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FRUIT GROWING FOR HOME USE IN
THE CENTRAL AND SOUTHERN
GREAT PLAINS.

BY

H. P. GOULD,
POMOLOGIST IN CHARGE OF FRUIT DISTRICT
INVESTIGATIONS.

BUREAU OF PLANT INDUSTRY.

Chief of Bureau, BEVERLY T. GALLOWAY.
Assistant Chief of Bureau, G. HAROLD POWELL.
Editor, J. E. ROCKWELL.
Chief Clerk, JAMES E. JONES.

[Cir. 51]

FRUIT GROWING FOR HOME USE IN THE CENTRAL AND SOUTHERN GREAT PLAINS.^a

LOCATION OF THE REGION UNDER DISCUSSION.

The geographical position of the Great Plains is indicated by the map shown in figure 1. This map was first used in the Yearbook of the Department of Agriculture for 1907 in connection with an article by Prof. E. C. Chilcott, of this Bureau, entitled "Dry-Land Farming in the Great Plains Area". The eastern boundary of the Great Plains from an agricultural standpoint is considered somewhat arbitrarily to be the ninety-eighth meridian. The western boundary is likewise assumed to be the 5,000-foot contour. It extends south as far as the thirty-second parallel of latitude and north to the Canadian line.

For the purposes of the present discussion, western Kansas and eastern Colorado comprise the section referred to as the central Great Plains; western Oklahoma, the Panhandle of Texas, and eastern New Mexico constitute the southern portion.

In this connection it should be stated that between the 5,000-foot contour and the Rocky Mountains there are points which have an elevation exceeding 5,000 feet, where fruit is grown with some success without irrigation. In fact, two of the most successful nonirrigated orchards in eastern Colorado are considerably above this elevation. One of these is near Littleton, with an elevation of about 5,350 feet; the other, near Parker, with an altitude of nearly 6,000 feet.

^a In the rapid settlement of the semiarid region, the matter of home building is a very important feature of the development that is in progress. A good supply of fruit may be made to contribute very materially to this end and add greatly to the well-being of the family. During the summer of 1909 a considerable number of representative fruit gardens and orchards in eastern Colorado, western Kansas, and the Panhandle of Texas were visited by Mr. H. P. Gould, Pomologist in Charge of Fruit District Investigations, for the purpose of studying conditions, varieties, methods, etc., and with a view to making the information thus obtained available for the benefit of the large number of new settlers who are rapidly coming to these sections to make homes. This paper is largely an account of the methods that appear to be best suited to the climatic and other conditions in this region and which thus far have given promising results, supplemented by such suggestions as the investigations of the writer have called forth.—A. F. Woods, *Acting Chief of Bureau.*

some of the small fruits are also frequently found. The orchard fruits comprise principally apples, cherries, and native plums. Peaches are quite common in some sections, while occasionally pears and apricots are seen.

In a few instances fruit plantations of commercial size have been developed entirely without irrigation, 10 to 20 acres—in a very few cases more—being devoted by a single individual to fruit growing. But such plantations are exceptional. Where they do exist they have been developed gradually with the increasing experience of the owner.

The fruit from commercial orchards in this region, and from the home fruit gardens whenever there is a surplus, always sells very readily, buyers sometimes driving 40 and 50 miles across the plains to obtain it.

The possibility of growing fruit at many points in the central and southern Great Plains may be said, within certain limits at least, to have been demonstrated. In the majority of the orchards and fruit gardens investigated the results have justified the efforts that have been made. In numerous widely separated cases very satisfactory returns have been secured. In many sections a complete crop failure is rare.

Not all of the efforts to grow fruit, however, have been successful. Many things have contributed to failure. The one ever-present difficulty where only the natural rainfall is available is lack of moisture. Yet after the trees are well established it is not often that this causes more than temporary losses, as a crop of fruit for a single season. In some sections hail is frequent and occasionally causes great damage not only to the fruit but to the trees. Many regard it as the most serious factor that has to be considered. Late spring frosts are also a cause of much injury. But with all the difficulties, rarely is the effort to grow fruit one to be regretted. Those who have been successful prize beyond any commensurate monetary value the product of their trees and bushes.

THE OUTLOOK FOR THE FUTURE.

The vast majority of settlers on the Great Plains must depend upon their own plantations for a supply of fruit for home use. Most of those who do not have home-grown fruit are obliged to do without it. The chief interest, therefore, in the cultivation of fruit in this region centers about the home and the production of enough to meet the needs or desires of each family.

Here and there, as above stated, there are fruit plantations of commercial size. Doubtless others will be developed in the future. But

such plantations will be located as are those now in existence (1) on especially favorable sites where more or less water is available for irrigation^a in times of extreme drought and where hailstorms and late spring frosts occur but rarely, or (2) they will be owned by men with sufficient capital to enable them to resort to unusual and relatively expensive methods of tiding the trees over such crises, or (3) they will be developed gradually by the extension of small home orchards as the owners gain experience and the conviction that their location and personal qualifications warrant it.

The matter of reasonably successful fruit culture in this region, at least for home use, resolves itself largely into two questions: (1) The selection of varieties adapted to the conditions, and (2) the application of suitable methods of orchard maintenance. The primary object of this paper is to discuss some of the factors that contribute to these ends.

