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Prunes, Apples, and Pears,
in Oregon.

By U. P. HEDRICK.

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The Bulletins of this Station are sent free to all residents of Oregon who request them.
Oregon Agricultural College.

Corvallis Or., Jan. 1, 1896.

The following bulletin on prune, apple, and pear growing, is respectfully submitted to the fruit growers of Oregon. The teachings and conclusions set forth in this bulletin are largely derived from data collected in making a Survey of the fruit interests of Oregon, an undertaking which was begun by the Horticultural Department of the State Experiment Station, September 1st, 1895, and which will be continued during the summer of 1896. In making this Survey, several weeks were spent by the writer; by Mr. A. H. Carson of Grant's Pass, and by Mr. E. L. Smith, of Hood River, in a careful examination of the orchards of Western Oregon. A large mass of data and observations has been acquired and it is hoped at the conclusion of the work that this may be published in such form that it will be of value to the fruit grower. Meanwhile, the information collected will be the basis of all bulletins upon practical horticulture issued by the Horticultural Department of the Station.

U. P. HEDRICK.
PRUNE GROWING IN OREGON.

The prune industry has grown to be one of the most important interests in the state. Already it has assumed greater proportions than all other orchard industries. As the favorite fruit crop of Oregon it has much in its favor; the trees are sure to bear, there are no climatic conditions to overcome, the finished product is not perishable, and its insect pests and fungous diseases are less numerous than other fruits. The trees suffer, it is true, from several pests but they are slight affections in comparison to the codlin moth and apple scab of the apple and pear, and, until we have curculio and black knot which render plum growing in the East almost impossible, we can say that prunes are free from diseases. Moreover, there is a growing demand for the product, dried and green, which promises well for the industry.

There are about 26,000 acres devoted to prune growing in Oregon. Prunes are grown throughout the western part of the state and along the Columbia and its tributaries in northern and eastern Oregon, but the major part of the industry is comprised in the Willamette and Umpqua River valleys. In the Willamette Valley, there are about 15,000 acres of prune orchards. As yet most of these orchards are on the black alluvial soil near the river and have not to any appreciable extent encroached upon the red hill soil farther away, though that soil will produce prunes is certain. The second largest prune district is the Umpqua River Valley. Here there are about 6,500 acres of prune orchards. The valley of the Umpqua seems to be the most favored region for prunes, trees and fruit reaching their highest perfection there. The Petite or French prune especially seems to thrive; the Italian can be as well, and perhaps better, grown in the Willamette Valley. The Petite prune, and the Italian
more or less, are grown very successfully in the Rogue River Valley also, where there are approximately 1,500 acres. Attempts are being made to grow prunes in Hood River Valley and along the Columbia in eastern Oregon, but experienced orchardists say that these sections cannot well compete with the more favored prune localities, and that their splendid fruit resources can be used to better advantage in growing other fruits. In these districts there are about 2,500 acres.

Climate.—One of the resources of Oregon is its climate. An adequate estimate of its functions and value as a factor in producing prunes, and its influence upon prune growing, would lead us far beyond the limits of a brief bulletin. But some of the practical information gathered from the recent Survey will be in place.

The horticultural effects of the Willamette Valley climate are as follows. All fungous diseases are more prevalent than in higher and drier valleys. The great prune pest of the state, shot hole fungus, finds a more congenial home and is far more rampant in the Willamette Valley than elsewhere. Brown rot, newly introduced into the state, is as yet found only here and will soon be a most grievous pest. In the humid atmosphere, moss and lichens quickly cover the trees. Strong winds, a feature of Willamette Valley climate, make it necessary to head low and prune so as to secure strong, stocky trees. Sunburn is not so common as in the warmer and drier valleys. Fruit ripens from one to three weeks later than in the other valleys. Deficiency in sunlight and summer heat makes the growth of some varieties of prunes unsatisfactory.

The chief horticultural effects of the Umpqua, Rogue, and Hood River Valley climates, are, in comparison with the Willamette; fewer fungous, but more insect pests; woolly aphis, green aphis, San Jose scale, red and yellow spider, are more plentiful, except perhaps in Hood River. There is an earlier and more perfect ripening of fruits, especially those of summer and autumn, because of the continual sunshine and dry air. On the other hand, Italian prunes do not attain their full size and best characteristics because of being forced into early maturity. Injuries from hot winds and sun-scald are more frequent. Local influences governed by topography are much more marked in these valleys, making it important that fruit locations be select-
ed with great care. More attention must be given to the special conditions and natural agencies which contribute to the development of fruit in any location. The rainfall is much less and the atmosphere not nearly so humid so that in some places prune growers may have, sometime, to resort to irrigation.

The same causes that make the differences in the various valleys, make local variations also, and these need always to be taken into consideration by the fruit grower. There are, for example, all through the state, small valleys, protected from cold winds, and heavy fogs, and open to sunshine, which produce fruits earlier in the season, and of better quality, than locations not so favored. Elevation ministers to the same effect. Rivers moderate climatic influences somewhat. In general, then, the metes and bounds of latitude are set aside somewhat by local modifications, and the intelligent fruit grower who chooses his location in accordance with climatic condition, will find in the climate a valuable ally.

Soils—Soils and stocks are intimately related, but of the latter we shall speak hereafter. Prunes thrive best in a rich sandy soil, as is well demonstrated by the splendid orchards grown on that soil in Douglas county. The second best soil is the black loam of the valleys, always provided that it is well drained. At present, most of the Willamette orchards are in this soil, and better ones can hardly be produced, when other conditions are proper. The red lands are third in the list of desirable soils, but great care in selecting locations on red lands must be taken in regard to depth of soil. One of the previous mistakes made by planters all through Western Oregon is that of locating their orchards on shallow soils. This is especially true on the red lands. The minimum depth of soils for prunes is four feet, and as much deeper than that as possible is desirable. Fine prunes are grown on granite soils, but these soils are not lasting and must be irrigated if best results are to be had. The above claims for the various soils are not arbitrary. In fact, location, drainage, and depth of soil have almost as much to do with success in prune growing as does the kind of soil. It must be remembered that there are infinite gradations between the various soils.

The prune tree is a gross feeder, its limbs growing oftentimes several feet in one season, so whatever the soil, it must be rich. On the other hand, a soil may be too rich, producing a
weak, watery growth not at all desirable. Prunes contain a large amount of water so that it is necessary to have a soil somewhat retentive of moisture, and also one that can be thoroughly tilled, that being essential to proper conservation of moisture. But, as before stated, the land for prunes must be thoroughly drained. This is to be emphasized at all times since one of the great faults of the prune orchards of Oregon is that they are not on properly drained land. Briefly, the ideal soil for a prune orchard is: A rich, sandy loam, warm, mellow and deep, containing sufficient vegetable humus to give lightness and retain moisture without being damp and heavy, and having good natural or artificial drainage. The character of the soil is not to be determined by surface appearance but by thorough examination.

**Procuring trees.**—Oregon is well supplied with good nurseries and a grower can get first class trees, but many hardly know what they want. One of the chief complaints among the prune growers we visited this fall, was in regard to their young trees. Procuring trees is so largely a matter of business and good judgment, that anything which any one aside from the buyer could say would be of little value, but a word or two in a general way will be proper here. Patronize the nearest reputable nurserymen, endeavoring to get stock at a low price, but not purchasing simply because of cheapness. Buy only first class trees, two years from the bud, having as an ideal, trees of medium size, with straight, stocky, hard growth, clean trunks, free from borers, insects and injuries, and a perfect union of stock and cion. Have your trees shipped as soon as they can be well dug, and set them as soon as possible, having the ground in the best condition. Buy only varieties which show the greatest adaptability to your particular location, a point which seems trite, but which nevertheless is not always observed. Varieties in unsuitable locations and mixed orchards are such common faults that particular attention is called to the fact, that only those which you know will do well should be planted.

**Stocks.**—Throughout the prune regions visited, perhaps no question awakened as much interest or received as much attention as that of stocks for prunes. The statistics collected by Mr. Carson show that in a little more than nine-tenths of the or-
Prunes are often grown on peach stocks. Mr. Carson believes, with the prune growers, that the peach is the proper stock. But after examining carefully, in this particular, all orchards coming under my observation, and taking the testimony of Prof. Coote, who as horticulturist at the Station, gave the matter attention for several years, the writer is satisfied that peach stocks are used too commonly in Oregon, and that the poor orchards on the heavy, black, damp, or cold soils are largely attributable to the fact that peach stocks were used.

