

AN APPLE ORCHARD SURVEY OF THE ARKANSAS RIVER VALLEY
AREA IN COWLEY AND SUMNER COUNTIES, KANSAS

by

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INTRODUCTION

Any orchard survey should prove of value in three ways: first, as a research problem for the person making the survey, second, its value to the Department of Horticulture of the Agricultural Experiment Station and the Extension Division of the Agricultural College and third, of value to growers in the region covered in the survey.

The research work of such a survey consists in the selection of type of information desired and of reducing the questions to be asked to terms with which the average farmer is familiar, and after the survey is made, in organizing the material in such a way that accurate conclusions may be drawn and, finally, the drawing of such conclusions.

Data of such a survey should furnish more accurate information to the Department of Horticulture of the Agricultural Experiment Station as to the problems of the growers within the region of the survey. Such a survey should prove of value to the Extension Division of an Agricultural College in showing the specialist what the problems of the region under survey are, and thus giving him a basis upon which to organize the demonstrations he under-

takes and the information he brings to the orchardists to meet those problems.

Such an orchard survey should prove of value to the region covered because good orchard practices are community or collective problems to even a greater extent than are general farm practices. Data of such a survey should point out the individual and collective weaknesses of orchard management in the community, and such knowledge, if properly acted upon, should improve the orchard practices of the community.

REVIEW OF LITERATURE

In reviewing the literature dealing with surveys, only that part directly contributing to the survey problem under study was abstracted.

Sandsten and Tompkins (6) of Colorado in their survey of the orchards of the Arkansas River valley in Colorado, state that the area adapted to tree fruits is confined to two rather narrow and broken strips of land on both sides of the river. The better orchard land is mostly found on the second river level. Fruit growing is confined to the irrigated section and the orchard industry has probably

reached its maxium development, especially so with apples.

Lewis et al., (4) of Oregon state that the highest degree of success in fruit growing depends largely upon three things: one, environment such as soil and climate; two, the best methods of orchard practice and management; and three, the crop must be handled in a business like manner. An orchard survey should bring out these things and bring the state experiment station and the growers of the area under study into closer relations.

Anthony (1) of Pennsylvania, states that the permanency of the pomological research of any experiment station depends largely upon the success with which it is coordinated with the pomological needs of the state. This knowledge according to Anthony, can best be secured by an orchard survey of the state. He writes, "We feel that our knowledge of fruit growing in Pennsylvania is much more substantial, and that we are more intimately acquainted with the growers problems. We feel that our chances of planning and conducting our research in such a way as to be of service in our turn are much brighter".

Spillman (7) states that when farm management investigations first began, it was supposed that the cost accounting method was the only method by which sufficient-

ly accurate data could be secured. Due to the cost of making such records and the time required, a method was tried out of securing data direct from the farmer. Comparative investigations were made to test this later method and the results of five such investigations show an error of less than one per cent in four cases and an error of only one and one-half per cent in the other case. Experience has shown that the average farmer knows the details of his business with a fair degree of accuracy. The securing of such data direct from farmers requires no slight skill on the part of the investigator to reduce his questions to the terms in which the farmer carries the information in his head.

Hall et al., (3) describe Cowley County Kansas as laying in the Great Plains region of the United States. The country is treeless except for narrow fringes of timber along the streams. It has a mild climate, with, however, a rather wide range in temperature. The lowest temperature recorded was -27°F . The summers are usually long and at times, the temperature is high, often to 100°F . or higher, with prevailing southerly winds.

Two series of soil were noted as being adapted to growing of fruit and truck crops. Near the lowlands of

the Arkansas river there are found soils of considerable friability both in the surface and subsoil, though more compact in the subsoil. These friable soils, believed to have originated in part, at least, from wind-blown material transported from the bottom-land soils along the Arkansas River containing considerable sand, are classed in the Derby series. The Derby soils are characterized by the brown color and friable structure of the surface material and by the reddish-brown to dull-red color and friable structure of the subsoil. In this county the Derby soils occupy level to undulating areas and gentle slopes along and near the Arkansas River bottoms; they have well-established drainage. The Derby fine sand is the only soil of this series noted as being adapted to fruit growing. The surface is billowy or undulating, and it is inclined to drift where clean cultivated crops are grown. Incorporation of organic matter will reduce this tendency. The drainage is good and this soil is said to conserve moisture well in dry seasons. "The type is not important in the agriculture of the county, but is highly prized for growing truck crops and fruit, especially apples. There is one commercial apple orchard northwest of Arkansas City on this type of soil, Ben Davis, Jon-

athan, Grimes, and Winesap being the leading varieties grown."

Along the Arkansas River, where the overflow waters carry sediment from distant sections, including the Rocky Mountain region, the first bottom soil material is pre-vaillingly lighter colored and becomes more friable with depth and the lower subsoil is more sandy and friable than the upper soil. These soils are classed in the Arkansas series. Arkansas fine sand is the most extensive soil of this series, the surface soil of which consists of from 10 to 18 inches of light-brownish, loose fine sand, passing below into yellow or grayish, loose fine sand. This soil is valued most highly when used for production of truck and fruit crops. The Arkansas fine sand in its natural state is very low in organic matter and is benefited to a marked degree by incorporating barnyard and green manure. Drifting can largely be prevented by the use of cover crops.

Two other soils of this series, the Arkansas fine sandy loam and very fine sandy loam, are adapted to the growing of fruit crops and the same methods of soil management suggested for the Arkansas fine sand are adapted to these soils.

STATEMENT OF THE PROBLEM

The survey decided on applies to all apple orchards in the southern Arkansas river valley in Kansas. It was planned to include such statistical and practical particulars as would contribute to a clear picture of the industry and would prove of value to those interested.

The location of all orchards within the area was desired so that maps might be made to show the location of these orchards, together with the name of the owner, and the best route by which each of the orchards may be reached by automobile.

The number and age of all trees together with the varieties found in each orchard was desired, as no definite data on this important subject were available. Information was also desired as to type of soil on which these Arkansas river valley orchards are planted.

Data were also secured regarding soil management; spray schedule; number of spray applications; kind and amount of spray material used, together with make and size of spraying machines; and who operates the orchard, tenant, farm manager, or owner. A copy of the survey blank used is shown here, figure 1.

FIGURE 1. SURVEY BLANK.

No. _____

Owner _____ Address _____ Location _____

Trees

Age _____ Size _____ Total number _____ Stand _____

| Varieties | : | Number | : | Varieties | : | Number |
|-----------|---|--------|---|-----------|---|--------|
| _____ | : | _____ | : | _____ | : | _____ |
| _____ | : | _____ | : | _____ | : | _____ |
| _____ | : | _____ | : | _____ | : | _____ |

Soil

Surface type _____ Depth _____ Subsoil type _____ Depth _____

Drainage _____ Water table _____

Soil Management _____

Cover Crops _____ Intercrops _____

Windbreaks _____ Species _____

Spraying

No. of applications _____

Materials: Lime sulfur _____ Lead As. _____ Ca. As. _____

Copper sulphate _____ Oil _____ Others _____

Equipment: Rig _____ Tower _____ Number _____

Accessories: Spray gun _____ Rod and nozzles _____

Convenience of water supply _____

FIGURE 1. (Continued)

Method of distributing materials _____
 Method of covering tree _____ Wind _____
 Two half or two whole rows _____ Part of tree _____
 Labor _____ Cost per acre _____
 Means used to observe issuance of codling moth _____

General Conditions of Trees and Orchard

Form _____ Pruning: Regularity _____ Effectiveness _____
 Fruit buds _____ Set of fruit _____
 Canker diseases: Blotch _____ Blister canker _____
 Collar blight _____ Fire blight _____
 Effectiveness of pest control _____

Marketing

Method _____ Distance to shipping point _____
 Per cent of fruit sold to: Auto trade _____ Trucks _____ Shipped _____
 Number of boxes shipped _____ No. of bbls. shipped _____ No. cars
 bulk _____ Disposal of culls: _____ Cider apples _____
 Gals. cider sold _____ Gals. vinegar _____

Remarks

Name of Tenant _____ Name of Manager _____
 Survey by _____ Date _____

LOCATION AND CHARACTERISTICS OF TERRITORY SURVEYED

The region covered by this survey is found along the Arkansas river in northeastern Sumner and western Cowley counties, Kansas. It is made up of three districts or communities with a town as a center of each. These towns being the trading centers of the districts, the names of the towns have been used to designate the districts. The upper portion of the region, or the Belle Plaine district, Map No. 1, is the largest and orcharding is a very important farm enterprise in the community. The center portion, or the Oxford district, Map No. 2, does not have such a large orchard area, nor do the orchards contain such a large number of bearing trees. The southern or lower district around Arkansas City, Map No. 3, is smaller than either of the other districts and has but few new plantings.