CLIMATIC CONDITIONS.

The rainfall and temperature conditions are the most important climatic factors in connection with fruit growing. The seasonal and annual precipitation in the Great Plains are shown by the broken lines in figure 1. Hailstorms are serious in some sections and sometimes cause much damage to fruit and fruit trees.

Of the temperature conditions that characterize the region under discussion, late spring frosts are perhaps the most serious feature. Injury to the fruit blossoms is rather frequent from this cause.

The data collected in table 1, on page 7, will give the reader a general conception of prevailing conditions as to precipitation and range of temperature in this region:

^a In Bulletin 130 of the Bureau of Plant Industry, which is composed of papers presented at the second annual meeting of "The Cooperative Experiment Association of the Great Plains Area," held at Manhattan, Kans., June 26-27, 1907, there occurs one by Mr. J. E. Payne, superintendent of the substation of this Department at Akron, Colo., entitled "Fruit Growing on the Plains." This article gives a general account of fruit culture in this region and discusses, among other matters, several different methods of collecting and storing water for use on small areas of land. A number of diagrams are used which aid very materially in giving clearness to the discussion. These methods are applicable in many locations in the region included in the present discussion. The reader is referred to the bulletin mentioned for information relative to them.

TABLE I.—Records of temperature, frost, and precipitation at several points in the central and southern Great Plains.

Locality.	Elevation.	Temperature.						
		Mean.			Absolute maximum (August, 1902).	Absolute minimum (February 1899).	Days with maximum above 90° F.	Days with minimum below 32° F.
		Annual.	Maximum.	Minimum.				
	<i>Feet.</i>	<i>°F.</i>	<i>°F.</i>	<i>°F.</i>	<i>°F.</i>	<i>°F.</i>		
Garden City, Kans.	2,836	54	70	39	112	-32	63	144
Fort Collins, Colo.	4,997	47	62	31	100	-38	19	179
Pueblo, Colo.	4,663	52	66	37	104	-27	42	148
Hoehne, Colo.	5,700	50	68	33	103	<i>a</i> -29	29	169
Amarillo, Tex.	3,658	56	68	44	<i>b</i> 105	-16	36	111

Locality.	Frost.				Precipitation, annual.
	First killing in autumn (average).	Last in spring (average).	Earliest killing in autumn.	Latest in spring.	
					<i>Inches.</i>
Garden City, Kans.	Oct. 4	May 2	Sept. 7	May 26	19.6
Fort Collins, Colo.	Sept. 21	May 13	...do....	June 5	14.6
Pueblo, Colo.	Oct. 15	Apr. 28	Sept. 12	May 23	11.6
Hoehne, Colo.	Oct. 2	May 10	Sept. 13	July 4	13.0
Amarillo, Tex.	Nov. 7	Apr. 12	Oct. 16	May 23	21.9

a January, 1901.*b* June, 1902.

SITES FOR FRUIT PLANTATIONS.

In the central and southern Great Plains the sites for orchards and other fruit-producing plants should be selected as a rule with reference to the best supply of soil moisture. On some of the ranches, especially the smaller ones, there is little or no choice, as the conditions are so nearly uniform. Convenience of location in such cases will probably be the ruling factor.

In many instances, however, the soil conditions with regard to moisture can be taken into account. Streams of considerable size pass through some of the ranches. The bottom land adjacent to such streams frequently has an underflow which can be reached by the roots of fruit trees. Under such conditions trees often make a remarkable growth.

The water from small streams, even if they are dry a considerable portion of the time, can often be utilized to good advantage for fruit growing if the plantations are located with reference to such sources of supply. On many ranches that are not traversed by streams of any description there is still some choice of site. Wherever a slight elevation or slope occurs from which there is surface drainage during showers or more protracted rains, the area which receives the run-off, other things being equal, is a relatively favorable site for fruit growing. This is because of the additional quantity of water that it receives.

By taking advantage of such conditions as these with regard to sites it is often possible to make results reasonably certain where otherwise there would be much risk.

PREPARING THE LAND FOR PLANTING.

Generally speaking, the primary aim should be to so manage the soil that it will contain the greatest quantity of moisture possible when the trees and other plants are set out. This is for the purpose of insuring a sufficient supply to enable them to start into vigorous growth at once.

So far as possible, the preparation of the land for planting fruits should be begun two years before they are to be set out. A course suggested in the present connection by one of much experience in the Great Plains is as follows:

The first step should be to thoroughly prepare the land for a crop of corn, potatoes, beans, or some other cultivated crop. Sorghum, however, should not be used in this connection, as it is likely to take too much moisture from the soil.

This preparation should consist of deep plowing; that is, to a depth of 8 to 10 inches. Then thorough cultivation should be given before planting the crop, followed by frequent and thorough tillage throughout the season. This treatment under fairly favorable conditions should result in a good crop, and will also aid in keeping the soil in that condition which best permits deep plowing in late summer or early fall. During the next season the land should be thoroughly summer fallowed to conserve in the soil to the fullest extent possible the rain that falls during the warm season. This treatment consists of disking or harrowing every few days. By this means vegetation of all kinds will be kept down and a good surface mulch maintained.