Prunes can be and at one time were grown on their own roots, but their habit of sending up suckers condemned this practice. Peach roots were next adopted as a stock upon which to grow them, but in nearly all prune and plum growing regions, excepting the Pacific Northwest, the peach has been discarded for the myrobalan plum chiefly, and the marianna and St. Julien stock somewhat. We know of no experiments in growing prunes upon the latter two stocks in Oregon though extensive trials of prunes on these stocks might lead to valuable results. Any information concerning such trials will be gladly received at the Station.

The writer has but few followers in his belief that the peach is not the best stock for prunes in Oregon and so will give his reasons for thinking so pretty fully.

First. The range of soil on which peaches will thrive is very small. There are but few localities where prunes are grown in Oregon in which peaches would thrive at all even if climatic conditions were right. On the other hand the myrobalan plum is a thrifty tree in almost any soil.

Second. Peach roots require better drainage than plum roots. Good plum trees will grow on myrobalan roots, where it would be waste to plant them on peach roots. The importance of this is obvious to those planting on low lands.

Each peach seed produces a tree different from every other one in habit of growth and vigor. Does it not follow that the stocks must vary in their capacity to develop trees? Moreover, the pits in most cases have been obtained from a cannery from immature and poor fruits and there is a constant tendency in trees from such seed to degenerate. Stocks from myrobalan and marianna plums are obtained from cuttings, or ought to be, of
strong, vigorous trees and will therefore produce trees of a more uniform character.

Third. Prunes do not “take” as well on peach roots as on the plums. To do well some varieties, yellow egg for example, ought to be double “worked.”

Fourth. Some growers claim the myrobolaii to be a dwarfing stock. Wickson says “it is sufficiently free growing in California to suit all purposes, and to form a good foundation for full standard trees.” I know this to be true in other states and from reason and observation believe it to be true in Oregon.

Fifth. While plum stocks are susceptible to peach borers they are not nearly so much so as the peach stocks. Diseases affect peach roots oftener than the plum, and their life in general is more precarious than that of the plum so that a prune tree on a peach root is shorter lived than when on plum roots.

Sixth. We have the word of authorities in most other fruit regions that in general the plum roots are better. Wickson, in California says: “Choice of stock should be made according to soil, but unless it is known that there is some local advantages in the use of other stocks, the myrobolan should be used.” Taft, in Michigan says: “Plum trees do best on myrobolan stocks though the peach is sometimes recommended for light soils.” In the two greatest peach growing states in the Union, myrobolan stocks are recommended for plums.

We cannot help but think that many prune growers in Oregon have made a grievous mistake in selecting trees with peach roots and we advise any one contemplating planting prunes to look into the matter of stocks thoroughly. Only use peach roots when you have a peach soil is the advice we would give.

Preparation of Land.—One of the striking features of Oregon horticulture, as brought out by the recent Survey, is the great need and the great lack of drainage. In all of the orchards visited between Ashland and Portland and Portland and The Dalles, there were only eighteen that had been artificially drained, and not half that many that had been subsoiled. This fact is all the more significant because nearly one hundred of the fruit growers visited gave it as their opinion that their land would be benefitted by drainage, and Mr Carson takes a still more radical view of the situation, and says that nearly half of the prune
orchards will be practically profitless because of the lack of proper drainage. The whole trend of the information obtained in this Survey points to drainage as one of the great fundamentals of a rational system of horticulture in the valleys of Western Oregon. The need of it can hardly be over estimated and fruit growers must come to look upon the lack of it as the direct and indirect cause of a multitude of the ills of their orchards.

The essential mechanical features of good fruit land demand drainage. There must be an ability to get rid of surplus water if any orchard tree is to grow and thrive, even if the water is only abundant when the tree is dormant. Proper drainage helps to retain moisture in the dry season, since, if a soil have too much water it becomes puddled, then bakes, and sun and wind quickly evaporate all moisture from it. Well drained land is warmer in spring and fall because of not having the cooler water in it; it is cooler in the heat of the summer, when proper root growth demands an amount of moisture, coolness, and circulation of air, that can not be had in a baked, parched soil. A boggy, miry condition of the soil prohibits cultivation often times when it should be given, and so hinders good tillage. Good drainage makes available plant food that is otherwise lost.

By allowing a free passage of currents of air, carrying with them rich substances in the atmosphere, it helps to fertilize a soil.

Subsoiling.—Intimately connected with drainage is subsoiling. What has been said about the necessity of drainage largely applies to subsoiling. It is a peculiarity of Oregon soils that you can not judge the subsoil, with any certainty whatever, from the surface, nor can you infer that the same subsoil extends for any great distance under the same surface soil. Conditions vary so that every fruit grower should examine his soil in several places and judge for himself if any part of his orchard needs subsoiling.

Any soil having an open porous subsoil cannot be benefitted by having the soil made more open. But any soil upon which water stands, or runs off, having a subsoil that is at all compact, and to any great degree impervious to water, ought to be subsoiled. Often times deep plowing will help to accomplish this object. But generally an implement which can be pulled through this compact soil, breaking, and loosening it up, must
be used. The nature of the soil determines the depth of subsoiling.

Like drainage, subsoiling tends to dispose of surplus water, allowing it to filter through the hard-pan, and also helps to retain it in a dry season, since the water sinks lower in the ground and is not so easily evaporated, but rises gradually by capillary attraction. The act of subsoiling tends at first to dry a soil out, and unless a rain follows before crops are put in may in this way be for a time somewhat injurious. Therefore, subsoiling ought to be done sometime before a crop is planted that the soil may contain the proper amount of moisture. The after cultivation of land that has been subsoiled should be as shallow as possible, thus by mulching, the evaporation is checked and moisture is retained. Such cultivation should be frequent and long continued.

Setting Trees.—There are a few points about setting trees which need emphasizing. It is obvious, first of all, that the rows must be straight. Any man with ingenuity and a “good eye” can secure this result. So far as trimming trees before planting is concerned, it is advisable to cut away all roots which are broken and injured, since a smooth wound will heal more quickly than a ragged one. Roots of inordinate length may of course be cut back to make a symmetrical root system. When a tree is dug, half of the fibrous roots are left in the ground. The top, therefore, ought to be cut back a corresponding amount, or more so, since it will require some time to resume vital activities. Trees not so trimmed often fail to grow at all, or if they start, are, in their weak condition, destroyed by droughts or pests.

The following rules for tree planting are always in order: The soil should be well firmed about the roots of trees; the roots straightened out in approximately their natural position; the hole should be large and roomy; the earth fine and dry enough to crumble; the tree to be set a little deeper in the soil than it stood in the nursery row; the roots of the tree must not be long uncovered; and every care must be taken to get the tree in the natural environment as quickly as possible. If the operation of tree planting is to be perfect these details must be observed.

Distance Apart.—It is an almost universal fault throughout
the state for prune growers to plant their trees too close together. The shrewd growers are convinced of this and will tell you not to plant less than twenty-two feet apart. The Petite prune, perhaps, may be well grown at twenty feet. Trees are gross feeders and need plenty of room. Additional reasons for a greater distance apart are, that it allows of better cultivation, enables you to spray more easily, and it will give you a well formed, strong tree with an individuality of its own.

*Cultivation.*—The most widespread, and the most serious fault of Oregon prune orchards, as I conceive it, after having spent some time among them, is, neglect. Commonest among the many things neglected, is neglect in tillage. It must be said that prune orchards in general yield so abundantly without tillage that it is not to be much wondered at that the prune growers think they do not need tillage. Every orchard is so greatly influenced by special soils and conditions in which it grows that it is hard to attribute the behavior of an individual orchard to either tillage or the lack of tillage. But if a man thinks for a moment of the obvious effects of tillage upon any crop in the soil he will see at once that cultivation is essential to any rational system of horticulture. Corn, potatoes, vegetables, all annual crops demand cultivation. Berries and fruits do not differ from vegetables in any of their activities of life, and that which benefits them must be as useful to these. Cultivation must be judicious or grievous damage to an orchard may result. There are underlying principles of the operation which must be interpreted with considerable skill if cultivation is successfully done. Just what proper cultivation is, must be determined by every man, for every farm, and for every season. Only general principles can be given and a few of these are as follows: All young orchards should be given perfectly clean cultivation. All through the state we saw young orchards smothered in weeds the owner thinking it not necessary to cultivate until the trees began to bear. *It is necessary to cultivate the first year* so that the trees may be rightly started and the roots sent deep enough into the ground to escape the plow and cultivator in future years. As the orchard comes into bearing, the cultivation, perhaps, need not be so thorough, the orchard itself, in its wood and fruit, being the indicator of the treatment needed.