MARKETING CONDITIONS AND THEIR EFFECT ON ORCHARDING

Marketing conditions throughout the region are peculiar in that this valley is a commercial apple growing

district, confined to a more or less limited area, without a near competing district with which to divide the local trade. The general type of farming engaged in has always been extensive and orchards from the beginning have been of larger average units than are found in other orchard sections of the middle west. Because of a lack of home orchards, the farmers outside the region surveyed depend on the orchards of this region for their supply of fall and winter apples. In years of short crops this local trade consumes the entire crop, and even with normal yields only the larger orchards have any apples for shipment. As most of this trade takes the apples in bulk rather than package, very little or no packing is done. The usual practice with the smaller orchards is to sell the apples "tree run". If any sorting is done, the culls are sold at a lower price for cooking or canning. For this reason the data do not show the sale of as many cider apples as the quality of the fruit on the tree might indicate. This willingness of the local trade to be satisfied with a lower quality than would be necessary if the apples were packed for shipment reduces the comparative reward to the orchardist who takes pains to produce a quality product.

THE BELLE PLAINE DISTRICT

The first commercial orchard planted in the region of the survey was set out by Mr. John Alter in 1878, northeast of Belle Plaine. The trees of this orchard were later removed and at the time the survey was made another orchard was in bearing on the same piece of land. A total of 1253 acres of orchard are to be found in this district containing 48,648 trees of 19 varieties. Table I shows the details of these plantings. Here the orchard industry seems to have reached the limits of expansion as Table V shows only three orchards planting trees during the past ten years. This limit has been reached not because of lack of soil adapted to fruit production, but because of the lack of farmers with the training necessary for successful fruit growing. The geographical data of this district are shown by Map No. 2.

Three streams flow through the area of this district; namely, the Ninnescah river in the southwest corner of the district with only one orchard along its banks, the Arkansas river seems to form the east boundary of the district, although there are three orchards found

along its left bank, and the Cowskin creek which flows through the middle of the district. Most of the orchards of the district are found along this stream. There are three railroads through Belle Plaine furnishing abundant shipping facilities, while a paved road from the west edge of town to Wichita and other improved highways furnish good routes for trucks.

THE OXFORD DISTRICT

The orchards of the Oxford district lie closer to the Arkansas river than do the orchards of the Belle Plaine district. No other stream of any importance flows through the area. The larger number of orchards are found along the left bank of the river, although the area two miles south of Oxford shows considerable plantings situated on the right bank. Study of the Map No. 2 might lead to the conclusion that the reason why the orchards seem to group themselves along one side of the river due to the greater abundance of orchard soil. To a certain extent this is true but not always. As a rule the better orchard soil is found in the bends of the stream, as illustrated by the Nevett Brothers' orchard.

Because the Oxford district is within easy driving distance of Winfield, bankers and professional men observing the profits in orcharding have been purchasing orchards or planting orchards on land already owned. These owners employ an orchard manager, usually a man with considerable orchard experience, to live on the ranch and manage it under the supervision of the owner.

This region was subjected to a flood in the summer of 1924 which resulted in drowning out a large number of trees. These have been replaced and this partially accounts for the large number of trees planted during the past five years as shown by Table VI. The data show a total of 1237 acres of orchard in this district with 41,017 trees of twenty-one varieties. Nine orchards show plantings during the past five years.

THE ARKANSAS CITY DISTRICT

The Arkansas City district is similar to the Oxford district in that professional men of Arkansas City and Winfield have purchased or planted orchards. The orchard business here seems to be at a standstill with little or no new planting. This is possibly due to the same rea-

sons noted above about the Belle Plaine district and certainly is not due to a lack of available orchard soil.

At Arkansas City the Walnut river flows into the Arkansas river. Two orchards were found on the left bank of the Walnut, the balance laying to the left of the Arkansas. Two differences between this and the other districts were noted. It is here only, that the orchards are found on the Derby series of soils, the balance of orchards were all on the Arkansas series. Here also, the writer first noticed the native oak trees along the river which are so abundant along the Arkansas in Oklahoma. The Guarantee Title and Trust Company's orchard just east of Arkansas City was the only commercial peach orchard in the region of the survey. The data show a total of 561 acres of orchard containing 22,095 trees of 12 varieties with only one orchard showing any planting during the past five years. Map No. 3 shows the geographical details of this district.

VARIETIES WELL ADAPTED TO THIS REGION

In developing any new orchard region, the securing of well adapted varieties is usually through trial and

error methods. This is well illustrated by a study of the varieties planted in the early orchards of the Arkansas valley when compared to plantings in the later orchards. The five major varieties of the older orchards were Wine-sap, Grimes Golden, Jonathan, Ben Davis, and Missouri Pippin. Of these the last two are not being planted in the newer orchards, due to lack of resistance to disease pests and the comparatively low dessert quality of their fruit. Choice of varieties to plant in the new orchards have in the past followed very closely the requirements of the local trade for late fall and winter apples, largely ignoring the general demand for early apples and for those most acceptable on the general markets. This tendency to pay attention to the requirements of only the local trade has too often resulted in the planting of a larger number of varieties than is good practice for a commercial orchard.

For the production of summer apples, this region is very advantageously located, the only competing district being the Ozark region of southern Missouri and northern Arkansas. Early varieties can be shipped from this district and arrive on the Kansas City market at a time when summer apples from other districts are not flooding the

market. Yellow Transparent is the earliest adapted variety and is usually ready to market by the middle or last of June. Early Cooper which is the most popular summer variety with the growers of the region, is usually ready for market by the middle of July. Wealthy, a fall variety in northern districts, is considered a summer variety here. It is mature enough for marketing by the last of July or first of August. The experience of those growing these varieties proves their adaptability and profitableness and more trees of these varieties should be grown. Another good characteristic of these summer varieties is that they are marketed early enough to escape the late codling moth infestation which is usually such a problem.

For fall apples the outstanding variety for this region is Grimes Golden, it being the most profitable and uniformly grown of the fall varieties. Table IV shows the number of Grimes Golden trees. Here this variety grows to good size, is not subject to blotch, ripens early, and develops a flavor unsurpassed by Grimes Golden produced elsewhere. Jonathan, another fall variety, should be planted in the orchards for its value both as a fruit and as a pollenizer for other varieties. It is a dependable bearer and is not subject to serious injury by blotch or

scab. Its greatest weakness in this region is the failure to develop full Jonathan color. Golden Delicious is another fall variety that may prove very valuable in this region. Mr. Fred Gillock of the Arkansas City district has 125 trees nine years old which are proving that the variety is well adapted to that section. It is a new variety and should be given a longer test and under a greater variety of conditions before large plantings are made. The same criticism made of Jonathan, that it does not color properly, can be made of Delicious. The growers also complain that Delicious is an erratic bearer in this region.

Of the winter varieties Winesap is by far the most popular. The number of Winesap trees is shown in Table IV. Many winter varieties have been tried but from the beginning, Winesap has been the variety most commonly grown. Only two of the orchards in the area of the survey failed to show any Winesap trees and both of these were small orchards of five acres or less. The soil and climate of the region combine to produce Winesaps of very fine color and quality. When properly sorted and packed, Arkansas valley Winesap apples compare favorably with those of the Northwest, making up in flavor the little

they may lack in color. Stayman is another winter variety that is becoming popular with the growers and is to be recommended.

The experience of a large number of growers has proved that the above varieties are adapted to the region and anyone considering planting an orchard in this region cannot go wrong in planting them.

PESTS AND THEIR CONTROL

Codling moth is the most serious orchard pest that the growers of the Arkansas valley have to combat. The control of this insect for the past fifteen years has been their most important problem. Data in Table VIII show that in the year 1929 there were purchased 85,300 pounds of arsenate of lead for a total of 92,454^{*} mature apple trees.