If the soil is heavy or becomes very compact below the surface mulch during the summer fallowing, it should be plowed again in the fall before the planting, which should be done in the spring.

A practice that has given good success at the time of this plowing, or during the fall if late plowing is omitted, is to lay the ground off in narrow lands so that there will be a dead furrow where each row of trees is to stand. These furrows serve to hold rain that might otherwise be lost. It is a good plan, after these dead furrows have been made, to open them still deeper by plowing as deeply as possible. The soil should then be harrowed thoroughly and compacted.

To sum up the foregoing suggestions, the best preparation of the soil for fruit trees consists—

FIRST SEASON.

- (1) In thorough preparation for a cultivated crop, such as corn and potatoes.
- (2) In thorough cultivation of the crop throughout the season.
- (3) In deep fall plowing after the crop is harvested.

SECOND SEASON.

- (1) In thorough summer fallowing.
- (2) In plowing 8 to 10 inches deep in the fall before planting the trees, unless this has been done for a previous crop.
- (3) In opening furrows as deep as can be done with a plow where the rows of trees are to stand. This should be done in the fall and the trees planted the next spring.

In addition to opening a dead furrow where the rows of trees are to stand, one very successful grower in this region during the fall digs the holes where the trees are to be planted, making them large and deep. The furrows and holes catch any run-off that may occur during rains, and in the winter, where there is a considerable fall of snow, they fill up with snow when it drifts over the ground. As it melts in the spring or on warm days in winter additional moisture is collected where it is most needed and soaks into the ground deeper than it otherwise would.

Under ordinary climatic conditions this method of preparing the land should result in its being well supplied with moisture. Under these conditions the trees should start into growth readily and make a good development of roots.

NURSERY STOCK.

Only nursery stock of good grade and quality should be used in this region. In fact, it is usually poor economy to plant poor stock under any conditions. It is difficult, however, to indicate just what nursery stock of "good grade and quality" is without entering into a more extended discussion of the matter than the limits of this paper permit.

Many factors need consideration in this connection. Varieties differ in habit of growth in the nursery as well as when they reach mature age. For instance, some varieties of the apple are weak growers, while others are relatively vigorous. Hence a large tree of a particular variety and age might represent in size a small tree of some other sort of the same age. Some varieties are drooping, scraggly growers; others make an upright growth. The conditions under which the stock is grown as to soil, moisture, etc., and the standards of different nurserymen are all factors which enter into the matter. It may be said in general, however, that nursery stock should be free from injurious diseases and insect pests, well rooted, and well grown in every way. In many cases undoubtedly much responsibility with regard to the suitability of the stock secured must rest with the nurseryman who supplies it.

Aside from the general healthfulness of the stock, perhaps no other factor is of so great importance as that it be well rooted. If planted in a section where there is usually an abundance of moisture and where other climatic conditions are favorable, poorly rooted stock

may have some possibility of overcoming and outgrowing defects incident to a poor root system. Under the semiarid conditions of the Great Plains, however, the risk is too great to warrant the planting of such stock.

The age at which nursery stock is planted varies more or less with different growers; it also depends upon the kind of fruit. In the case of apples, pears, plums, and cherries, two-year-old trees are generally used. These are trees that have grown in the nursery for two seasons after being budded or root grafted. One-year-old peaches and apricots are usually preferred. One-year grape roots are frequently used, but more commonly two-year roots are planted. Either one or two year old plants of currants and gooseberries are used. Most of the small-fruit stock, however, is suitable for planting after one season's growth in the nursery.

It is a question whether good-sized one-year-old trees of all the above kinds of orchard fruits are not fully as satisfactory for planting in this region as older trees. This view is probably not in accord with the prevailing opinion and usual practice. It is, however, supported by the opinion of a considerable number of experienced growers in this region. The writer is convinced that in many cases the younger trees can be planted with a good degree of success. The results obtained at the dry-land fruit garden maintained at the departmental substation at Akron, Colo., likewise point in this direction.

There is considerable interest in this country at the present time in regard to dwarf apples. These are trees propagated on Paradise or Doucin stocks, which has the effect of greatly dwarfing the growth of the trees. Quite a number of these trees have been planted as an experiment at Akron, Colo., in the dry-land fruit garden just mentioned. No conclusions, however, are warranted at this time.

PLANTING THE TREES.

If the nursery stock is not to be planted within a very few days after it is received, it should be unpacked and "heeled in." To do this make a deep furrow and place the roots of the trees or other plants in it, with the tops, in the case of trees, nearly horizontal. Pack moist soil about the roots so as to keep them from becoming dry. Light watering may be necessary occasionally to maintain the soil in a sufficiently moist condition. In some cases the tops may need protection. If the branches become dry and the bark begins to shrivel in the least, soil should be thrown over the entire trees or some other means of protection provided. With these precautions stock may be held in good condition for some time if necessary.

When the stock is handled for planting, the roots should still be so protected that they will not become dry. This may be done by covering them with wet gunny sacks or some other suitable material. It

is a good practice to "puddle" the roots before planting. This consists in dipping them in rather thin mud, which gives the roots a moist covering of soil. This furnishes considerable protection if they are not exposed too long.