Usually, sowed crops should be avoided in an or-
chard, since they forbid all chance of cultivation and use up plant food and moisture that should go to the trees. Occasionally, on an extremely rich soil, an orchard may be brought into bearing by sowing a crop of grain in it. There is no objection to growing hoed crops or small fruits in a young orchard but the land must be well tilled and well fed, and it must be stopped when the trees come into bearing as there is but little land that can be worked on the share system—a good yield of fruit and of another crop at the same time.

Cultivation should begin as early in the season as possible and should be given frequently thereafter until the time to cease comes, which, in this climate, is the middle of July or the first of August, this always to be governed by the growth the tree is making. Early cultivation is important since it warms up the soil, gets it in good mechanical condition, kills the sprouting herbage, and gets the trees quickly to work. It should stop as soon as the tree has completed the desired growth so that it can ripen and harden its wood for the winter.

We are not sure but at this time a catch crop of rye, crimson clover, or some other quick growing plant might not be grown to advantnge, to be plowed under in the spring. The merit of such a course would be that the unsightly crop of weeds which springs up after the summer's cultivation is finished, scattering its seeds to the four winds, certainly poor husbandry, would be destroyed; more important than this the mechanical condition of the soil would be greatly improved since it would keep it from running into a molten mass in the winter, would dry it out more quickly in the spring, and add very greatly to the vegetable matter of the soil. It would also aid in ripening the wood of the trees. This matter is only a suggestion however to be thought over by the grower. The practice is becoming a favorite one with Eastern orchardists and is recommended by Eastern writers.

In a young orchard it is advisable to plow the land each year for several years. The after cultivation should be with an implement which with the minimum expenditure of time and labor, will destroy weeds and keep the surface soil loose and friable. There are such a host of good implements that there need be no trouble in finding one suitable for any purpose. Disk harrows,
spring tooth-harrows, clod-crushers, smoothing-harrows, weeders, and cultivators all have their places. The reversible disk-harrow, we find, is a favorite implement with many Oregon fruit growers. The frequency with which we should cultivate, depends upon the soil, season, and purpose. Cultivating once a week some seasons is not too often especially if its object be to conserve the moisture. A crust should never be allowed to form or weeds to become established. The soil should always be left soft and fine if the fresh and grateful effects of a mulch are to be obtained; when left in this condition the roots are enabled to reach every portion of the soil, thus utilizing a maximum amount of plant food much of which otherwise might remain unavailable. An implement should be used which will allow of working close to trees so that high pruning need not be encouraged on account of close working.

Pruning.—Prune trees, generally, have been fairly well pruned in Western Oregon. It is an operation not at all difficult to learn since the advice given in horticultural books is plain and generally good. Opinions differ as to what the ideal tree, after pruning, should be. The consensus of opinion of the best growers, as we conceive it, after talking with them, would favor a tree about as follows: A medium, low, roundish, symmetrical top, upon which the fruit can be readily thinned and picked, the tree easily sprayed, and upon which there are strong branches, that will not break with a load of fruit, and that will shelter the stem from the sun. Such a tree will be vigorous, and long lived. Considerable data regarding pruning was obtained in the Survey, but is of a nature hardly suitable for a short and popular bulletin, however, one can conclude from it that while failures are not often caused by neglect in pruning yet they are aggravated by it, and the experience given in the various reports presses home in the most convincing way the fact that careful and thorough pruning has much to do with the success of a prune orchard. A man of good judgment will not adopt arbitrary rules for pruning, but the following hints, as a guide, may be of value to him.

In forming the head the branches should be distributed upon the different sides of the stock as much as possible. It should be formed by selecting several branches well distributed along the
stem for a distance of one foot down from the top and pointing in such a way that the head becomes well balanced and symmetrical. The strongest upright branch should be left as the leading shoot and be so trained that other branches can be given off from it. Side branches should be well cut back.

After the head is formed an annual pruning should be given though branches or shoots out of place ought to be removed as soon as discovered. In Oregon, prune growers consider late winter the best time to prune but the work can be done any time after the wood has thoroughly ripened and before the buds start in the spring. It is almost a universal fault in a prune orchard to find too much wood. There ought to be just so much wood and so much fruit, to secure which, you may either head back or thin out branches. If headed back, the cut should be made above a bud growing on the upper side of a limb so that the new branch will take a natural upward and oblique position, making a broad, strong branch with great weight bearing power. Be prudent in thinning out the branches of a prune tree as a tree will support many branches, having a tendency to "open up" as the branches become loaded with fruit. Crotches should be avoided, as when two branches of equal size form a crotch it is almost certain that one of them will break.

A pair of pruning shears or a sharp pruning knife is sufficient to do all the pruning needed if the work is undertaken in time. The use of a saw is to be discouraged though it is frequently a necessary evil. In making a cut no projecting spur should be left and the wound should be as small as possible, care being taken not to tear or injure the bark. The cut should always have a good slant. Whenever a wound is made with so great a diameter that it will not grow over in one season, it should be painted with something to keep the wood from checking and rotting. Shellac dissolved in alcohol is good, or ordinary paint may be used. To prune intelligently the habit of growth of the tree, whether upright, spreading, or close growing, should be studied. In fact, in practice, it will be found necessary to give every variety of fruit a little different treatment.

Thinning Fruit.—One of the striking facts brought out by the Survey, in regard to profit in growing prunes, was, the much greater net profit in growing prunes of a large size. Net
profits were almost double in some cases by an increase in size. The question as to why prune growers did not thin their fruit and get large prunes was constantly suggesting itself. In looking over the records of the Survey I do not find a dozen men who practice thinning their prunes other than by reducing the wood of the tree by pruning. The best prunes can not be grown, nor really good prunes can not be grown on overloaded trees. The quantity of fruit in bushels will be the same on a tree whether the fruit is thinned or not, and you have for the trouble of thinning a handsomer and much more valuable product. Thinning requires considerable work but if systematically done it resolves itself in a simple job, and, at any rate, the fruit must be picked sooner or later and the work done in June and July saves just so much work when the crop ripens. From this standpoint then, it is an extremely short sighted policy not to thin fruit, but there is another factor which makes the operation still more important.

On trees that have had their fruit thinned there are, of course, many less pits, the large fruits being mostly watery flesh. For the formation of the excessive number of pits in the fruits on unthinned trees it requires a much greater quantity of the mineral elements of the soil and since these are the elements most apt to be wanting and most difficult to obtain it is obvious that the growth of a tree, over loaded with fruit, is checked, its vitality weakened, and in the end productiveness lessened.

During most seasons, on trees overloaded, much of the fruit drops. Had this fruit been taken off at the proper time there would have been a much less strain upon the tree. If properly thinned, the danger from "brown rot" or "plum rot," which has shown itself in the State and which threatens to do considerable damage, will not be so great, since the disease is communicated from fruit to fruit, hence will be worst where the fruit is the thickest.

The thinning can be best done when the prunes are about the size of the end of one's thumb, though no set rule can be given for the operation. The quantity of the fruit removed must vary with the size, and vigor of the tree, the variety, and the way in which the tree has been pruned. When the work is done the fruit should be evenly distributed over the tree, making due
allowance for the size and strength of the various branches. With a little experience a tree can be very easily thinned, the prunes being pulled off in hand fulls. The work is much facilitated if the tree has been well pruned, since pruning in itself reduces the number of fruits to be removed, and makes it easier to get at the fruit on the tree.