*In arriving at this figure all trees of five years of age or less were not considered, as it is not the usual practice in that region to spray trees of this age. Because of lack of size, two trees between five and ten years of age were considered as equal to one mature tree.

This would allow an average of .922 pounds of arsenate of lead per tree for the entire season. Two pounds of lead arsenate are used with fifty gallons of water. At this rate the .922 pounds of lead would supply slightly more than twenty-three gallons of spray material per tree. There was an average of seven spray applications for bearing trees which would allow 3.3 gallons of material per tree for each application. When this is compared with an average of 6 to 8-gallons to the tree for each application as required in the Kansas Station orchard, it is more easily understood why codling moth is such a poorly controlled pest. Lead arsenate is the only stomach insecticide used in this district, although a few growers state that they had used some calcium arsenate in other years but did not seem to think it gave as good control as the lead.

San Jose scale has been a serious pest in this region in the past and it is the usual practice to spray for its control. Lime sulphur, winter strength, is the insecticide usually used. The application of this is delayed as long as possible in order to get better control of the scale and to aid in the control of apple

scab. In addition to the lime sulphur there were twenty-two barrels of miscible oil used for the control of scale. In one orchard the time of application was the same as for the delayed dormant of lime sulphur. Two tanks of material were applied and then it was noticed that the opening buds of the trees receiving the application were already showing injury. These trees later put out new leaves, although they set no fruit.

The clover mite is an insidious pest in this region and is serious because an outbreak is usually not noticed until considerable damage is done to the foliage of the trees. The first serious outbreak to come to the attention of the Kansas Station Staff was in the summer of 1924. (2) Ben Davis and Missouri Pippin seem to be the varieties for which the insects showed a decided preference. Grimes Golden, Winesap and Delicious were very lightly infested. Spraying with dormant strength lime and sulphur helps to control outbreaks of the insect, however, orchardists should watch for leaf injury by this pest and be prepared to dust the trees with sulphur for its control in the summer.

Apple scab has never been so injurious a disease here as in the other orchard sections of Kansas. However,

in 1929 scab injury was severe and the survey data indicate the need of more lime sulphur applications for the control of this disease. A total of 294 barrels of liquid lime sulphur and 11,755 pounds of dry lime sulphur were used in combating scab together with the San Jose scale noted above. Application of the delayed dormant has given such good control of scab that the "pink" or cluster bud spray has been omitted from the spray schedule altogether, and has led to the practice of omitting this spray when no earlier spray had been applied. Clean cultivation of orchard soils is common practice during the early part of the summer, and this in itself would minimize scab infection.

For the control of apple blotch, this region has used Bordeaux mixture; 21,785 pounds of copper sulphate and 2000 pounds of powdered Bordeaux, were purchased for the 1929 crop. Weather conditions in the spring of 1929 were such that only a light infection of blotch was to be expected and orchards that received proper applications of Bordeaux spray did not show any loss from this disease.

SPRAYS: MEANS AND METHODS OF APPLICATION

Efficiency of pest control depends not only upon the amount of spray material used, but also upon the means and method of application. Data were secured as to the number and kind of spray machine used. All the machines but one were of the large power type; the one barrel sprayer was used by the owner of a three acre orchard whose trees were small. There was a total of 63 spray machines in the territory surveyed. This is 9 fewer than the total number of orchards, but the shortage is to be explained by the fact that in a number of cases an owner of a machine sprays 2 or 3 orchards. These 63 machines are of three different makes, one is a Meyers "Special", 26 are Hardie machines, and the balance, 36, are the product of the John Bean Manufacturing Company. Six of the Bean machines were of the new power-take-off type for tractor operation. These machines were operated on the large Nevitt and Alter orchards. They have extra large tanks and deliver a larger amount of spray than the smaller machines. Enough material is furnished for 3 guns at a pressure up

to 350 pounds per square inch.

In many commercial apple orchard regions it is the practice in large orchards to use a wagontank to supply the spray machines with water. In only two orchards was this practice noted. An explanation of this perhaps lies in the fact that due to the shallow water table the spray tower or mixing plant could be located in the most easily accessible point in the orchard. The two orchards that were hauling water to the spray machines were in the Arkansas City district and one of them was located where the water table was from twenty to thirty feet below the surface.

As to the labor supply for spraying the orchard manager or owner usually operated the machine and did all or part of the spraying. In the larger orchards where it was necessary to hire labor for spraying, local labor was secured, usually the same men from year to year. The number of men employed for a machine depends upon the size of the machine and the type of spray gun used. In every case the spray material was applied with spray guns rather than with spray rods. On one survey sheet, note was made to the effect that 1929 was the first year in which the spray guns had replaced the rods and nozzles. For the large

type of machine which would supply an abundance of spray material at a maximum pressure, three men were sometimes used, two on the ground and one on the tower, but it was the usual practice even with the large machines to have one man on the ground and one in the tower. The ground man might, however, use a double gun. Where medium size or small machines were used, one man would sit on top of the spray tank and do the spraying from that position. This method is the one used by many of the orchardists and is objectionable because it is impossible to do thorough spraying on any but the smallest trees from this position.

Four methods were used to cover all sides of the tree. The method followed by 60 per cent of all the orchardists was to spray one-half of a row at a time, spraying with the wind, and then wait for a still day or until the wind changed to spray the other side. This practice should be discontinued because if it is time to spray, efficient orchard management will not allow for procrastination. Seventeen per cent of the men stated that they sprayed with the wind meaning that they allowed the wind to blow the spray material through the trees. As the prevailing wind in this region is from the south during the spraying season, these orchards were laid out

with the wide rows running north and south and the spray rig was driven up and down between each two rows of trees, the operator spraying the near side of each row. Sixteen per cent sprayed one entire row at a time, usually having one man in the tower and one on the ground. This and the following method are well adapted to orchards having large trees. Seven per cent used two men on the ground and covered two whole rows at a time. This method is used where the trees are not tall enough to require a man in the tower to reach the tops of the trees.

In answer to the question, "How do you cover the tree"? the almost universal answer was "from the top down". In only two orchards was it a general practice for a man on the ground to go under the trees. A very good method and description was given by one of these men as follows:

"The ground man goes half way around the trees from one side then back and around to the other side until he crosses, spraying from under the trees, first spraying upward toward the center of the tree. We spray east and west with the wind then cross north and south the next spray, the ground man working mainly from under the trees especially on the older trees."

WINDBREAKS: VARIETIES AND THEIR VALUE

The planting of windbreaks has not been general in this region and those that do have any sort of windbreak planted close to the orchard cannot see much benefit from it.

Wherever an owner reported the value of a windbreak, it was usually from a large grove of trees growing along the bank of the river and not especially close to the fruit trees.

Three species were noted. First, and most important as far as size and number are concerned, was the common cottonwood, Populus deltoides; second, the catalpa, Catalpa speciosa, and third, the walnut, Juglans nigra. There is evidence that the black walnut is actively harmful to nearby apple trees.

METHOD OF SOIL MANAGEMENT

The soil management data were the most uniform of any secured. For orchards under bearing age, the usual method is to intercrop with corn, although with young or-

chards under the same management as bearing orchards it is now a practice to grow truck crops between the trees unless the acreage of young orchard is large. Watermelon is perhaps the most usual crop planted under such conditions with Irish potatoes, sweet potatoes, and tomatoes also used. In a few cases soy beans were used as an intercrop before the trees came into bearing.

After the trees come into bearing it is the almost universal practice of the orchardists to disc the orchard as soon as the weeds begin to grow in the spring and continue the cultivation until the middle or the last of July, when grass and weeds are allowed to grow. The purpose of this late neglect is two fold, first, to check the growth of the trees by reducing the water supply in the soil, and second, to give a soil covering to prevent it from blowing the following winter. This ignores the fact that trees bearing a crop of apples are likely to need all available moisture until about September 1 for the maturing apples.