Spring planting is advised, as the winter conditions would doubtless be very hard on stock planted in the fall.

In general, the advice about trimming off injured roots, cutting back the top, etc., usually given for planting trees and other plants in humid sections, applies in this region. Low-headed trees are undoubtedly to be desired; that is, trees the tops of which are formed not more than 15 inches to 2 feet from the ground. To produce such trees a more severe heading back when the trees are set out may be necessary than many persons with experience elsewhere are accustomed to give. It will not be difficult to develop trees with low heads, however, if one-year-old trees are planted. This is an additional advantage in planting trees of this age. The heads of older trees are formed when received from the nursery and they may not meet the wishes of the planter in this respect.

In starting the head of a tree, four to six main branches should usually be allowed to remain. Or, if desired, a single "leader" may be left in the center of the tree and the head formed by a considerable number of comparatively small branches radiating from it.

Reference has already been made to digging the holes in which to set the trees. If they have been made large and deep, as previously mentioned, they may need to be partially filled before the trees are placed in them to avoid too deep planting. In filling in the soil about the roots, the usual precautions need to be observed in regard to packing the soil firmly. If it is not sufficiently moist to insure the prompt starting of the tree into growth, enough water should be poured into the hole after it has been partially filled with soil to thoroughly wet the portion in close proximity to the roots. The hole is then filled, though many leave the surface about the tree a little lower than the general level in order to retain in the little "basin" thus made the rain which might otherwise drain away. Such a practice is of particular value during heavy showers when there is considerable run-off, more water being retained about the tree than would be the case if the surface was perfectly level.

While many trees are planted only two or three inches deeper than they were in the nursery, as in other regions, many advise setting them at least six inches deeper than they stood in the nursery. This places the roots where they are less influenced by surface conditions. The trees are more firmly fixed in the ground than if planted shallow and are therefore less affected by the winds. In other ways there appears to be good reason for this deep planting.

Strong winds are characteristic of the Great Plains—so much so that in many exposed sections the tops of the trees by its force are distinctly inclined away from the direction of the prevailing wind. At most points this is from the southwest. To overcome the influence of these prevailing winds the trees when they are set should be inclined somewhat toward the quarter from which these winds come. The direction for setting as given in one instance is to “incline the trees toward the 2 o’clock sun.”

By leaning the trees, as suggested, the injury to the trunks which often occurs where they lean toward the north or northwest—that is, away from the sun, may be largely avoided. This injury is generally attributed to the intense heat of the sun shining on the exposed trunks, but it is probably more often the result of too rapid thawing in the sun after heavy freezing.

The general principles that apply in planting fruit trees apply in regard to small fruits, etc.; hence, no special comments about handling them appear necessary.

WIND-BREAKS.

Another method of preventing the undesirable effects of the winds is to plant a wind-break, or “shelter belt,” on the side or sides of the orchard from which the prevailing winds come. A wind-break is made by planting hardy trees of some kind that will grow as rapidly as or faster than the fruit trees. It should usually be started at the same time the fruit trees are put out, unless the planting of the orchard has been anticipated and trees for the wind-break started in advance of the fruit trees.

If the space is restricted, a single hedge row of some strong-growing tree will amount to something as a shelter for the orchard. But better results will follow if several rows of trees be planted. A common practice is to set at least three rows 8 feet apart and the trees 8 feet apart in the rows. The trees in the different rows should alternate, so that in one row they will stand opposite the center of the space between the trees in the adjoining ones.

A number of different kinds of trees are used in the central and southern Great Plains for wind-breaks. Mr. J. E. Payne,^a superintendent of the departmental substation at Akron, Colo., recommends the Russian mulberry, the black locust, and the wild Russian olive. The Russian mulberry, however, is not entirely hardy in all parts of the central Great Plains. In many places, seedling Russian apricots would probably be satisfactory to use with other kinds of trees and possibly some seasons when not injured by spring frosts they would produce fruit.

^a See Bulletin 130, Bureau of Plant Industry, U. S. Dept. of Agriculture, p. 65.

The Forest Service^a of this Department suggests for planting in eastern Colorado the green ash, the honey locust, the white and golden willow, the white elm, the Russian olive, and the Carolina poplar, and in the Panhandle of Texas, the black locust, the honey locust, the Osage orange, and the Russian mulberry. The latter, besides forming a dense wind-break, in favorable seasons produces considerable fruit that is much liked by birds. When there is a supply of this fruit at hand, it is said that birds will eat it in preference to cherries. Hence the planting of mulberries is frequently recommended as a means of protecting the cherry crop from bird depredations.

Professor Longyear,^b of the Colorado Agricultural Experiment Station, gives the following advice about wind-breaks:

For the taller growing tree in this region the common cottonwood may be used, setting them about 8 feet apart for the outer or north and west rows. A second row of some denser growing kind should be planted about 8 feet from the first and as close as 4 feet in the row. For this purpose box elder is a suitable tree, except in dry situations, in which case the green ash is recommended. The trees in the third row may be planted in the same as in the second row, using a more compact-growing kind. The Russian golden willow is recommended for this purpose as a rapid grower. The Russian wild olive is a more compact tree of lower growth and is particularly desirable. White or American elm is also a suitable tree for the inner rows in many places, especially where a fair amount of moisture can be depended on.