**Fertilization of prune blossoms.**—Important discoveries have been made by workers in the Agricultural Department at Washington in regard to varieties of fruit that are infertile, or somewhat infertile, with themselves,—that is the pollen of a variety does not fertilize the flowers of the same variety but is perfectly potent upon the flowers of another variety. The Clapp and Bartlett pear and Spy and Spitzenburgh apple are notable examples of varieties which are somewhat self-sterile and require trees of other varieties to be mixed with them to secure free fertilization of flowers. The subject is, as yet, but little understood, no experiments of value having been tried with prunes, so we dare not say much that can be construed as at all authoritative. We diligently sought for information upon the subject while making the Survey but could get but little. What we could learn, and observation, lends color to the view that some varieties of prunes, like apples and pears, are inclined to be somewhat self-sterile and that better fertilization is secured in a mixed orchard. The matter is one of great interest and some importance, especially to large prune growers, and the writer will be pleased with any data or information bearing upon the subject.

**Insects and diseases.**—The following is a brief summary of the number of orchards attacked by the various pestiferous enemies of the prune, as summarized from data obtained on the Survey: All of the prune orchards visited were affected with shot-hole fungus; all had been or were affected by borers; the green aphis had been in forty-one of them during the season. San Jose scale and woolly aphis were found in a few orchards, but orchards were generally, even in infested regions, pretty free from both these pests neither of them being particularly fond of the prune; the bark being so compact that they can hardly pierce it with their beaks. "Canker" was found in fifty-one orchards the disease being the most grievous in the Willamette Valley. A
small yellow mite, the "yellow spider" was found doing considerable damage in Rogue River, and Umpqua River valleys. "Brown rot" one of the worst fungous diseases Eastern plum and peach growers have to contend with was found in several orchards in the Willamette. Gophers were everywhere abundant and the amount of damage this pestiferous animal does is almost equal to that of all other pests combined, this of course will be lessened as the orchards grow older.

In general, prune orchards were in a very fair condition, in regard to pests, though it was everywhere obvious that all pests were becoming more numerous, and that the necessity for spraying had not existed in the past as it does at present. Prune growers should congratulate themselves that they have not as yet the curculio and black knot, the great enemies of prune culture in the East. Shot hole fungus seems to be firmly established in all orchards; some were but slightly diseased, the foliage of others was completely riddled. Prune growers must take means to keep this disease in check, or, through the defoliation and consequent weakening of the tree the prune crop will be greatly lessened. Only 30 prune orchards had been sprayed and the work in half of them had not been done thoroughly.

A spraying bulletin has just been issued from the Station which gives direction for spraying prune orchards, so that the matter only needs to be briefly touched here. For shot hole fungus and all other fungi, spray two weeks after blossoms have fallen with Bordeaux mixture. 10-12 days later repeat. Repeat when fruit is about half grown. After the crop has been gathered, it is well to spray again. For fungi we do not think a winter spraying needful. If a necessity arises for spraying when the crop is nearly ripe, for "brown rot" for instance, use the copper sulphate mixture, 1 pound to 300 gallons of water.

Varieties.—Though other sorts are locally popular, the French, or as it is known in Oregon, the Petite prune, is the universal favorite in the commercial world, and where it thrives among fruit growers. Unfortunately it does not do well in the Northwest except in certain favored spots and so growers must be content to grow a prune not quite so popular in the market at the present time, but one which bids fair to create a special market for itself, and when its good qualities becomes known
by a more general introduction it may be confidently expected that it will command a price equal to the French prune; and, since it can be only grown to perfection in the Pacific Northwest it is not beyond the range of possibilities that it may become a special product. We speak of course of the Italian prune.

**The Italian Prune.**—*Fellenburg, German Prune, Swiss Prune.*—Medium size or large roundish but tapering at both ends; suture small but distinct; color dark purple with a heavy bluish bloom; stalk 1 inch long cavity shallow; flesh yellowish green, juicy, parting easily from the stone; flavor sweetish with sub-acid, delicious; tree hardy, vigorous and very productive. It is not known where the Italian prune originated but it has been grown in Italy for a long time, where it finds great favor in its fresh state.

At present the Italian is the recognized prune of the Pacific Northwest. As grown in this section it is superior in quality, size and productiveness to any other prune grown. When dried it is much larger than the French Prune, and its acid flavor makes it more agreeable to the taste for most people. In color the dried product is black or bluish black, in quality it is quite distinct from other prunes, having a most agreeable sub-acid flavor.

**Prune D'Agen:**—*Petite Prune, French Prune, Prune D'Enle, and Robe de Sergent.*—The fruit as grown in Oregon may be described as follows. Medium-sized or small, oval or egg-shaped; suture small, distinct; color, violet purple with bright colored bloom; stem short, slender; cavity small, and shallow; flesh greenish yellow, sweet, full of sugar, rich and delicious, clinging slightly to the stone.

This is the prune which is grown in the leading prune districts of the world. It is known under so many names, there are so many sub-varieties, and the nomenclature in general is so confused that the real Prune D'Agen is hard to identify.

The Prune D'Agen is smaller than most other varieties. It has a larger proportion of solids and sugars and so shrinks less in drying. The lack of acid, however, gives it an insipid flavor and this is the chief defect of the prune when dried, and renders it almost worthless in the fresh state. The qualities that make it so popular are, the wonderful productiveness of the tree, small shrinkage in drying, and its sweetness recommends it to many. The tree is very healthy and vigorous, bearing large crops and rarely failing to yield a crop. It is very particular in regard to soil and climate, doing well only on a rather light, dry soil, and in a warm, dry climate. In Oregon
these conditions are to be found best in the Umpqua and Rogue River valleys.

**Silver Prune.**—**Coe’s Golden Drop.**—Size large, oval or roundish; suture distinct, one side abnormally large oftentimes, necked; color light yellow, in the sun small red dots; stalk stout, nearly one inch long; flesh yellow, juicy, firm, adhering slightly to the stone; flavor rich, sugary, good quality; tree a vigorous grower and very productive.

It was originally thought to be a seedling from Coe’s Golden Drop, but authorities have decided beyond all question of doubt that the two plums are one and the same, local modifications and conditions changing the fruit so that one might think the one a sub-variety of the other.

The trees are hard to grow and for this reason, as a general thing, the variety has not proved profitable.

The dried product of this variety, if properly prepared, is as fine as any put upon the market, both in size, and flavor for many. Unfortunately, public taste demands that a white prune be sulphured, a process which injures the quality of the product as a food, and which in some markets creates a prejudice against it. The dried prune contains much sugar but has enough acid to give it an agreeable flavor.

**Reine Claude.**—As yet we are not quite sure about this variety. The Reine Claude of France, the favorite plum of that country, is our Green Gage growers deny it. Another year we shall be sure of the matter.

The fruit of the Reine Claude is small; suture faintly marked; color yellowish green sometimes marbled with red; stalk slender, three-fourths of an inch long; flesh greenish yellow, not clinging to the stone, juicy, melting; flavor excellent, very mildly acid, sweetish, unsurpassed. As a dried product, when bleached, it is a bright golden yellow in color and has a delicious flavor.

The Reine Claude will never be one of the great commercial prunes but as a fancy product it is surpassed by none, being almost equal to the best raisins or figs.

**White Egg.**—**Yellow Egg, Magnum Bonum.**—A very large, oval plum with a neck at the base and a distinct suture; stalk an inch long, not sunk but surrounded by a fleshy ring; color light yellow with a thin white bloom; flesh firm and juicy and clinging to the stone; flavor acid. Not to be recommended for the dried product though it finds some favor in the fresh state.

A few varieties of prunes, several of considerable promise, have originated in the Northwest, among them are the following.
The descriptions, in the main, are condensed from this year's "Prune Number" of the Rural Northwest, a paper to which we are also indebted for some facts concerning the preceding varieties.

**GOLDEN PRUNE.**—A prune clearly resembling Coe's Golden Drop or the Silver Prune, being however, a little more rounded, slightly different color, and flavor a little different. The dried product is of excellent quality. The tree, like that of the Silver Prune is not hardy or vigorous. This is its great defect. The prune originated with Mr. Seth Lewelling of Milwaukee, the originator of the Black Republican and Bing cherries.

**WILLAMETTE PRUNE.**—A dark ruddy brown prune of the Italian type. Said to be some larger than the Italian, a little sweeter, a little earlier, and to dry heavier. The dried prune is dark much like the Italian. It requires considerable skill in curing. In the fresh state it is hardly surpassed in quality. Originated with Mr. Jessie Bullock of Oswego, Oregon.