There were three exceptions to the above soil management program which should be mentioned. The Donley Brothers of the Oxford district planted vetch in their bearing orchard in the fall of 1925. After discing the orchard the last of July that year they planted the vetch

seed with a wheat drill, making a "through" between each two tree rows. In the spring of 1926 they delayed cultivation until the vetch had time to ripen seed, when it was disced under with a double disc. Cultivation ceased about August 1 to give the vetch seed a chance to germinate. This practice has been continued each year since and has proved so successful that Nevitt Brothers, whose orchard adjoins that of the Donleys, planted a small area to vetch in the fall of 1927 and when the survey was made they had vetch planted in all of their bearing orchard of the Oxford district. These orchards were visited by orchardists on the Orchard Tour of 1929 and due to the publicity given at that time upon the value of vetch as an orchard cover crop, 4300 pounds of vetch seed were ordered by the Cowley County Farm Bureau for planting in the region.

Lowell Mason of the Belle Plaine district in the winter of 1928-29 applied four car loads of barnyard manure to the 42 acres of old orchard on the Sarah Mason place. There was not enough manure to cover the whole acreage so it was applied to only 1200 trees. In addition, 4 pounds of ammonium sulphate were applied beneath the outer limbs of each tree. On the Orchard Tour in August 1929, the

author heard a number of remarks as to the large size of fruit on the trees so treated.

There was one commercial orchard in Sumner County outside the survey area which was visited. The reason for this visit was the unique soil management program which has been carried on since the trees in this orchard came into bearing ten years ago. This orchard is located one mile south and two and one-half miles west of Conway Springs in northwest Sumner County. Wheat is the major and almost universal crop of this community and since, so far, the combine harvester has not proved successful with the farmers there, the threshing of the wheat has resulted in an abundant supply of wheat straw, the major portion of which has been burned to get it off of the ground. Mr. Harry Shetler, the owner of this orchard, conceived the idea of mulching the trees with the waste straw. He pays one dollar a load for the straw delivered at the orchard and he does the spreading. It takes 300 loads each winter to cover the 40 acres. This orchard was also visited on the Orchard Tour and was the outstanding orchard visited in the southern part of the state. The size and set of fruit was by far the best of any of the orchards covered in the survey. The control of disease and insect pests

was also the best, although the isolation of this orchard is perhaps as important a factor in accounting for this condition as is the method of soil management. This orchard should be given more study as to the continued effect of mulching upon the growth and healthfulness of the trees, the development of fruit buds, the set of fruit, and the resistance to frost injury.

PRUNING

Few of the orchard managers had very definite ideas as to pruning. What they knew they had learned from observation in other orchards and, although they were striving for the modified leader types as recommended by the College, they were not reaching their goal in many orchards. The older trees had been pruned for an open head and are now too spreading to change to a modified leader form. When asked as to how regularly they pruned, the answer was, yearly. This is true in a way, but with few exceptions it meant that they did some pruning each winter and tried to get over all their trees. However, from observation, the results did not show that there had been regular yearly pruning of all the trees. Trees in this

section grow rapidly and the usual practice is to give the trees a heavy pruning once in every four or five years. This is a practice that should be changed and the trees given a regular yearly pruning, not so heavy as they now occasionally receive, but heavy enough to keep the trees open to sunlight and spray material. This would make unnecessary the removal of such large limbs and would reduce the chance for infection by blister canker.

MARKETING FACILITIES AND METHODS

As mentioned previously, marketing is peculiar in this region because of its isolation, and because the local trade consumes the greater part of the crop except in years of heavy production. Buyers belong to one of three classes; first, those coming by automobile, who might be classed as retail buyers, second, truckers or peddlers, and third, buyers for the wholesale dealers and jobbers of Wellington, Winfield, and Wichita. The automobile trade was made up of people wanting to secure their winter's supply of apples direct from the orchard. The truckers were usually from small towns or were hauling to small towns selling direct to the merchants or peddling

the apples on the streets. Prices were fairly uniform between orchards with a slight lowering of prices to the truck haulers over the automobile trade because they took larger amounts. The automobile trade, however, in the aggregate takes the largest share of the crop. Orchard managers appreciate this local consumer trade and take pains to keep the good will of the buyers.

LESSONS TO BE DRAWN FROM THE SURVEY

Pruning, spraying, and soil management are the problems confronting the orchard men of this region. More orchardists should realize that efficient spraying cannot be accomplished where good pruning is not practiced. There seems to be a need here for a demonstration of the efficiency of spraying on trees well pruned and open as compared to trees which are too bushy and in need of pruning.

Better control of pests could be expected if more material were applied to the trees each spray. This, however, will never offset poor and inefficient methods of application. Few of the orchard men seem to realize that there is a relation between the leaf area of a tree and

the next year's crop. Too often one year of short crop has been followed by another simply because the orchardist, seeing no apples on his trees, has neglected to spray them, thus allowing leaf eating insects and leaf destroying diseases to reduce photosynthesis and thus so weaken the buds as to cause a short crop the following year.

As pointed out by Hall et al., (3) soils adapted to fruit growing in this region need abundant supplies of organic material. This being true, more care should be taken to see that plenty of organic matter is incorporated into the soil before the orchards come into bearing. With this in mind, the soil management problem is three fold; first, to conserve moisture, second, to maintain the nitrogen content of the soil, and third, to keep the soil from blowing. Moisture conservation demands attention mainly in the summer months and can be solved by continued cultivation. This method, however, causes a rapid loss of organic matter and, later, nitrogen. Loss of organic matter will certainly cause a soil to blow more easily. Thus, clean cultivation will conserve moisture but, at the same time, makes more difficult the solution of the other two problems. A winter legume, as a cover crop, would seem to complete the solution of the whole

problem. The orchard could be cultivated when moisture is needed in the summer and the legume which grew in the fall and spring, if incorporated into the soil, would add both organic matter and nitrogen. A winter legume would also cover the ground at a time when soil blowing usually takes place, and would thus serve another useful purpose. The success of winter vetch in the two orchards mentioned has proved that it is the legume to be planted in the younger orchards for the solution of these three problems. In the older orchards where straw cannot be secured, the application of barnyard manure is to be highly recommended. More data should be secured as to the success of the application of sodium nitrate to trees in the section before it should be recommended as a general orchard practice. The success of the mulch in the orchard of Mr. Shetler near Conway Springs has proved that this method is very well adapted to a sandy soil with an open subsoil as is found throughout the region of survey. Before such a method is adopted, however, the orchard manager should be sure of an adequate supply of straw both for the present and in the future.

ACKNOWLEDGMENT

The writer acknowledges with pleasure the suggestions and advice of R. J. Barnett, Professor of Horticulture. A word of appreciation is due the growers of the region for their spirit of willingness and cooperation in giving the information asked for. The writer received valuable assistance in various ways and wishes to express his indebtedness to all who so kindly aided him in the survey.