In cases where the wind is exceptionally strong, it may be found necessary to plant a belt 4 or 5 rods wide in order to secure complete protection. The outer two rows may consist of Russian olive, the third and fourth rows of black locust, the fifth and sixth rows of box elder or ash, the seventh and eighth rows of American elm, and the inner two or three rows of cottonwood or Carolina poplar, the rows being about 8 feet apart. The golden Russian willow may be used in place of the elm, and honey locust may take the place of the black locust.

If the wind-break consists of several rows of trees as above suggested the time will come in many cases when it may be possible to cut some of the trees for posts and other uses. This may be done whenever the trees are dense enough to give the necessary protection to the orchard after being thinned out somewhat.

ORCHARD MAINTENANCE.

CULTIVATION.

In the semiarid central and southern Great Plains the most important thing, so far as cultivation is concerned in its relation to the production of general crops, is the conservation of moisture. This is equally true in relation to the growing of an orchard and the production of a crop of fruit. In general, the methods and the tillage im-

^a Letter dated November 16, 1909, from the District Forester of District No. 2.

^b Bulletin 123, Colorado Agricultural Experiment Station, p. 16.

plements that have been found most satisfactory in any given section may also be used in cultivating the fruit plantation, with a single exception. In plowing the orchard and in the use of other implements of tillage, care must be taken not to work the soil so deep that the roots are injured. If the trees are set deep when they are planted, there will be little danger in this respect. A well-cultivated apple orchard located near Plainview, Tex., is shown in figure 2. The surface has been maintained in good condition for conserving moisture.

The maintenance of soil fertility by frequently renewing the supply of humus is essential to continued success. Nothing is better for this than stable or barnyard manure. The turning under of some green-



FIG. 2.—Apple orchard six years old grown without irrigation at Plainview, Tex. The tops are rather too dense, but formed at a desirable height from the ground. A good soil mulch has been maintained.

manure crop, however, makes an efficient substitute. A good supply of humus is also of the greatest importance in connection with the supply of moisture and its conservation.

IRRIGATION.

The possibility has been mentioned of resorting to irrigation in order to tide over the trees or other fruit-producing plants in times of severe drought. Figure 3 shows a small earth reservoir used for retaining a supply of water for this purpose. There are many of them in this region. One may be constructed on almost any ranch and in most yards where there is a good well of water and a windmill.

It is made by excavating the earth and mounding it up somewhat about the edge or rim of the reservoir. The inside is then puddled with clay or in some other way made sufficiently impervious to water to prevent seepage. The water may be siphoned out for distribution.

SPRAYING.

On account of the dry atmosphere in the Great Plains region, fungous diseases will probably not be serious, but the more common insect pests may be expected to do more or less damage unless means of control are applied. The insect problems, however, are doubtless so similar to those of other regions that the methods of control that are effective elsewhere will prove satisfactory here.

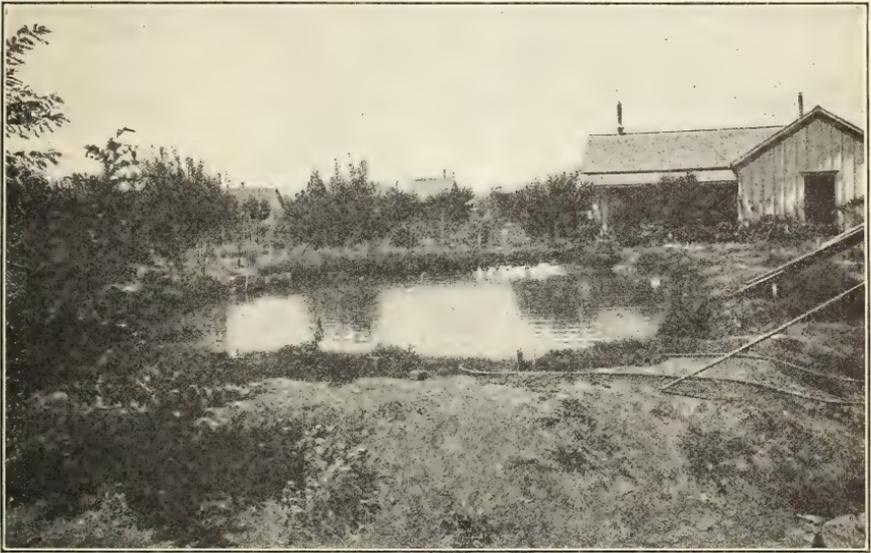


FIG. 3.—An earth "tank," or reservoir, for irrigating small gardens and fruit plantations.

Much information about spraying for fruit diseases and insects is contained in publications of this Department. The more important ones are as follows:

Farmers' Bulletins.—No. 127, Important Insecticides; No. 243, Fungicides and Their Use in Preventing Diseases of Fruits; No. 283, Spraying for Apple Diseases and the Codling Moth in the Ozarks; No. 284, Insect and Fungous Enemies of the Grape East of the Rocky Mountains.