**TENNANT PRUNE.**—Another prune of the Italian type, which originated with Rev. John Tennant of Ferndale, Washington. Said to be much earlier in ripening than any of the prunes now generally used. It has been largely planted in the northwest, but enough trees have not come in bearing so that its qualities can be well known.

**THE PACIFIC.**—A variety having the general characteristics of the Willamette prune. The Pacific is said to be larger and more juicy than the Willamette. Especially recommended for good quality in the fresh state.

**THE DOSCH.**—A seedling plum coming from Mr. H. E. Dosch of Hillsdale, Oregon. An early and unusually large prune, making a cured prune larger than that of the Italian, though too juicy to dry well. It is sweet and of first class flavor in the fresh state.

**CHAMPION PRUNE.**—Also an Italian seedling originated by Mr. Bullock of Oswego, Oregon. Earlier than the Italian. Large, round, reddish bloom; flesh firm, good quality, sweet, and parting from the stone easily. Tree productive and a good grower.

**Evaporators.**—Getting the fruit evaporated is the greatest bugbear the prune grower has to deal with. The evaporators now in use turn out all grades of prunes, and while a poor product may be largely attributed to the care and attention which has been given the operation, yet it is more largely the fault of the evaporators. Herein lies a great chance for improvement and prune growers should begin to give the question considerable thought. The Station has given the matter all the attention possible and hopes before the next crop is evaporated to issue a bulletin upon the subject. Not much can be said in this bulletin, but I can say, after having examined a great number of driers, that I am convinced that steam in steam pipes furnishes the most efficient and economical heat for drying prunes, especially for a large establishment and advise those who contemplate building evaporators to look towards steam as one of
the means of making better evaporators than we now have. The greatest objection to steam is its cost, but once in use there is such a saving in running the plant that the excess in first cost is soon made up. Steam driers may be built in many localities through some co-operative plan. It is certain that when a few have been built that competition will force all growers, both because of economy and because of the much better product put out, to take their fruit to evaporators using steam.

Steam may be used in an almost endless number of ways to suit circumstances and may be adapted to many styles of evaporators now in use. A great point of merit in a steam evaporator is that the operation of drying the fruit is completely under the control of the operator; chance and "luck" are largely eliminated and a standard product is assured. Another feature not to be lost sight of, is that the steam may be utilized in running graders, parers, dipping apparatus, hoisting fruit, pressing machines, heating water etc, making altogether a thoroughly practical and business-like establishment. As a model evaporator of this kind the reader is referred to that of Mr. C. H. Richer of Vancouver, Washington. We are well aware of the fact that there are two or three steam evaporators in the state that are not doing good work, but this does not alter our view of the matter as we consider their lack of success due to poor arrangement for carrying off the moisture laden air, rather than the means of furnishing heat.

Shipping fresh prunes.—In the shipping of fresh prunes East one may reasonably believe that a new era has opened for the prune industry. The opening of the era however is too recent to warrant much discussion. The outlook is promising indeed for this branch of the industry and has already stimulated into renewed activity growers who were inclined to take pessimistic views of the future of the dried product. The popularization and distribution of good fresh prunes in the East must cause the demands for them to grow until the past few years achievements will appear but little more than a suggestion when the real development has taken place. Because of their tough skins the Italians have, so far, proved the best shippers.

Cost of a Prune Orchard.—At the Experiment Station we are often asked what it costs to produce a bearing orchard. The following, taken from data given by 132 prune growers, is the
average cost of planting and caring for a four year old prune orchard.

FIRST YEAR.

<table>
<thead>
<tr>
<th>Description</th>
<th>Per acre.</th>
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<tr>
<td>Cost of trees, 20 feet apart, at 10 cents each</td>
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<tr>
<td>Preparing ground</td>
<td>3.10</td>
</tr>
<tr>
<td>Planting trees</td>
<td>3.15</td>
</tr>
<tr>
<td>Cultivating</td>
<td>3.20</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$20.25</strong></td>
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SECOND YEAR.

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<tr>
<td>Pruning</td>
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<tr>
<td>Replanting</td>
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<tr>
<td><strong>Total</strong></td>
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THIRD YEAR.

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<td>Pruning</td>
<td>1.45</td>
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<tr>
<td>Spraying</td>
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<tr>
<td>Replanting</td>
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<td><strong>Total</strong></td>
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FOURTH YEAR.

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<td>Spraying</td>
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<td>Replanting</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$8.15</strong></td>
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</tbody>
</table>

Total for four years: **$41.80**

While the data given above was taken from those engaged in growing prunes, it must not be thought that the figures represent more than the approximate cost of an Oregon prune orchard. The writer believes that the cost is somewhat lower in the average given than the real cost of a good prune orchard because, in the statistics given us by the growers many of the needful operations had been omitted, especially true of spraying, thus reducing the average. There were many orchards, too, that were entire failures from which no data was taken.

**Profits.**—One hundred four and a half dollars, is the average net profit per acre of the 1894 crop, as summarized from the reports of the Survey. The extremes in the figures given us were so great, and the growers seemed to know so little about the cost of the various operations connected with getting the fruit on the market that we hardly know whether we dare recom-
mend the average given, as even approximately correct. However, it is of interest and will serve as a guide to any one who cares to make estimates on the profits of a prune orchard.

The figures refer to sales in the open market of all grades of fruit. We believe the estimate to be a very conservative one from the orchards from which the data was taken. But the reader need not order trees to plant his farm. Data could not be obtained from the scores of profitless orchards. Moreover, prices are not apt to be so good in the future, as no product of the soil will bring a fancy price through a long series of years. This is not to discourage the real fruit grower, as we believe there is no branch of horticulture that promises greater rewards than prune growing does to the careful and energetic horticulturist. But the lawyer, doctor, preacher, merchant, or the man who fails in the trades and professions, need hardly hope to gain a fortune in growing prunes.
APPLES IN OREGON.

APPLES are not as plentiful in Oregon as they were a few years ago. The situation seems to be this. The old orchards were largely planted as minor appendages to a general farm. Fruit was grown for home use, and not with the idea of selling it. Years ago these old orchards began to die. On this decreasing orchard area a whole host of pests concentrated their energies; they came unnoticed and without hindrance; moss was allowed to cover the trees and cultivation was neglected. All this was allowed because the incentive for an orchard was in no sense a monetary one. But this is changed, there is now a monetary incentive for an orchard, and thousands of acres of new orchards are being planted and attempts are being made to rejuvenate many of the old ones. We have fewer apples in Oregon today, then, because this is a transitory period, in the production of apples, between the old orchards, now nearly annihilated, and the new ones not yet in bearing.

The cause of the failures of the old orchards can be remedied. There are no insurmountable obstacles in the way of growing as good apples, in the land once famous for its "big red apples," as ever have been grown. No great climatic changes have occurred since the fine fruit was grown; the soil is the same, with the exception that it has been robbed somewhat of its fertility; and these, climate and soil, are the factors that make a fruit region. To again grow Oregon apples in their pristine beauty and quality, the orchardist has but to renovate or rejuvenate his orchard, by tillage, enrichment of the soil, pruning, and by making warfare upon all pestiferous enemies by spraying. But to do this, apple growing needs and must be made a special industry, to be handled by keen and energetic men.

Favored apple regions.—There are still localities in Oregon, where the apple grower can rely upon the fertility of the soil, the congeniality of the climate, and the immunity from pests and diseases, to produce good apples without much care on his part. The apples that are grown in Hood and Rogue River valleys and Eastern Oregon, fruit unsurpassed in beauty and qual-
ity, are grown under much the same condition that they grew in Willamette Valley years ago. The lesson to be learned by the horticulturist in these favored spots, from their neighbors in the Willamette Valley, is easy. The splendid young orchards growing in these valleys, should not be neglected,—allowed to go unpruned, the land untilled, and the trees yearly taking the fertility of the soil and nothing returned. Because of present immunity from pests, security from them should not be overestimated. Fungi and insects, numerous and voracious, are already swooping down upon the orchards in these valleys and it behooves individuals and communities to wage war upon them. The future profitableness of apple growing in all virgin apple localities in Oregon, depends upon their now being rightly pruned, sprayed, fertilized, and cultivated.