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Figure 2

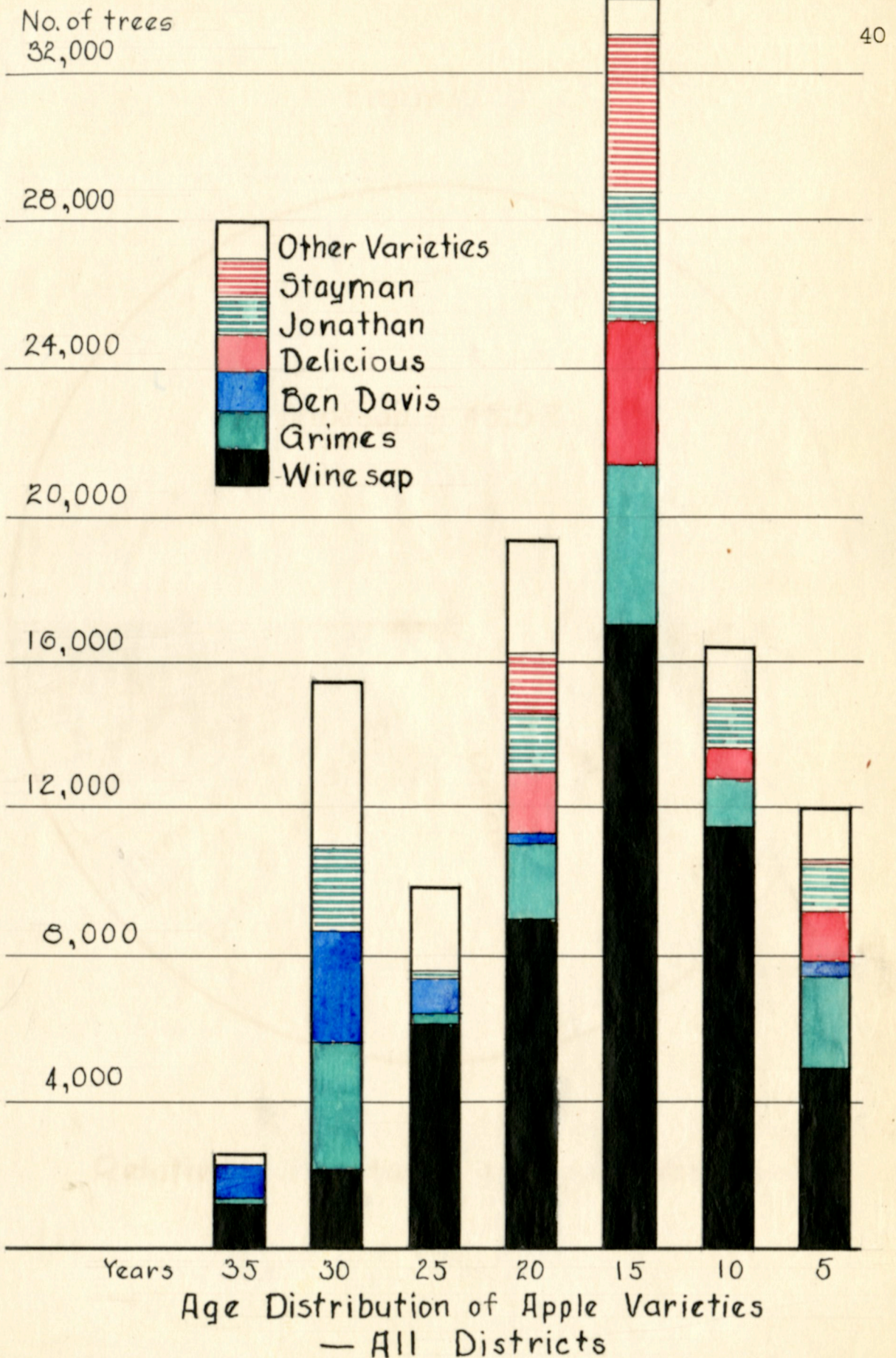
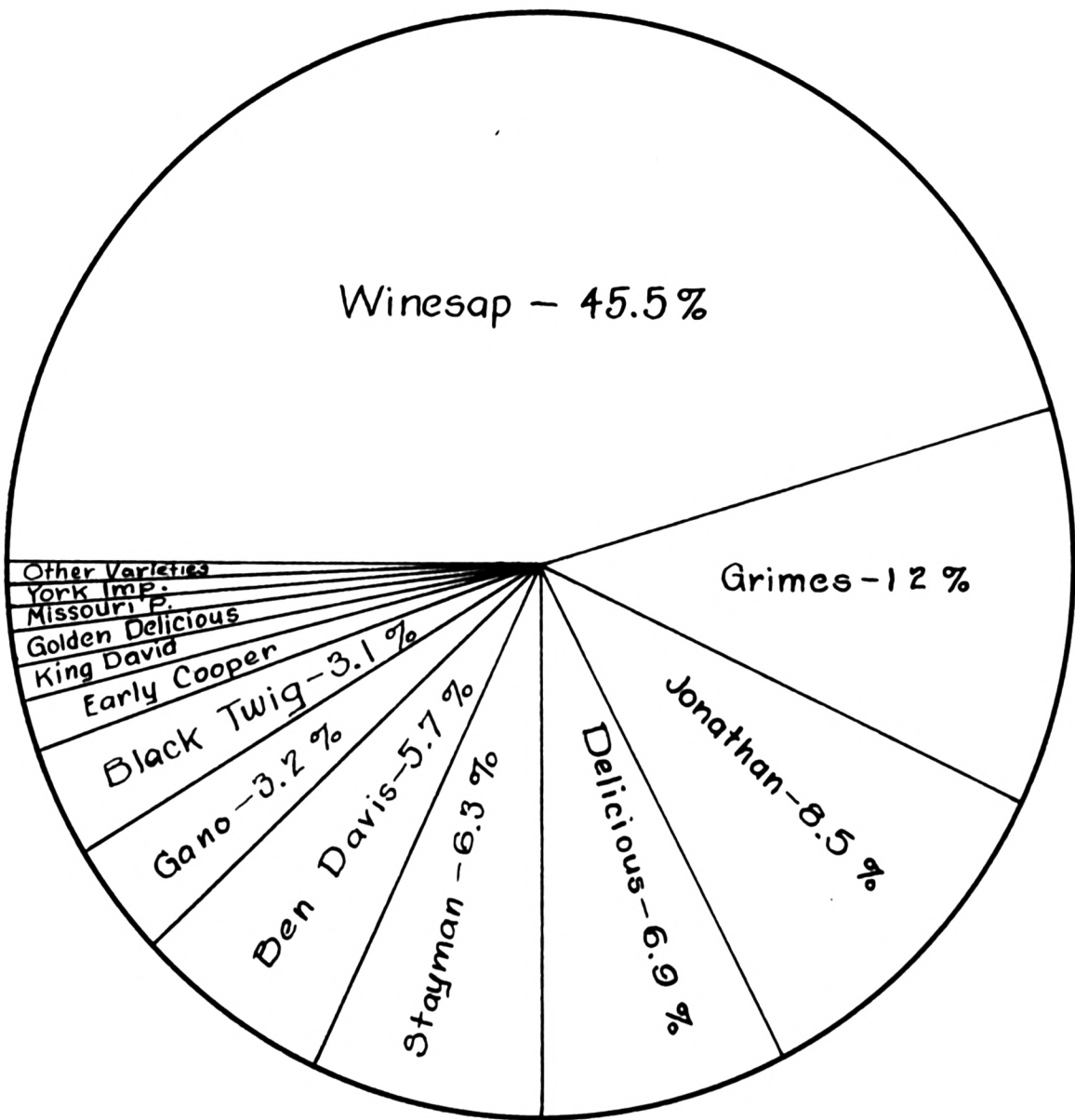


Figure 3



Relative Importance of Apple Varieties

TABLE I
VARIETY DISTRIBUTION BY ORCHARDS
BELLE PLAINE DISTRICT

| Orchard: | Grimes: | | :Black: | : | : | :Ben | : | :Miscellaneous: | | |
|----------|----------|-----------|---------|-----------|------------|----------|--------|-----------------|-----------|--------|
| Number | :Golden: | Jonathan: | Twig | :Stayman: | Delicious: | Winesap: | Davis: | Gano: | Varieties | :Total |
| 1 | 29 | 72 | 29 | 112 | 245 | 406 | | | 45 | 938 |
| 2 | 54 | 38 | 500 | 12 | 2 | 800 | 700 | | 72 | 2178 |
| 3 | 1640 | 560 | | | | 2100 | 1200 | | 600 | 5500 |
| 4 | | 200 | 450 | | | 640 | 960 | | | 2850 |
| 5 | 650 | 650 | | 250 | 250 | 400 | | | | 2200 |
| 6 | | | | | 80 | 2230 | | | 300 | 2610 |
| 7 | 400 | 400 | | 250 | 160 | 690 | | | | 1900 |
| 8 | 144 | | | | 144 | 1000 | | | | 1288 |
| 9 | 50 | 50 | 100 | 100 | | 500 | 30 | | 50 | 880 |
| 10 | | | | 75 | 125 | 200 | | | | 400 |
| 11 | 75 | 5 | 30 | | 175 | 1100 | 10 | | | 1395 |
| 12 | 60 | 320 | 6 | 6 | | 848 | 600 | 600 | 20 | 2460 |
| 13 | 25 | 25 | | 25 | | 100 | | | 25 | 200 |
| 14 | 25 | 50 | 50 | | | 125 | 50 | | 110 | 410 |
| 15 | 80 | | 120 | | 40 | 480 | | 120 | | 840 |
| 16 | 200 | 80 | 40 | 160 | 320 | 865 | | | 85 | 1750 |
| 17 | 60 | | | 80 | | 1220 | | | 80 | 1440 |
| 18 | 60 | | | 90 | 266 | 840 | | | 150 | 1406 |
| 19 | | | | 435 | 100 | 1000 | | 300 | | 1835 |
| 20 | 150 | 150 | 75 | 25 | 25 | 1000 | 100 | | 93 | 1618 |
| 21 | 125 | 185 | 60 | 530 | 175 | 310 | | | 290 | 1675 |
| 22 | 200 | 100 | | 150 | 450 | 1200 | | | | 2100 |
| 23 | 45 | 150 | | | | 200 | 400 | | 17 | 812 |
| 24 | 200 | 175 | 200 | | | 200 | 150 | 125 | 100 | 1150 |
| 25 | 50 | | 30 | | 30 | 300 | | | | 410 |
| 26 | 80 | 56 | 88 | | 32 | 1000 | | | 232 | 1488 |
| 27 | 75 | | 100 | 50 | | 500 | 500 | | 275 | 1500 |
| 28 | 120 | | 150 | | | 900 | 150 | 240 | 70 | 1630 |
| 29 | 80 | 50 | 200 | | | 250 | 225 | 225 | 170 | 1200 |
| 30 | 100 | | | 100 | 200 | 1000 | | | 200 | 1600 |
| TOTAL | 4777 | 3316 | 2228 | 2450 | 2819 | 22,404 | 5075 | 1610 | 2984 | 47,663 |