Circulars, Bureau of Entomology.—No. 20, The Woolly Aphis of the Apple; No. 26, The Pear Slug; No. 29, The Fruit Tree Bark Beetle; No. 32, The Larger Apple-Tree Borers; No. 54, The Peach-Tree Borer; No. 73, The Plum Curculio; No. 81, The Aphides Affecting the Apple; No. 98, The Apple-Tree Tent Caterpillar; No. 101, The Apple Maggot or Railroad Worm.

Circular, Bureau of Plant Industry.—No. 27, Lime-Sulphur Mixtures for the Summer Spraying of Orchards.

Yearbook Papers.—No. 50, Pear Blight: Its Cause and Prevention; No. 386, The Principal Insect Enemies of the Peach; No. 433, Lime-Sulphur Washes for the San Jose Scale; No. 460, The Codling Moth or Apple Worm; No. 480, Information about Spraying for Orchard Insects.

These publications are all for free distribution and may be secured upon application to the Secretary of Agriculture.

PRUNING.

A great many of the fruit trees now growing in the region in question are in serious need of judicious pruning. The chief fault at present is that too many branches have been allowed to grow and the tops of the trees have become too brushy. They have not been kept sufficiently open for the best results.

Of course the other extreme is also accompanied by serious results. The top must not be too open. If large limbs, and especially the trunks, are exposed to the direct rays of the sun, "sun scald," as the splitting of the bark in the spring is usually called, will often occur. This will greatly injure the tree.

It is difficult to give specific directions for pruning, as every tree presents its own problems and difficulties. But with the objects of pruning and the dire results of both extremes fully in mind, a desirable mean should not be difficult to reach.

The aim should be to cut out all branches that cross or in any way interfere with others that are more important and to thin out the tops enough to keep them comparatively open for the admission of air and sunlight. Where a vigorously growing tree is allowed to go year after year with no pruning, the limbs that compose the top become much crowded. The struggle for existence grows so intense that only weak, poorly nourished buds develop.

If the orchard is looked over every year during the winter or early spring and such branches removed as may be necessary to meet the ends in view, very little pruning will need to be done in any one year. Only rarely will there be occasion to remove large limbs.

In pruning the first year to form the head of the tree it will often be possible to leave branches which will effectively shade the trunk from the sun, especially if the tree is headed quite near the ground. This will make possible the development of an open-headed tree without danger of any serious secondary results. Leaning the tree toward "the afternoon sun" when it is set out, as previously suggested, will also reduce the danger of injury which might result if the tops were made too open at any time.

Another reason for thinning out the tree tops as much as is consistent with their healthfulness and crop-producing capacity is its relation to the soil moisture. This feature is generally overlooked in this semiarid region. Within certain limits the more branches there are

in a tree top, and consequently the more foliage there is, the greater the amount of moisture that is taken up from the soil and passed off through the leaves into the atmosphere.

Two very strong reasons are thus indicated why fruit trees should be thoroughly and systematically pruned: (1) It results in the production of better fruit and in many cases more of it. (2) It is a factor in conserving the soil moisture. This is always of great importance in this region.

There is a great difference in different kinds of fruit trees and even in different varieties of the same kind with regard to the amount of pruning that is necessary or desirable, some requiring very severe treatment, while others call for very little. But with the underlying principles in mind the application of them is not difficult. Reference to the accompanying illustrations will be suggestive in regard to this operation. Figure 4 shows a peach tree about four years old that stands in a yard in Plainview, Tex. It is low headed, its



FIG. 4.—A well-formed peach tree about four years old, Plainview, Tex.

branches are not too numerous, and in general it may be considered a well-formed, well-pruned tree.

Figure 5^a is a Ben Davis apple tree that stands in a dry-land orchard about 18 miles southeast of Denver, Colo. This tree has not been allowed to develop a top that is too dense, and in other respects it is desirable as to form.

The trees shown in figure 2 also are headed low and have other desirable features, but the tops should be thinned out somewhat to make them more open.

^aThe owner of the orchard in which the tree shown in figure 5 is located has a field of alfalfa on a creek bottom that passes through his ranch. He was irrigating this alfalfa at the time the photograph was taken. This is why he was wearing rubber boots. The orchard has never been irrigated. The roots of this tree probably do not reach the water table.

VARIETIES.

Perhaps the most serious question relating to fruit growing in the central and southern Great Plains is the matter of suitable varieties to plant. It is likewise one of the most difficult problems concerning which to make suggestions or give advice. To be successful, the trees or other plants must be able to withstand severe climatic conditions. The moisture supply is always scanty. The winds are



FIG. 5.—A well-formed Ben Davis apple tree, grown without irrigation near Littleton, Colo. The roots of this tree probably do not reach the water table. It would be better if more of the lower, small secondary branches had been left to shade the larger limbs and trunk.

often very drying and may cause the soil moisture to evaporate to a serious degree. Drying winds also cause large quantities of water to be given off through the leaves. In some sections the temperature drops very low at times. When all these conditions prevail at once and for any extended period, a combination exists the severity of which can hardly be exceeded. If there is no snow on the ground at such times to protect the roots from very hard freezing, the danger of serious injury to the trees is greatly increased.

