipped in 1922, the peak production year.

The second-early group of states, of which this state is a part, ranked second in total shipments from 1921 to 1929 inclusive. This group ranked first in 1918, 1919, and 1920.

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APPENDIX A
Carlot Shipments of Strawberries by States, 1918 - 1929

State	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918
<u>Early</u>												
Alabama	1354	1021	901	440	421	408	693	460	285	139	229	279
Florida	1632	545	618	341	678	580	1035	322	150	182	21	79
Louisiana	2859	2850	1659	2342	1076	1865	1678	1576	1525	626	682	556
Mississippi	113	88	65	53	54	108	141	89	38	16	102	79
Texas	253	148	126	45	21	76	59	9	2	2	14	20
Total	6211	4652	3369	3221	2250	3037	3606	2456	2000	965	1048	1013
<u>Second-Early</u>												
Arkansas	2463	2046	2049	1375	993	1613	1342	2165	1087	650	1034	651
N. Carolina	1870	2151	2202	1253	1634	2046	1668	1101	503	363	484	585
S. Carolina	30	71	33	22	44	70	60	8	-	-	-	27
Tennessee	2461	2180	2425	1253	1637	2902	3279	3634	1839	1150	1099	1234
Virginia	908	984	1104	1136	1249	1919	1193	1691	679	270	208	342
Others	18	23	20	7	20	26	27	3	-	-	-	-
Total	7750	7455	7833	5046	5577	8576	7569	8602	4108	2433	2825	2839
<u>Intermediate</u>												
California	173	159	182	104	130	191	226	201	292	258	703	509
Delaware	418	621	915	671	472	1307	924	940	866	652	430	822
Illinois	275	324	176	247	295	367	224	260	73	112	80	125
Indiana	105	126	44	52	29	24	26	51	25	65	39	42
Iowa	52	19	41	49	37	113	82	73	20	43	66	55
Kansas	63	2	57	1	20	40	19	8	-	-	1	1
Kentucky	851	1078	976	581	312	467	827	772	395	265	132	410
Maryland	772	980	1515	1394	1082	2155	1916	1634	1132	793	611	838
Missouri	2074	2637	1986	1435	1497	990	872	1963	451	245	1081	620
New Jersey	176	186	134	207	126	402	187	274	363	363	326	445
Others	111	48	33	-	2	-	3	14	-	-	-	-
Total	5070	6178	6059	4741	4012	6056	5396	6190	3617	2796	3469	3867
<u>Late</u>												
Michigan	45	61	114	155	39	554	408	640	454	446	391	272
New York	62	70	189	238	200	345	301	325	243	257	112	242
Ohio	3	-	2	-	-	11	8	25	19	5	21	21
Oregon	103	99	110	39	57	39	115	141	116	103	93	73
Pennsylvania	-	-	5	9	-	27	9	9	5	18	7	1
Utah	2	1	-	-	-	-	23	13	3	-	-	-
Washington	59	106	93	17	42	39	177	188	140	22	17	27
Wisconsin	26	39	31	40	27	183	151	84	52	80	29	17
Others	47	54	88	111	52	99	128	88	108	74	93	80
Total	347	430	632	609	417	1297	1320	1513	1140	1005	763	733

Source: U. S. D. A. Statistical Bulletins.

APPENDIX B

Total and Per Cent of Carlot Shipments of Strawberries in Each Group of
States, 1918 - 1929

Year	Early States		Second-Early States		Intermediate States		Late States		U. S. Total
	No.	% of Total Number	No.	% of Total Number	No.	% of Total Number	No.	% of Total Number	
1929	6211	32.0	7750	40.0	5070	26.2	347	1.8	19,380
1928	4652	24.9	7455	39.8	6178	33.0	430	2.3	18,715
1927	3369	18.8	7833	43.8	6059	33.9	632	3.5	17,893
1926	3221	23.6	5046	37.1	4741	34.8	609	4.5	13,617
1925	2250	18.4	5577	45.5	4012	32.7	417	3.4	12,256
1924	3037	16.0	8576	45.2	6056	31.9	1297	6.8	18,966
1923	3606	20.3	7569	42.5	5306	29.8	1320	7.4	17,801
1922	2456	13.1	8602	45.8	6190	33.0	1513	8.0	18,761
1921	2000	18.4	4108	37.8	3617	33.3	1140	10.5	10,865
1920	965	13.4	2433	33.8	2796	38.8	1005	13.9	7,199
1919	1048	12.9	2825	34.9	3469	42.8	763	9.4	8,105
1918	1013	12.0	2839	33.6	3867	45.8	733	8.7	8,452