TABLE II
VARIETY DISTRIBUTION BY ORCHARDS
OXFORD DISTRICT

| Orchard: Number | Grimes: Golden | Black: Jonathan | : Twig | : Stayman | : Delicious | : Winesap | : Ben Davis | : Gano | : Miscellaneous: Varieties | : Total |
|--------------------|-------------------|--------------------|-----------|--------------|----------------|--------------|-------------------|-----------|----------------------------------|------------|
| 31 | 100 | 150 | | | | 150 | 100 | | 150 | 650 |
| 32 | 200 | | | 180 | 650 | 2560 | 300 | | | 3890 |
| 33 | | | | | 100 | 110 | | | | 220 |
| 34 | 50 | 50 | | 50 | 100 | 200 | | | | 450 |
| 35 | 80 | | | 200 | 220 | 540 | | | | 1020 |
| 36 | 117 | | 157 | 156 | 234 | 840 | | | | 1504 |
| 37 | 32 | 32 | | 100 | 156 | 156 | | | 156 | 632 |
| 38 | 400 | 1000 | | 80 | 400 | 1000 | | | 20 | 2900 |
| 39 | 164 | 205 | | 246 | 246 | 820 | | | | 1681 |
| 40 | 250 | | | | 250 | 250 | | | 250 | 1000 |
| 41 | 125 | | | | 130 | 335 | | | 110 | 708 |
| 42 | 325 | | 40 | | | 200 | | | 9 | 574 |
| 43 | 200 | | 200 | | | 600 | | | 200 | 1200 |
| 44 | 300 | 200 | | | | 300 | | 200 | | 1000 |
| 45 | 1000 | | | | 200 | 150 | | | | 1350 |
| 46 | 1200 | | 50 | | 300 | 3000 | | 1200 | 225 | 5975 |
| 47 | 1200 | | | | | 200 | | | 90 | 1490 |
| 48 | 50 | 25 | | | 25 | 100 | | | | 200 |
| 49 | | | 80 | 240 | | 240 | | | 360 | 920 |
| 50 | | | | | | | 120 | | 280 | 400 |
| 51 | 400 | 400 | | | | 3200 | | | | 4020 |
| 52 | | | | 50 | 25 | 50 | | | 59 | 184 |
| 53 | | 25 | | | 65 | | | | 29 | 119 |
| 54 | | | | | | 450 | | 450 | | 900 |
| 55 | 50 | 50 | | | 50 | 50 | 20 | | 30 | 250 |
| 56 | 400 | 400 | | | 200 | 800 | | | 206 | 2000 |
| 57 | 200 | 200 | | | | 2 | | | | 402 |
| 58 | | | | 200 | | 200 | | | | 400 |
| 59 | 66 | 66 | | | | | | | 68 | 190 |
| 60 | 60 | | | 150 | 170 | 400 | | | | 780 |
| 61 | 100 | 50 | | | 200 | 800 | | | 350 | 1500 |
| 62 | 400 | 200 | | 500 | | 900 | | | | 2000 |
| 63 | 50 | | | | | 50 | | | 50 | 150 |
| District Total | 7519 | 3053 | 527 | 2154 | 3721 | 18,653 | 540 | 1850 | 2642 | 40,659 |

TABLE III
VARIETY DISTRIBUTION BY ORCHARDS
ARKANSAS CITY DISTRICT

| Orchard: Number | Grimes: Golden | :Black: Jonathan | : Twig | : Stayman | : Delicious | : Winesap | :Ben Davis | : Gano | :Miscellaneous: Varieties | : Total |
|--------------------|-------------------|---------------------|-----------|--------------|----------------|--------------|---------------|-----------|------------------------------|------------|
| 64 | | 110 | | 100 | 140 | 25 | | | 165 | 540 |
| 65 | 150 | 1044 | | 550 | 150 | 450 | | | 250 | 2594 |
| 66 | 200 | 300 | | 150 | | 800 | | | | 1450 |
| 67 | | 200 | | | | 200 | | | | 400 |
| 68 | 2455 | | | 800 | | 1600 | | | | 4855 |
| 69 | 250 | 80 | | 100 | 125 | 1620 | | | 325 | 2500 |
| 70 | 400 | 1400 | 600 | 300 | 400 | 1000 | 800 | | 400 | 5300 |
| 71 | 30 | | | 450 | 25 | 700 | | | 225 | 1430 |
| 72 | 200 | | 50 | | 300 | 3250 | | 200 | 200 | 4200 |
| District Total | 3680 | 3134 | 650 | 2450 | 1140 | 9645 | 800 | 200 | 1565 | 23,264 |

TABLE IV
SUMMARY VARIETY DISTRIBUTION
SUMNER AND COWLEY COUNTIES

| District: Name | Grimes: Golden | :Black: Jonathan | : Twig | : Stayman | : Delicious | : Winesap | :Ben Davis | : Gano | :Miscellaneous: Varieties | : Total |
|-------------------|-------------------|---------------------|-----------|--------------|----------------|--------------|---------------|-----------|------------------------------|------------|
| Belle | | | | | | | | | | |
| Plaine | 4777 | 3316 | 2228 | 2450 | 2819 | 22,404 | 5075 | 1610 | 2984 | 47,663 |
| Oxford | 7519 | 3053 | 527 | 2154 | 3721 | 18,653 | 540 | 1850 | 2642 | 40,659 |
| Arkansas City | 3680 | 3134 | 650 | 2450 | 1140 | 9,645 | 800 | 200 | 1565 | 23,264 |
| Total | 15,976 | 9503 | 3405 | 7054 | 7680 | 50,702 | 6415 | 3660 | 7191 | 111,586 |