HINTS ON PLANTING AND CARING FOR AN ORCHARD.

Lack of space prevents going into details in this bulletin with apples, as with prunes. It is hoped that a more comprehensive treatise on the subject may be issued within a few years. However, general principles laid down in the prune part of the bulletin, regarding soils, climate, drainage preparation of land, and cultivation, will be found as applicable to apples as to prunes.

Before planting.—"Well begun is half done." In an orchard, on a badly selected site, or composed of poor varieties, or in which the soil has been imperfectly prepared, all subsequent treatment will give correspondingly poor results. First of all, then, a fruit grower must be sure that his location and soil are well adapted to apples, and to the particular variety he wishes to grow.

Secondly, a careful study of varieties should be made before trees are purchased, as an error in this direction is a costly one. In general, the behavior of a variety in the planter's own neighborhood is a good indication of its value to him, provided of course that it is marketable. A mistake in selecting varieties once discovered, should speedily be remedied by top grafting.

Thirdly, the soil should be in the best possible tilth,—in an all around good condition, before a tree is set.

Locations and soils.—The apple tree is a comprehensive feeder and will thrive on almost any type of good soil. A more
primal requisite in Oregon is, that the location be a good one. In this state only perfect familiarity with most land will qualify a man to judge of its fitness for an orchard. Bed rock and impervious subsoils approaching the surface make much land unfit for an orchard. Flat wet land and land with “bad spots” which remain cold and sour, and in which trees die out after a year or two, is poor land for an apple orchard even if tile drained, as the soil is apt to be hard and full of clods. Some rolling lands will require drainage because of having stiff, tenacious subsoils near the surface. Familiarity with the “lay of the land,” and with its possibilities is necessary to enable a man to judge of its adaptability for an orchard.

Lack of drainage the commonest fault of Oregon orchards.—Too many young orchards are set in undrained land. Undrained land does not admit of proper tillage; plant food is not available; the soil is too cold in the spring and bakes and is too warm in the summer; it does not allow of proper air circulation. Naturally wet, boggy, land, or land with a hard impervious subsoil is unfit for an apple orchard unless it is thoroughly and systematically drained.

Preparation of land.—The best way to get a soil in good mechanical condition for an orchard, is to grow some cultivated crop the season before the orchard is to be set. In this way the soil will be made mellow, pernicious weeds will be destroyed, and any “sour places” may be discovered and possibly done away with. It is very essential that the soil be fine and mellow so that the young tree can establish itself well, and send its tender roots deep in the earth, out of the way of the plow and cultivator in the future. Loose, fine earth also acts as a mulch, by destroying capillary attraction, and thus prevents the moisture of the soil from being evaporated.

Planting the trees,—Whether spring or fall planting is best in this climate is hard to say. To plant in the fall and have the trees stand in the water-soaked soil during the rainy season, does not seem right. But when conditions are proper there are many advantages in fall planting. If the ground is well drained, and in good condition, and the trees well matured, apples can be set with best results in the fall. For these reasons; the trees will become established during the winter and will start to growing in the spring before spring planting can be-
gin; the early growth thus made will enable the tree to better withstand the dry summer which is sure to follow; fall planting saves heeling in; and better trees may generally be had by ordering in the fall. The operation of setting the trees needs to be done with every care, taking all precautions to quickly get the plant in its natural surroundings without injury to it.

I advise not less than 35 feet apart each way for apples. A good safe distance apart allows of many conveniences in working in an orchard and by the added productiveness, arising from better tillage, more plant food, more sun, and more water, will well pay.

Cultivation.—What has been said concerning cultivation of prunes is quite as applicable to apples. It is a safe generalization, to say that an orchard should never be seeded down. Even in growing crops in an orchard that may be cultivated, the temptation to continue doing so is so strong that the orchard sometimes become a minor crop. If necessary to sow grain in an orchard, sow it in strips, running one way between the trees, allowing room to cultivate between the grain and trees. As a temporary expedient an apple orchard may sometimes be thrown in bearing by planting it to grain, but this done, it should be brought under cultivation the following summer.

As stated in the prune part of this bulletin, cultivation should begin the first year; it should begin each spring as soon as the ground is dry enough to allow it; and should be stopped in time for the wood to ripen for the winter.

Since writing the paragraph concerning catch crops for prunes, (to which the reader is referred,) my view of the matter has been considerably strengthened, and I wish to urge its practice more strongly than I did in that paragraph. In a paper written by Prof. E. R. Lake for the State Horticultural Society, the value of a catch crop was strikingly shown.

A 25 acre strip in a large prune orchard worked by Prof. Lake, was allowed to become covered with a rank growth of wild mustard. The crop was turned over, and the following season, Prof. Lake says:-“The soil of this mustard strip remained moist and friable all summer through, and with one-third the tillage it presented a more favorable condition for tree growth, as shown by the vigor of the trees, than any other part of the or-
chard under similar circumstances. The saving in expense of tillage can fairly be estimated at $75.00 as we tilled the rest of the orchard the past year."

We have quoted this passage simply to show the value of such a crop in saving tillage, but there are other effects well worthy of consideration, chief of which is, its office in catching and holding plant food—both nitrogen and the mineral elements; its office in destroying weeds, and its rendering early tillage possible.

The nature of the catch crop must be determined by practice in the different localities. Prof. Lake has been growing vetches and crimson clover as well as the mustard, but at present, prefers the wild mustard which he allows to seed itself. Other possible crops are, oats, rye, buckwheat, peas or rape.

Pruning.—In this short bulletin, it is not intended to enter into a general discussion of pruning. The reader is referred to the horticultural literature upon the subject, much of which, judiciously interpreted, is good, remembering always to prune for advantages peculiar to our climate and your particular location. Pruning to produce fruitfulness in Oregon need never be given consideration, but, on the other hand pruning to reduce the crop by cutting out bearing wood, is sometimes a necessity.

The height to head is greatly influenced by location. The warmer and drier a climate the lower trees should be headed. Low heading has many practical advantages, such as ease of picking fruit, of pruning, of spraying, and less damage from strong winds. But the good health of the tree resulting from shading the trunk is the chief merit of the system. In heading low the limbs must be trained obliquely otherwise there will be difficulty in getting close to the trees with the cultivator. We are not advocating for this climate the California method of pruning, but recommend a mean between their low heading and our high heading, not dispensing, as the Californians do, with a central trunk and strong side leaders.

Self sterile varieties of apples.—The studies of Waite and Fairchild in the Agricultural Department at Washington, have quite clearly demonstrated that some varieties of apples are more or less self-sterile, and that to insure free bearing these varieties ought to be planted in a mixed orchard. The following
varieties are supposed to be somewhat self-sterile: Gravenstein, Bellflower, Chenango, King, Spy, Melon, Rambo, Red Astra-
chan, Roxbury Russet, Spitzenburg, Talman Sweet. The only
varieties much grown in Oregon that are credited with being self-
fertile, are Baldwin, and Greening. Remarks made by extensive
growers of Newtown Pippin lend color to the view that this
variety is somewhat self-sterile. The matter is one of great im-
portance to those planting large orchards, and it is deplorable
that the knowledge upon the subject is so scant and fragmentary.
We shall be pleased, indeed, at the Station, to have the results
of any experiments, or any experience that the fruit growers
may be able to furnish us. The matter we know is receiving
some consideration in the state, one large grower has top-grafted
alternate rows in a number of acres in his orchard in order to be
sure of free fertilization.

Insects and diseases.—Of all fruits, the apple suffers most
from pests in Oregon. Out of the 128 apple orchards visited by
the Survey workers this fall, all were affected with apple scab
and codling moth. A few in Hood and Rogue River valleys
were but slightly affected, yet the pests were there. Nearly all
were, or had been affected with green aphis. Woolly aphis was
found in 86 orchards; San Jose scale in 74 orchards; and “canker”
in 83 orchards. Various other insects and fungi were found to
a minor extent.