Source: U. S. D. A. Statistical Bulletins

APPENDIX C

Total and Average Carlot Shipments of Strawberries in the United States
for Three Four-Year Periods, 1918-1929

State	Shipments 1926 - 1929		Shipments 1922 - 1925		Shipments 1918 - 1921	
	Total	Ave.	Total	Ave.	Total	Ave.
<u>Early</u>						
Alabama	3716	929.00	1982	495.5	932	233.00
Florida	3136	784.00	2615	653.75	432	108.00
Louisiana	9710	2427.50	6195	1548.75	3389	847.25
Mississippi	319	79.75	392	98.00	235	58.75
Texas	572	143.00	165	41.25	38	9.50
<u>Second-early</u>						
Arkansas	7933	1983.25	6113	1528.25	3422	855.50
N. Carolina	7476	1869.00	6449	1612.25	1935	483.75
S. Carolina	156	39.00	182	45.50	27	6.75
Tennessee	8319	2079.75	11452	2863.00	5322	1330.50
Virginia	4132	1033.00	6052	1513.00	1499	374.75
Others	68	17.00	76	19.00	-	-
<u>Intermediate</u>						
California	618	154.50	748	187.00	1762	440.50
Delaware	2625	656.25	3643	910.75	2770	692.50
Illinois	1022	255.50	1146	286.50	390	97.50
Indiana	327	81.75	130	32.50	171	42.75
Iowa	161	40.25	305	76.25	184	46.00
Kansas	123	30.75	87	21.75	2	.50
Kentucky	3486	871.50	2378	594.50	1202	300.50
Maryland	4661	1165.25	6797	1699.25	3374	843.50
Missouri	8132	2033.00	5322	1330.25	2397	1599.25
New Jersey	703	175.75	989	247.25	1497	374.25
Others	190	47.50	19	4.75	-	-
<u>Late</u>						
Michigan	375	93.75	1641	410.25	1563	390.75
New York	559	139.75	1171	292.75	854	213.50
Ohio	5	1.25	44	11.00	68	14.50
Oregon	351	87.75	352	88.00	385	96.25
Pennsylvania	14	3.50	45	11.25	31	7.75
Utah	3	.75	36	9.00	3	.75
Washington	275	68.75	446	111.50	206	51.50
Wisconsin	136	34.00	445	111.25	178	44.50
Others	300	75.00	367	91.75	355	88.75

APPENDIX D

Average Size of Carlot Loads of Strawberries by States

State	Number of Crates per Car	Capacity of Each Crate	Total Number of Quarts per Car
<u>Early Crop</u>			
Alabama	420	24 qts.	10,080
Florida	-	-	6,718
Louisiana	-	-	9,380
Mississippi	420	24 qts.	10,080
Texas	420	24 qts.	10,080
<u>Second early</u>			
Arkansas	420	24 qts.	10,080
Calif., S. C.	-	-	7,804
Carolinas	240	32 qts.	7,680
Tennessee	410	24 qts.	9,840
Virginia	240	32 qts.	7,680
<u>Intermediate</u>			
Calif. (other)	-	-	7,800
Delaware	240	32 qts.	7,680
Illinois	420	24 qts.	10,080
Indiana	420	24 qts.	10,080
Iowa	420	24 qts.	10,080
Kansas	720	24 pts.	8,640
Kentucky	420	24 qts.	10,080
Maryland	240	32 qts.	7,680
Missouri	420	24 qts.	10,080
New Jersey	240	32 qts.	7,680
<u>Late</u>			
Massachusetts	-	-	-
Michigan	650	16 qts.	10,400
New York	240	32 qts.	7,680
Ohio	420	24 qts.	10,080
Oregon	720	24 pts.	8,640
Pennsylvania	240	32 qts.	7,680
Washington	720	24 pts.	8,640
Wisconsin	720	16 qts.	11,520

Source: U. S. D. A. Technical Bulletin 180.