TABLE V
DETAILS OF ORCHARD MANAGEMENT
BELLE PLAINE DISTRICT

| Name of Owner | SPRAY FINDINGS | | | | | | | | | | | Operated By |
|------------------|----------------|---------|----------|---------|----------|-----------------------|------------|------------|------------|----------|----------|-------------|
| | : Survey | : Acres | : Age of | : Total | : Lime | : Sulphur | : Arsenate | : Dry Bor- | : Copper | : Effect | : Sprays | |
| | : No. | : No. | : trees | : trees | : Liquid | : Dry | : of Lead | : deaux | : Sulphate | : of | : No. | |
| | | | : years | : No. | : Bbls. | : Lbs | : Pounds | : Pounds | : Pounds | : Sprays | | |
| A. A. Cone | 1 | 20 | 13 | 938 | 6 | | 900 | | 450 | G. | 9 | T |
| C. H. Glover | 2 | 67 | 24 | 2178 | | 2000 | 4000 | 2880 | | F. | 10 | O |
| John Alter | 3 | 135 | 28 | 5500 | | | | | | G. | 9 | O |
| John Alter | 4 | 65 | 35 | 2850 | 100 | | 18,500 | | 8000 | G. | 9 | O |
| John Alter | 5 | 55 | 16 | 2200 | | | | | | G. | 9 | O |
| John Alter | 6 | 70 | 9 | 2610 | | | | | | F. | 7 | O |
| Chas. Alter | 7 | 50 | 15 | 1900 | | | | | | G. | 9 | O |
| Sam Barner | 8 | 35 | 11 | 1288 | | 1000 | 1,500 | 800 | | V.P. | 3 | O |
| Sam Barner | 9 | 35 | 16-22 | 880 | | | | | | V.P. | 4 | O |
| D. M. French | 10 | 10 | 10 | 400 | 2 | | 100 | | | F. | 8 | O |
| W. R. Sherman | 11 | 35 | 20 | 1395 | 14 | | 800 | 164 | 100 | F. | 8 | O |
| Eliza Mason | 12 | 60 | 27 | 2460 | | 300 | 1,800 | | 1200 | V.P. | 7 | T |
| George Wight | 13 | 5 | 8 | 200 | | 400 | 150 | 200 | | F. | 7 | O |
| George Wight | 14 | 12 | 25 | 410 | | | | | | | | O |
| T. Max Reitz | 15 | 21 | 6-9 | 840 | 1 | 20 | 300 | | 75 | G. | 6 | O |
| Lucius Woods | 16 | 42 | 11 | 1750 | | 1000 | 800 | 500 | | F. | 6 | O |
| Nevitt Brothers | 17 | 40 | 12 | 1440 | See | 45-47 | Table VI | | | F. | | M |
| Tom Barner | 18 | 40 | 17 | 1406 | | 700 | 1000 | 500 | | V.P. | 5 | O |
| Net Bishop | 19 | 45 | 15 | 1835 | | | 400 | 200 | | V.P. | 3 | O |
| Thos. Mason | 20 | 40 | 31 | 1618 | | 1500 | 2000 | 1000 | | G. | 7 | O |
| C. W. Hitchcock | 21 | 46 | 12 | 1675 | | 400 | 300 | | | P. | 4 | O |
| H. W. Herrick | 22 | 55 | 16 | 2100 | 8 | | 1200 | | 550 | G. | 9 | T |
| M. D. Leggett | 23 | 20 | 18 | 812 | | 400 | 1000 | 200 | | P. | 6 | O |
| C. B. McCalleser | 24 | 28 | 20 | 1150 | | 1800 | 600 | | 500 | F. | 5 | O |
| Wm. Duvall | 25 | 10 | 10 | 410 | | Hires orchard sprayed | | | | V.P. | 3 | O |
| Sarah Mason | 26 | 35 | 10 | 1488 | | | | | | G. | 7 | O |
| Sarah Mason | 27 | 60 | 22 | 1500 | 50 | | 6000 | | 1800 | G. | 7 | O |
| Lowell Mason | 28 | 42 | 32 | 1630 | | | | | | V.G. | 7 | O |
| O. S. Bishop | 29 | 40 | 22 | 1200 | | | 3000 | 2500 | | F. | 8 | O |
| W. D. McComas | 30 | 40 | 11 | 1600 | | 100 | 500 | | 200 | V.P. | 3 | O |
| Total | | 1253 | | 47,566 | 181 | 9620 | 44,850 | 8944 | 12,875 | | | |
| G. - Good | F. - Fair | | | | | | | | | | | |
| P. - Poor | T. - Tenant | | | | | | | | | | | |
| V. - Very | O. - Owner | | | | | | | | | | | |
| | M. - Manager | | | | | | | | | | | |

TABLE VI
DETAILS OF ORCHARD MANAGEMENT
OXFORD DISTRICT

| Name of Owner | SPRAY FINDINGS | | | | | | | | | | | |
|--------------------|----------------|-------|--------|--------|--------|---------|----------|----------|----------|---------|--------|----------|
| | Survey | Acres | Age of | Total | Lime | Sulphur | Arsenate | Dry Bor- | Copper | Effect | Sprays | Operated |
| | No. | No. | trees | trees | Liquid | Dry | of Lead | deaux | Sulphate | of | No. | By |
| | : | : | years | No. | Bbls. | Lbs | Pounds | Pounds | Pounds | Sprays: | : | : |
| J. H. Koons | 31 | 20 | 25 | 650 | 12 | | 700 | | 350 | G. | 8 | M |
| J. H. Koons | 32 | 60 | 5 | 3890 | | | | | | | 1 | M |
| L. M. McCammon | 33 | 5 | 15 | 220 | 2 | | 100 | | 50 | G. | 8 | O |
| Mrs. Tom Notestine | 34 | 20 | 15 | 450 | | 500 | 600 | | 50 | V.G. | 12 | O |
| John Binkey | 35 | 40 | 14 | 1020 | 8 | | 1200 | | 700 | F. | 6 | O |
| Frank Poovy | 36 | 40 | 13 | 1504 | | 600 | 1000 | | | G. | 8 | O |
| Frank Poovy | 37 | 20 | 5 | 632 | | | | | | | 1 | O |
| Albright Estate | 38 | 75 | 13 | 2900 | | | 2700 | | 450 | F. | 7 | M |
| Louie Zerkle | 39 | 20 | 13 | 1681 | 2 | 550 | 400 | 400 | | G. | 8 | O |
| Dr. James | 40 | 25 | 9 | 1000 | 1 | | 150 | 150 | | P. | 4 | T |
| Mike Cheveront | 41 | 18 | 9 | 708 | 3 | | 150 | | 100 | P. | 4 | O |
| J. A. Madison | 42 | 25 | 20 | 574 | 2 | | 500 | 48 | | F. | 6 | O |
| Donley Brothers | 43 | 30 | 3 | 1200 | | 300 | 1200 | | 300 | | 1 | O |
| Donley Brothers | 44 | 25 | 17 | 1000 | | | | | | G. | 6 | O |
| Nevett Brothers | 45 | 40 | 13 | 1350 | | | | | | F. | 7 | O |
| Nevett Brothers | 46 | 285 | 29 | 5975 | 20 | | 13000 | | 5000 | F. | 7 | O |
| Nevett Brothers | 47 | 40 | 3 | 1490 | | | | | | | | O |
| Carl Young | 48 | 10 | 12 | 200 | 1 | | 50 | | | V.P. | 2 | T |
| Wilmer et al | 49 | 30 | 3 | 920 | | | | | | | | M |
| Wilmer et al | 50 | 30 | 1 | 400 | | | | | | | | M |
| Wilmer et al | 51 | 120 | 8 | 4020 | 7 | | 200 | | 50 | P. | 4 | M |
| Sam Nixon | 52 | 6 | 13 | 184 | 2 | | 200 | | 50 | G | 8 | O |
| Sam Nixon | 53 | 3 | 5 | 119 | | | | | | | | O |
| M. B. Taylor | 54 | 30 | 25 | 900 | 10 | | 1000 | | 800 | V.G. | 8 | O |
| O. D. Gentry | 55 | 5 | 2 | 250 | | 25 | | | | | | O |
| Henry Hendrickson | 56 | 50 | 4 | 2006 | 10 | | 200 | | 20 | F. | 3 | O |
| Henry Hendrickson | 57 | 10 | 16 | 402 | | | | | | G. | 7 | O |
| George Garry | 58 | 20 | 16 | 800 | 1 | | 150 | | 40 | P. | 7 | O |
| George Gentry | 59 | 10 | 2 | 190 | | | No data | | | | | O |
| George Hafer | 60 | 30 | 14 | 780 | 6 | | 550 | 400 | | G. | 9 | O |
| George Hafer | 61 | 40 | 3 | 1500 | | | | | | | | O |
| John Clark | 62 | 50 | 15 | 2000 | 20 | | 1300 | | 400 | G. | 8 | O |
| R. M. Stewart | 63 | 5 | 2 | 150 | | 15 | | | | | | O |
| Total | | 1237 | | 41,065 | 107 | 1990 | 25,350 | 998 | 8360 | | | |