The varieties of the various kinds of fruit grown in the region under discussion are quite limited in number. With few exceptions, the plantings are young, so the merits of the different sorts that have been planted are not yet fully determined. Under these conditions it is not possible to make any very definite recommendations as to varieties for this region. However, the following lists, composed

largely of varieties that growers thus far regard favorably, will be suggestive in the extension of fruit growing.^a

It should be understood, however, that the suggestions as to varieties to plant are only tentative. Further experience and observation will doubtless result in many changes.^b

Varieties Suggested for the Central Great Plains.

APPLES.	APPLES—continued.
Early varieties.	Crabs.
Benoni.	Florence.
Chenango.	Siberian Yellow.
Early Harvest.	Transcendent.
Jefferis.	Whitney.
Maiden Blush.	
Oldenburg (<i>Duchess of Oldenburg</i>).	PLUMS.
Red June.	America.
Summer Queen.	Damson.
Yellow Transparent.	De Soto.
Mid-season varieties.	Forest Garden.
Grimes.	German Prune.
Jonathan.	Golden (<i>Gold</i>).
Wealthy.	Italian Prune.
Winter varieties.	Kroh (<i>Poole's Pride</i>).
Arkansas (<i>Mammoth Black Twig</i>).	Lombard.
Arkansas Black.	Pride (<i>Shipper's Pride</i>).
Ben Davis.	Waugh.
Coffelt.	Wildgoose.
Missouri (<i>Missouri Pippin</i>).	CHERRIES.
Northwestern (<i>Northwestern Greening</i>).	Dyehouse.
Ralls (<i>Genet, Geneton</i>).	Montmorency Ordinaire (<i>Montmorency</i>). ^c
Rome Beauty.	Morello (<i>English Morello, Wragg</i>).
Shackleford.	Richmond (<i>Early Richmond</i>).
Stayman Winesap.	Suda (<i>Suda Hardy</i>).
	GRAPES.
	Agawam.
	Concord.

^a Growers have supplied information regarding varieties both in personal interviews with the writer and by correspondence.

^b Some of the varieties mentioned in these lists are more commonly known in this region by a synonym than by the name that conforms to the rules of nomenclature adopted by the American Pomological Society. As these rules are followed as far as possible, the accepted name is given in each case. Wherever this course is likely to cause confusion as to the identity of any variety, the synonym by which it is commonly known is given in italics after the leading name.

^c Much confusion exists regarding the identity of the cherries grown in America under the names Montmorency, Montmorency Ordinaire, and Large Montmorency. Growers in the Great Plains area commonly use the name Montmorency without distinguishing one variety of this group from another. Many nurserymen also fail to discriminate between them. It appears probable that the variety most commonly planted in this area is the sort commonly known in the New York nurseries as Montmorency Ordinaire, though it has also been distributed more or less under the name Large Montmorency. The Large Montmorency variety of the eastern nurseries is claimed to be of better quality than Montmorency Ordinaire, but it is considered a shy bearer.

Varieties Suggested for the Central Great Plains—Continued.

GRAPES—continued.

Diamond (*Moore's Diamond*).
Niagara.
Worden.

GOOSEBERRIES.

Champion.
Downing.
Houghton.

GOOSEBERRIES—continued.

Industry.
Pearl.

CURRANTS.

Fay (*Fay's Prolific*).
London (*London Market*).
White Grape.
Crandall.

Varieties Suggested for the Southern Great Plains.^a

APPLES.

Early varieties.
 Early Harvest.
 Horse (*Yellow Horse*).
 Maiden Blush.
 Red June.
 Tetofski.
 Yellow Transparent.
Mid-season varieties.
 Grimes.
 Jonathan.
 Wealthy.
Winter varieties.
 Arkansas Black.
 Ben Davis.
 Bismarck.
 Gano.
 Limbertwig.
 Missouri (*Missouri Pippin*).
 Northwestern (*Northwestern Greening*).
 Ralls (*Genet, Geneton*).
 Rome Beauty.
 Winesap.
Crabs.
 Florence.
 Hyslop.
 Whitney.

CHERRIES.

Montmorency Ordinaire (*Montmorency*).^b
Morello (*English Morello, Wragg*).
Richmond (*Early Richmond*).
Spanish (*Yellow Spanish*).

PLUMS.

Damson.
Golden (*Gold*).
Golden Beauty.
Hammer.
Hawkeye.
Kroh (*Poole's Pride*).
Lombard.
Nona.
Pottawattamie.
Wolf.
Wonder.

PEACHES.

Alexander.
Alton.
Arp (*Arp Beauty*).
Carman.
Chinese Cling.
Elberta.
Heath (*Heath Cling*).
Lee (*General Lee*).
Lemon Cling.

^a Certain fruits are being propagated and planted in this section under the varietal names mentioned below, the exact identity and standing of which it has not been found possible to determine. It is possible that some of them are well-known sorts to which local names have been applied. As they are apparently of considerable value in this section of the Great Plains and the names as given have definite significance there, it seems advisable to mention them in this connection. The principal varieties that come in this group are:

Apples: Hale County Beauty, Lively Choice, Stormproof, Red Winter Cluster, Yellow Cluster.