APPENDIX E

Trend of Shipments of Strawberries in Three Tennessee
Areas, 1921-1929

Year	West Tennessee	East Tennessee	Middle Tennessee	Tennessee Total
1921	843	742	254	1839
1922	2113	1030	491	3634
1923	1621	1172	486	3279
1924	1834	842	226	2902
1925	872	553	212	1637
1926	651	305	297	1253
1927	1077	783	565	2425
1928	8853	751	576	2180
1929	808	822	521	2151

Source: Crops and Markets

APPENDIX F

Carload Unloads of Strawberries on 20 Markets from Tennessee
1918 - 1929 (a)

City	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
Boston			30	53	73	32	20	15	29	17	20	25
Buffalo						62	28	30	26	27	67	86
Chicago	226	187	131	279	354	538	447	200	209	466	253	326
Cincinnati	157	102	72	228	315	314	228	252	128	121	274	254
Cleveland	74	31	79	105	186	195	120	85	72	141	124	124
Columbus						104	119	77	62	98	76	97
Detroit	12	4	56	65	214	263	111	145	61	111	178	102
Indianapolis						112	88	46	35	130	81	59
Kansas City					1	5	1					
Louisville							27	17	28	25	26	13
Milwaukee						38	42	20	2	16	10	11
Minneapolis	1		7	4	35	28	12	3		3		
New York	40	7	14	30	31		1		1	20	7	6
Omaha							1	1		2		
Philadelphia		3	3	3	12				1	13	1	
Pittsburg	23	31	18	63	229	209	94	54	49	77	72	78
Providence							19	5	9	11	13	
St. Louis	1	4	25	3	23	62	14	25	5	17	16	14
St. Paul				1	10	2		1		1		65
Toledo							88	45	46	71	77	
Total Tenn. Shipments	1234	1099	1150	1839	3634	3279	2902	1637	1253	2425	2180	2151(b)

Source: U. S. Department of Agriculture.

(a) Blank spaces indicate that no unloads were reported.

(b) Preliminary.

APPENDIX G

Total Unloads in 20 Markets from All States,
1918-1929 (a)

City	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
Boston						1127	1237	856	938	1248	1135	1076
Buffalo						262	338	219	295	342	415	405
Chicago	876	1246	909	1499	1719	1696	1809	942	1526	1701	1590	1862
Cincinnati	255	232	80	356	474	559	355	340	282	364	559	565
Cleveland	161	99	138	239	342	393	349	260	279	426	428	496
Columbus						179	192	145	154	226	220	227
Detroit	125	103	171	225	552	548	550	413	478	718	877	722
Indianapolis						192	178	129	133	271	263	243
Kansas City	100	50	68	180	262	129	146	145	124	225		
Louisville						92	75	44	70	71	80	68
Milwaukee						226	213	157	225	267	287	353
Minneapolis	119	101	84	147	351	246	228	184	236	235		324
New York	1206	896	1202	1923*	2853*	3029*	2537	2005	1625	2181	2097	1895
Omaha						129	90	86	117	116		
Philadelphia	304	243	291	300	568	750			363	447		
Pittsburg	271	166	185	321	497	516	458	285	360	484	520	472
Providence,						184	240	134	150	198		
St. Louis	77	45	85	132	265	277	229	130	171	296	330	290
St. Paul	52	58	49	72	160	130		86		116		
Toledo						160	170	94	108	153	154	175

Source: U. S. Department of Agriculture.

(a) Blank spaces, no data available.

* Less than carlots added.