TABLE VII
DETAILS OF ORCHARD MANAGEMENT
ARKANSAS CITY DISTRICT

| Name of Owner | : | : | :Age of: | Total: | SPRAY FINDINGS | | | | | | :Oper- | |
|----------------------------------|----------|--------|----------|--------|----------------|----------|-----------|---------|----------|-------|----------|----|
| | :Survey: | Acres: | trees: | trees: | | | | | | | :ated | |
| | :Number: | No. | :years | :No. | :Lime | Sulphur: | Arse- | :Dry | :Copper: | Ef- | :Sprays: | By |
| | : | : | : | : | :Liquid: | Dry | :nate of: | Bor- | :Sul- | :fect | :No. | : |
| | : | : | : | : | :Bbls. | :Lbs. | :Lead | :deaux: | :phate | :of | : | : |
| : | : | : | : | : | : | :Lbs. | :Lbs. | :Lbs. | :Sprays: | : | : | |
| Fred Gillock | 64 | 40 | 9 | 540 | | 300 | 800 | | 450 | V.G. | 8 | 0 |
| Frank Weiler | 65 | 46 | 14 | 2594 | | 1000 | 800 | | | G. | 4 | 0 |
| Tom Williams | 66 | 40 | 12 | 1450 | | 800 | 800 | | 400 | F. | 6 | 0 |
| Guarantee Title and Trust Co. | 67 | 30 | 12 | 400 | | No Care | | | | | 0 | T |
| Group Owners | 68 | 50 | 18 | 4850 | 50 | | 2000 | | | F. | 7 | 0 |
| Dr. Martin | 69 | 60 | 8 | 2500 | | 1000 | 2000 | | 900 | G. | 6 | 0 |
| Ralph Dixon | 70 | 155 | 29 | 5300 | 60 | | 6000 | 2000 | | G. | 8 | 0 |
| Mrs. Dr. Young | 71 | 35 | 14 | 1430 | 5 | | 250 | | | V.P. | 6 | 0 |
| Dr. Snyder | 72 | 105 | 13 | 4200 | 44 | | 2000 | | 1000 | V.G. | 9 | M |
| Total | | 561 | | 22,095 | 159 | 3100 | 14,650 | 2000 | 2750 | | | |

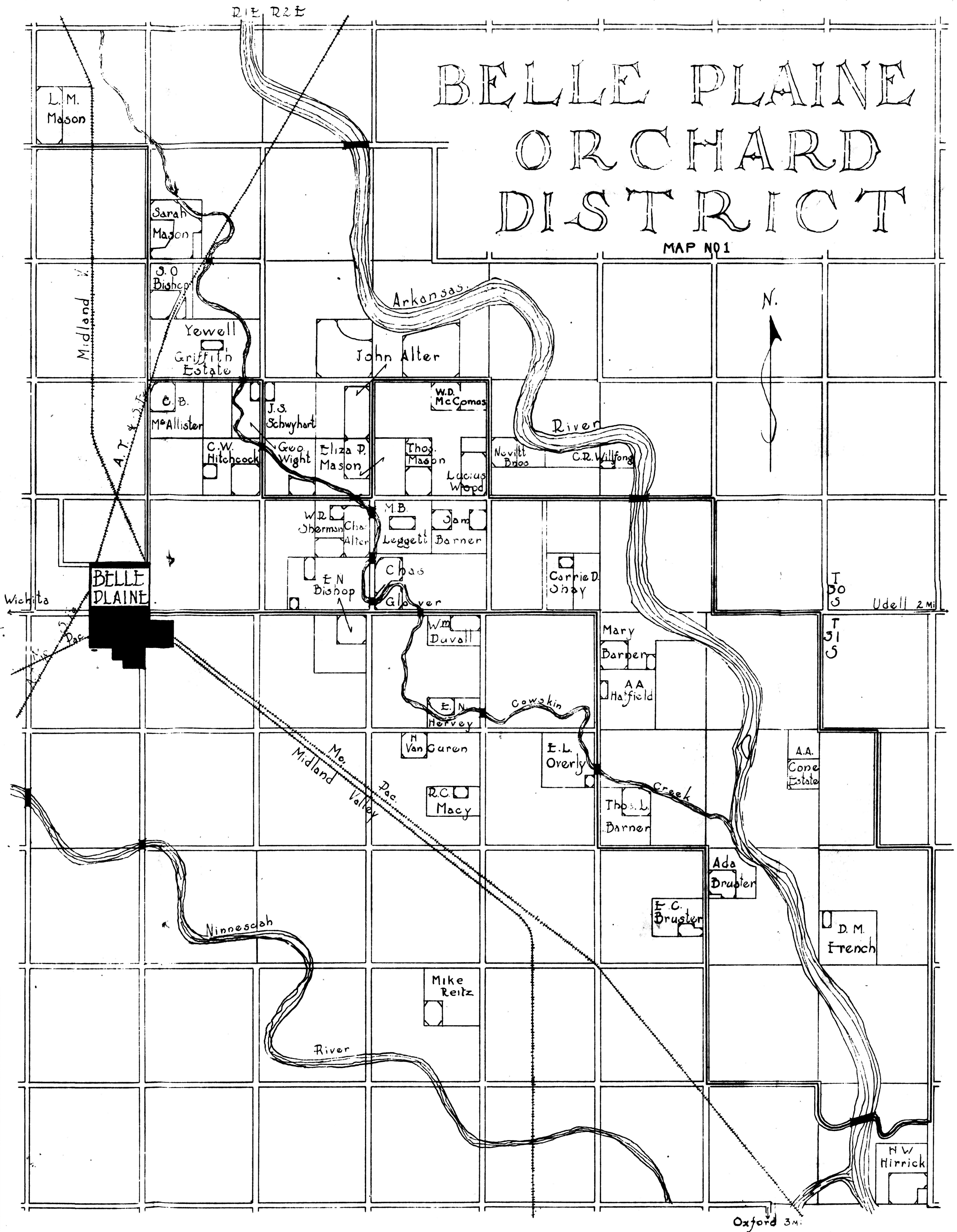
TABLE VIII
DETAILS OF ORCHARD MANAGEMENT
SUMMARY

| | : Acres | : No. | : Total : trees : No. | Lime Sulphur | | : Arsenate of : Lead Lbs. | : Dry : Bor- | : Copper : Sul- : phate : Lbs. : Pounds |
|---------------|---------|-------|-----------------------------|--------------|----------|------------------------------|-----------------|--------------------------------------------------|
| | | | | : Liquid | : Dry | | | |
| | | | | : Bbls. | : Pounds | | | |
| | | | | | | | | |
| Belle Plaine | 1253 | | 48,648 | 181 | 9620 | 44,850 | 8944 | 12,875 |
| Oxford | 1237 | | 41,017 | 107 | 1990 | 25,350 | 998 | 8,360 |
| Arkansas City | 561 | | 22,095 | 159 | 3100 | 14,650 | 2000 | 2,750 |
| Total | 3051 | | 111,760 | 447 | 14,710 | 84,850 | 11,942 | 23,985 |

Map 1
BELLE PLAINE DISTRICT

BELLE PLAINE ORCHARD DISTRICT

MAP NO 1



Map 2

OXFORD DISTRICT

Belle Plaine District

R2E D3E

OXFORD ORCHARD DISTRICT

MAP NO. 2

OXFORD

River

Arkansas Spring

Creek

Creek

Little

N

A.T. & S.Fe.

Mo. Pac.

Winfield 5 Mi

Donley Bros.

J.A. Madison

Nevett Bros.

Mike Chiscomb

Dr. James

Sam Nixon

John Clark

M.B. Taylor

Henry Hendrickson

Geo. Garry

O.D. Gentry

Wilmer Hilfinger

Arkansas City District

Sumner Co

Cowley Co.

Valley

Midland

T 31 S

T 32 S

Map 3

ARKANSAS CITY DISTRICT

ARKANSAS CITY ORCHARD DISTRICT

MAP NO. 3

Oxford
District

R3E R4E

Sumner Co.
Cowley Co.

T
33
S
T
34
S

Dr. Steiner

Dr. Martin

Arkansas

Dr. Snyder

Winfield

N.

Walnut River

River

ARKANSAS
CITY

Frank
weiler

Guarantee
Title & Trust
Co.

Legend

- 1 Mrs. H. J. Solett
- 2 Ralph Dixon
- 3 Wright
- 4 Falkner
- 5 V.A. Marsh
- 6 Tracks
- 7 Inman
- 8 Marsh
- 9 Hinton
- 10 Funk
- 11 Morton

Mrs. Dr. Young

Ralph
Dixon

Thorp

Joiner

Tom
Williams

Fred
Gillock