Pear: McWhorter.

Peaches: Annie Williams, Dalmont's Favorite, Horlacher.

Plum: Six Weeks.

^b See footnote c, page 19.

Varieties Suggested for the Southern Great Plains—Continued.

PEACHES—continued.

Levy (*Henrietta*).
 Mamie Ross.
 Oldmixon Cling.
 Sneed.
 Triumph.

PEARS.

Alamo.
 Angouleme (*Duchesse d'Angouleme*).
 Bartlett.
 Koonce.
 Wilder.

GRAPES.^a

Beacon.
 Carman.
 Concord.
 Diamond (*Moore's Diamond*).
 Fern Munson.
 Gold Coin.
 Marguerite.
 Niagara.

Varieties Suggested for Western Nebraska.

No investigations regarding fruit growing have been made by the writer in western Nebraska and eastern Wyoming. It is perhaps possible, however, to suggest varieties of fruit for planting in this section of the Great Plains with greater assurance than for any other portion of the semiarid region. This is on account of the long experience of a nurseryman and fruit grower who resides in Saline County, Nebraska, and who for many years has been planting orchards in western Nebraska. After having tested a large number of varieties, he suggests^b for Lincoln County, Nebraska, and other comparable sections the following:

APPLES.

Early variety.
 Oldenburg (*Duchess of Oldenburg*).
 Mid-season varieties.
 Cole Quince.
 Day.
 Grimes.
 Jonathan.
 Maiden Blush.
 Plumb Cider.
 Wealthy.
 Winter varieties.
 Ben Davis.
 Missouri (*Missouri Pippin*).
 Ralls (*Genet, Geneton*).
 Winesap.

APPLES—continued.

Crab.
 Whitney.

PLUMS.

De Soto.
 Forest Garden.
 Hawkeye.
 Lombard.
 Wyant.

CHERRIES.

Montmorency Ordinaire (*Montmorency*).^c
 Morello (*English Morello, Wragg*).
 Ostheim.
 Richmond (*Early Richmond*).

Varieties Suggested for the Extreme Western Portion of Nebraska and Eastern Wyoming.

APPLES.

Early varieties.
 Oldenburg (*Duchess of Oldenburg*).
 Yellow Transparent.
 Mid-season varieties.
 Day.
 Longfield.
 Wealthy.

APPLES—continued.

Winter varieties.
 Northwestern (*Northwestern Greening*).
 Patten (*Patten Greening*).
 Ralls (*Genet, Geneton*).

^a Several of the varieties here named are hybrids originated and introduced by T. V. Munson, Denison, Tex. Other hybrids and seedlings of his production may also be adapted to this region.

^b In a letter to the writer.

^c See footnote c, p. 19.

FURTHER COMMENTS ABOUT VARIETIES.

As late spring frosts cause much injury to fruits in this region during the blossoming period, it is important to select for planting varieties that blossom relatively late so far as it is possible to do so.

Very few currants and gooseberries are grown in the Panhandle region and correspondingly little information is available as to what varieties are adapted to this section. Hence, no sorts are named in the lists of fruits for planting there. It is probable, however, that the varieties suggested for the central section would be as satisfactory in the southern portion as any that could be named.

Juneberries have been successful at some points and are probably worthy of planting throughout the portion of the Great Plains under consideration. Other small fruits, such as raspberries, blackberries, strawberries, etc., are occasionally grown but frequently suffer from drought, especially if it comes early in the season. Not much can be said at this time, however, as to varieties. The Kansas blackcap raspberry, the Kittatinny and Dallas blackberries, and the Mayes (*Austin*) dewberry have been mentioned as giving satisfaction, especially if they are given some irrigation. The fruitfulness of currants is also said to be greatly increased, in some instances, if they are watered early in the season.

In some of the colder and more exposed locations the cane fruits require protection to prevent winterkilling. This can be given by laying the canes down and covering with earth during cold weather.

It will be noted that in the lists of varieties suggested for planting in the central and southern Great Plains, many sorts are listed for both sections. This naturally follows, because of the similarity of the conditions existing throughout these sections. In fact it seems quite probable that the same varieties in nearly every case might prove satisfactory in both the central and southern sections. At least, a variety that is proving satisfactory in the central portion would doubtless be a promising one for trial farther south. Lower winter temperatures sometimes prevail in the central portion of this region than in the southern. There is more rainfall in the southern than in the central portion. Because of these differences varieties that can be grown successfully in the Panhandle of Texas might not, in all cases, prove sufficiently hardy and drought resistant for eastern Colorado and western Kansas.

In the majority of cases, those who have set out orchards or other fruits have not kept any record of the varieties planted. The variety labels or other marks of identification soon become detached and the names of the different sorts are forgotten. In a section like this, where little is known about the adaptability of varieties, it is very

often of great importance to know the names of the varieties that are being grown. This may be of value not only to outside parties but also to the growers themselves.

It is therefore recommended that whenever fruit trees or other fruit-bearing plants are set out, a record of the varieties be made and preserved for future reference. If a plat of the land be made showing just where every tree or plant of each variety is planted it may add materially to the value of other records that are kept.

Approved:

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *January 10, 1910.*

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