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APPENDIX H

Percentage of Tennessee Carload Shipments of StrawberriesUnloaded at Each of 20 Markets, 1918-1929(a)

City	% 1918	% 1919	% 1920	% 1921	% 1922	% 1923	% 1924	% 1925	% 1926	% 1927	% 1928	% 1929
Boston	18.3						0.7	0.9	2.3	0.7	0.9	1.2
Buffalo							1.6	1.8	2.1	1.1	3.1	4.0
Chicago	18.3	17.0	11.1	15.5	9.7	16.4	15.4	12.2	16.7	19.2	11.6	15.2
Cincinnati	12.7	9.3	6.1	12.4	8.7	9.6	7.8	15.4	10.2	5.0	12.6	11.0
Cleveland	6.0	2.8	6.7	5.7	5.1	5.9	4.1	5.2	5.7	5.3	5.7	5.7
Columbus							4.1	4.7	4.9	4.0	3.5	4.5
Detroit	4.0	0.4	4.7	3.5	5.9	8.0	3.8	8.8	4.9	4.6	8.2	5.0
Indianapolis							3.0	2.8	2.8	5.4	3.7	2.7
Kansas City					0.03	0.1	0.03					
Louisville							0.9	1.0	2.2	1.0	1.2	0.6
Milwaukee							1.4	1.2	0.1	0.7	0.4	0.5
Minneapolis	0.08		0.6	0.2	1.0	0.8	0.4	0.2		0.1		
New York	3.2	0.6	1.2	1.7	0.8		0.03		0.08	0.08	0.3	0.3
Omaha							0.03	0.06		0.10		
Philadelphia		0.3	0.3	0.2	0.3				0.08	0.05		
Pittsburg	1.9	2.8	1.5	3.5	5.3	6.4	3.2	3.3	3.9	3.2	3.3	3.6
Providence							0.6	0.3	0.7	0.5		
St. Louis	0.08	0.4	2.1	0.2	0.6	1.9	0.5	1.5	0.4	0.7		0.6
St. Paul				0.06	0.3	0.06		0.06		(b)		
Toledo							3.0	2.7	3.7	2.9	3.5	3.0

Source: Calculated from U. S. Department of Agriculture Data on Shipments and Unloads.

(a) Blank spaces indicate no unloads reported.

(b) Less than 0.1%.

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APPENDIX I

Percentage of Each City's Strawberry Shipments That Come from Tennessee, 1918-1929 (a)

City	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
Boston							1.6	1.7	3.1	1.4	1.8	2.3
Buffalo							8.3	13.7	8.8	7.9	16.1	21.2
Chicago	25.8	15.0	14.4	18.6	20.6	31.7	24.7	21.2	13.7	27.4	15.9	17.5
Cincinnati	61.6	44.0	90.0	64.0	66.5	56.2	64.2	74.1	45.4	33.2	49.0	34.0
Cleveland	46.0	31.3	57.2	43.9	54.4	49.6	34.4	32.7	25.8	33.1	29.0	25.0
Columbus							62.0	53.1	40.2	43.4	23.4	42.7
Detroit	40.0	3.9	32.7	28.9	38.8	48.0	20.2	35.1	12.8	15.5	20.3	14.1
Indianapolis							49.4	35.6	26.3	48.0	30.8	24.3
Kansas City					0.4	3.9	0.7					
Louisville							36.0	38.6	40.0	35.2	32.5	19.1
Milwaukee							19.7	12.7	0.9	6.0	3.5	3.1
Minneapolis	0.8		8.3	2.7	10.0	11.4	5.3	1.6		1.3		
New York	3.3	0.8	1.3	1.6*	1.1*		0.04		0.06	0.9	0.3	0.3
Omaha							1.1	1.2		1.8		
Philadelphia		1.2	1.0	1.0	2.1				0.3	2.9		
Pittsburg	8.5	18.7	9.7	19.6	46.1	40.5	20.5	18.9	13.6	15.9	13.8	16.5
Providence							7.9	3.7	6.0	5.4		
St. Louis	1.3	8.9	29.2	2.3	8.7	22.4	6.1	19.2	2.9	5.7	5.0	4.8
St. Paul				1.4	6.2	1.5		1.2		0.9		
Toledo							61.8	47.9	42.6	46.4	50.0	37.1

Source: Calculated from U. S. Department of Agriculture Data on Shipments and Unloads.

(a) Blank spaces indicate no shipments reported.

* Total with less than carlots added used

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