Codling moth and apple scab were to be found everywhere
in the Willamette Valley, and but few orchardists had done
anything to check either. Exact data concerning the matter
was not taken, but it is believed, at a conservative estimate, that
nine-tenths of the apples in Willamette Valley were this year
made unsalable by these two pests. The outlook for the apple
grower would be bad, indeed, were it not for the fact that those
who have tried have succeeded in effectually checking both pests
by means of fungicides and insecticides. The testimony of sev-
eral growers to the fact that they had saved 95 per cent of a
crop of sound apples should be reassuring to those who doubt
the efficacy of spraying. There are many fruit growers who
still lack information concerning remedies and their applica-
tion. This is not a proper place for a detailed consideration of
the subject, but briefly, scab and codling moth may be con-
trolled by the following treatment: A spraying with Bordeaux mixture should be given for apple scab just before the buds swell in the spring. A second one as soon as possible after the blossoms drop and a third 12 to 16 days later; a fourth, if desired, 12 to 16 days after the third. The first spraying for codling moth in Western Oregon should be made between June 6th and June 12th; the application to be repeated about the first of July and on late apples again in the latter part of July and about the middle of August. Paris green,—1 pound to 200 gallons of water to be used for codling moth.

San Jose scale and woolly aphis occasion more loss to the apple orchards in the Umpqua and Rogue River valleys than all other pests combined. Both do considerable damage in the Willamette Valley, the latter especially. The woolly aphis can hardly be annihilated since it lives upon both root and top, but by constant warfare its numbers may be so reduced that the fruitfulness and vigor of the tree, need not be seriously impaired. We have much faith that there will yet be found a root, Northern Spy perhaps, that will resist the woolly aphis, and that the pest can then be controlled on the branches by the caustic washes.

About half of the fruit growers visited this fall, in whose orchards San Jose scale was found, did not know there was any scale there. Yet it may be very readily known. A roughish appearance of the bark of a tree, or a dark spot with edges discolored with red on the fruit; in both cases of which upon examination a small scale is found, and as a distinction from other species of scale, red bloches wherever branch, leaf, or fruit has been stung; are the distinguishing marks. For San Jose scale the lime, sulphur, and salt mixture has given the best satisfaction in this state.

I believe almost every orchard I have visited in Oregon, is affected with green aphis. The pest is a most grievous one, and like the woolly aphis there seems to be no way of annihilating it. Constant spraying with kerosene emulsion, or strong tobacco decoction, are the remedies to keep its numbers reduced.

At present we cannot say much about the "canker" that is causing so much trouble in the young apple orchards. Knowledge concerning it is scant and fragmentary,—to be much added to, we hope, before another season. "Canker" is a fungus
which spreads from a small infected spot in the bark of a tree to large areas, finally killing the tree. The only known remedy is to cut it out,—the sooner the better of course, and wash the wound with Bordeaux or a solution of copper sulphate. A spraying in the fall after the leaves have fallen will kill many of the spores of the fungus.

There are numerous rusts, mildews, and rots that affect orchards to a minor extent, but all these, at present, we think, will be kept in check by the fungicides that should be used for the more prevalent diseases.

Varieties.—There are practically, for commercial purposes, but seven varieties of apples grown in Oregon: These are, in order of choice as given by the fruit growers interviewed, and I believe in order of acreage of orchards visited: Spitzenburg, Ben Davis, Yellow Newtown Pippin, Baldwin, Red-cheeked Pippin, and Northern Spy. Only a few varieties of apples should be grown in a commercial orchard and these should be selected with special reference to their growth and productiveness in a particular location and to the market for which they are destined. Yet it seems to me that Oregon apple growers could well enlarge upon the number of varieties grown, not as individual growers, but as a whole. All ought not to grow so nearly the same varieties. Fameuse, Canada Red, Greening, Swaar, Roxbury Russet, Wagener, and Wealthy, are all good apples and offer a greater choice of varieties.

I think growers are making a mistake in planting so many Ben Davis apples. While the Ben Davis bears at an early age, is very productive, and is handsome in appearance, yet the quality is wretchedly poor, and in many markets where this has been found out they will not now sell well, and this dislike will of course grow. Moreover, the apple growers in Missouri, Arkansas, and Nebraska, are growing Ben Davis more than any other variety, thus preventing Oregon growers from finding any market at all in the East for the Ben Davis.

In Rogue River and Hood River valleys where the fruit matures earlier than in other sections of the state, a few apple growers will find it profitable to make settings of summer and fall apples. These apples are in demand in northern markets and facilities are good in both the valleys named for reaching
the selling places. Of course such apples come in direct competition with other autumn fruits, peaches and grapes, so that the demand for them is in this way limited, and commercial orchardists will not find them worth their attention unless they are sure of a special market. Good apples for such a trade are: Red Astracan, Gravenstein, Yellow transparent, Early Harvest, Chenango Strawberry, King, and Duchess of Oldenburg.

Some New Northwest apples.—The Report of the U. S. Pomologist for 1894, describes several promising new apples from the Pacific Northwest. Among these are:

ALMOTA.—A large pale yellowish green apple, stripped and splashed with crimson; conical in shape, somewhat ribbed; flavor mildly sub-acid; quality good; season autumn. Originated with C. R. Mays, of Pullman, Washington.

BLACKWOOD.—Size medium; shape roundish conical. Color light green with brownish blish in the sun; dots conspicuous, russet, raised; flesh yellow with a dark core line, tender, juicy; flavor, mildly sub-acid; quality very good; season winter. Originated with M. L. Smith of Farmington, Wash.

COLFAX.—Very large; shape roundish oblong; stem an inch long, slender; color bright yellow, stripped and splashed with crimson; dots numerous, minute; flesh yellowish, firm, crisp, juicy; flavor sub-acid; quality good; better for cooking than desert; season winter. Originated with Nelson Davis of Colfax, Wash., in 1886. A seedling of Rhode Island Greening.

Klickitat.—Size large; shape round, ribbed; stem stout and fleshy; surface smooth and glassy; color yellow marked with carmine and striped with crimson; dots minute to medium, yellow and russet, indented, flesh yellow, coarse grained, tender, moderately juicy; flavor mildly sub-acid; quality good; season winter. Originated with H. C. Cook, White Salmon, Wash., about 1876.

Steptoe.—Size large; shape roundish, slightly ribbed; stem long slender, fleshy at the connection with the fruit; surface smooth, oily; color pale yellow; dots variable, grayish to brown; flesh yellow, fine grained, crisp, juicy; flavor sub-acid; quality very good; season early winter; tree a strong grower and good bearer. Originated with John R. Reavis, Spokane, Wash., about 1882.

Yakima.—A Baldwin seedling now quite well known in Oregon. A winter apple, in appearance much like the King, in flavor like the Baldwin. The Yakima is finding considerable favor.

While visiting orchards with Mr. A. H. Carson in Southern Oregon last fall, Mr. Carson called my attention to some remarkably fine Spitzenburgs in a certain orchard. Across the road, at a little distance, we visited another orchard growing in a different soil and under different conditions. At the first glance we
hardly knew the fruit. Close examination showed them to be Spitzenburgs but greatly inferior to the first; possibly from the same nursery row as the others, however. What was here so strikingly shown we found true throughout the whole state. The character of the fruit changes, in Oregon with soil, topography and all conditions affecting the growth of fruit, to an extent not dreamed of by one accustomed to Eastern fruit growing. The thought to be derived from this is, that the variety of apples to plant is a local question. Every fruit grower must settle it for himself. When an error is made, top-grafting is the only remedy.

Profit and loss sometimes a matter of using the whole product of an orchard.—Some years even the best orchards will contain such an ill assorted lot of fruit that the profits are small or none at all. There are also many orchards from which the product is never taken. Last fall the writer saw tons and tons of fruit rotting on the ground that might well have been utilized as evaporated fruit or in making cider, jelly, apple butter, or vinegar. These products are all salable at prices that will very materially help in making an orchard profitable. A fruit grower who does not make use of every possible means of profit is neglecting his opportunities and has no right to say that “fruit growing does not pay.” Every fruit-growing community should have an establishment, either private or coöperative, to work up the fruit that heretofore has been waste product.

Strains of Varieties.—Part of the variance in apples in Oregon may be explained from the fact that there are so many strains of different varieties. This has been brought about no doubt, largely, from their being introduced from so many different sources. The practical point here is that all trees should be propagated from the best strains. This brings us to another matter which can be best brought out by quoting from L. H. Bailey of Cornell University:

“*It is probable that many trees fail to bear because propagated from unproductive trees.—We know that no two trees in any orchard are alike, either in the amount of fruit which they bear or in their vigor and habit of growth. Some are uniformly productive, and some are uniformly unproductive. We know, too, that cions or buds tend to reproduce the characters of the tree from which they are taken. A gardener would never think of
taking cuttings from a rose bush or chrysanthemum or a carnation which does not bear flowers. Why should a fruit-grower take cions from a tree which he knows to be unprofitable?

The indiscriminate cutting of cions is too clumsy and inexact a practice for these days, when we are trying to introduce scientific methods into our farming. I am convinced that some trees cannot be made to bear by any amount of treatment. They are not the bearing kind. It is not every mare which will breed or every hen which will lay a hatfull of eggs."

A FEW NOTES ON PEARS IN OREGON.

The following notes on pear growing are written with particular regard to conditions in Western Oregon. All the information possible concerning pears was gleaned in the survey last fall, but such information was scant and fragmentary because of there being but few commercial pear orchards, as yet, in the state. The old pear plantations are seldom more than scattered plantings about the farm yard and along the road-side. Most of these trees were of poor varieties and have outlived their usefulness. In the last few years, however, a new interest in pear growing has been awakened by a demand from the East, for our quite superior pears; this interest has been stimulated no doubt by the somewhat phenomenal profits made in a few of the existing commercial orchards.

As yet it can scarcely be said that pear growing can be termed an industry, there being only a few thousand acres of pears in the state. There is every reason to believe that there is profit in the fruit if growers are careful to inform themselves concerning all phases of growing and handling it. The acreage is sure to increase. Rogue River pears ship better, because of firmer texture, than pears grown elsewhere in the state, and in Rogue River pear growing might well be made a special industry. It is well that there be centers for growing fruits, since

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scattered plantations make uncertain amounts of fruit, and buyers will not buy so confidently as they would were the plantations grouped.

It will not be necessary to enter into many details of the cultivation of the pear, because the remarks respecting the apple will apply almost equally for the pear.

Land.—The best land for pears is a deep, mellow, clay loam; or at least the body of the soil should be clay—not hard clay which bakes in the furrows, but that which contains vegetable matter and crumbles under cultivation. Sandy gravelly lands are too deficient in water for the pear. In preparing the land it is important to plow it deep and fit it with great care so that the roots may go deep where they may obtain a liberal supply of water, for pears must not feel the effects of droughts. Flat lands with the subsoil close to the surface should be well tile drained before pears are set upon them, otherwise a weak, unhealthy growth, much subject to disease, and a poorer quality of fruit will be the result.

Distance.—Pears live to a good old age and attain a large size, and while their limbs do not spread comparatively far, yet their roots reach a long distance, so the trees must be given plenty of room. I should say pears ought not to be planted less than 22 feet apart. Even at this distance in old orchards I have seen trees with their branches interlacing, the trees in a pyramidal form at that. All orchard operations,—cultivation, spraying, and harvesting, are made so much easier and the quality of the fruit is so improved by roominess that the loss in number of trees is well made up.

Caring for the trees.—Pears should be given the same tillage recommended for apples. It is generally thought that pears, more than all other fruits may be neglected in the matter of tillage, or that they will do well in sod, but no fruit responds more quickly to tillage than the pear. This is largely because the fruit, to reach its full capabilities, require a great deal of water. The moisture of the soil is well conserved only when good tillage is given. It is therefore especially important that cultivation be begun early in the spring, and that it always be given as soon after a rain as possible. In the Willamette Valley climate, trees are quite apt to make a weak willowy growth that is much subject to blight and other diseases; so it is quite important that
cultivation be stopped when the tree has completed the required growth. As with apples and prunes I shall recommend that a cover crop of some rank growing grain be sown at this time to force the trees to ripen their wood. The crop plowed under in the spring, will more than repay for itself in fertility added to the soil and expense saved in tillage during the season.

**Pruning.**—A pear orchard will require but little pruning after the trees have been made to assume the desired shape, which ought to be accomplished in the first four or five years of the tree's life. My ideal pear tree is one with a low, spreading head, with a trunk about three feet high, and with a top consisting of from three to five main branches rising obliquely from the trunk thus assuming the shape of a somewhat pyramidal apple tree rather than the usual spire shaped pear tree.

There are several important advantages gained from this form of tree. First the low spreading head shades the stem and main branches from the hot sun and winds which causes their bark to crack and split, thus admitting germs of blight, and "canker." To obviate this difficulty is a great point in favor of this style of a head. Second, if allowed to grow upright without any checking, the limbs reach the height, in old age, of 40 or 50 feet, and since the fruit is mostly borne near the extremities of the limbs, it can be gathered only by the use of long ladders, thus making harvesting a difficult matter. A third advantage is, the trees can be better sprayed. A fourth is the ground is better shaded and more moisture is retained.

**Diseases and insects.**—Pear diseases and insects are so many of them common to the apple, that it only needs an enumeration of them here, to serve to call attention of pear growers to them. There are a few pests of the pear not found on the apple and of these a short description will be given.

The apple scab is unquestionably the worst pear pest in this state. It is particularly abundant in Willamette Valley. The only treatment is to spray with the Bordeaux mixture as for scab on apples. The apple moth is not quite so bad on pears as on apples but is nearly so. It is readily checked by the treatment for the apple,—spraying with Paris green. **Woolly aphis** is as bad on pears as apples and San Jose scale worse perhaps. The caustic sprays are the remedies. "Canker" should be cut out as soon
as discovered and the trunk of the tree washed with a solution of copper sulphate.

Pear blight scarcely needs description. It is well known by all pear growers, and yet the records of the Horticultural Survey show that it was present in nearly every pear plantation visited. It is presumed that the reader knows that the disease is caused by a bacillus and is as contagious in an orchard as diphtheria is in the human family. Only the most drastic measures will keep this disease in check. Safety lies in cutting it out as soon as discovered. When the disease has made some headway this seems harsh and entails some labor, but cutting it out is the only way to save the orchard.

The pear mite, *Phytoptus pyri*, is a most pestiferous insect in this state. Last season it was abundant everywhere. Prof. Washburn has described it in a previous bulletin from this Station so it needs no detailed description. It is an insect so minute that it can be seen only by the aid of a lens. It works in the leaves on which it raises a great number of minute, black blisters. There is no specific remedy for the pest. All badly diseased leaves and branches should be removed and burned. In the fall when the insects are migrating, a caustic wash would probably kill great numbers of them.

**Pollination.**—It is now an established fact that many pears to bear well must receive pollen from another variety blooming at the same time. The following varieties are said, by Waite, of Washington, to bear freely standing alone: Bosc, Duchess, Flemish Beauty, Tyson and White Doyenne. Those said to be somewhat self-sterile, and they include some of our most profitable commercial varieties, are as follows: Anjou, Bartlett, Boussock, Clärigeau, Clapp's Favorite, Columbia, Easter Beurre, Grey Doyenne, Howell, Jones, Lawrence, Louise Bonne de Jersey, Mt. Vernon, Pound, Sheldon, Souvenir du Congres, Superfine, Colonel Wilder and Winter Nelis. The Bartlett, Clapp's Favorite, Flemish Beauty and Seckel, bloom at about the same time, so that in planting the Bartlett it is easy to select a variety to fertilize it. But with the other prominent commercial varieties the task is not so easy. Mr. Coote, at this Station has made some extended observations along this line for several seasons, and with this season to verify them he hopes to be able to tabu-
late the blooming periods of the leading varieties of not only pears but of other fruits as well. We shall be glad to have the cooperation of all fruit growers in settling this question.

Varieties.—Bartlett and Winter Nelis are the favorite pears in Oregon and they reach their highest perfection in this state. Both are too well known to need description. We recommend them for home and market use. The question of varieties of pears is a local one, as it is with most fruits, and every grower must settle it for himself. Many good varieties of pears have not been tested thoroughly in Oregon yet, and in the following brief descriptions, the qualities given these varieties are those generally ascribed to them.

Tyson and Seckel are the favorite summer pears. Both are nearly free from blight; ship well; grow well; and look well. Though both are highly flavored, the Tyson is perhaps the better and is the handsomer one of the two.

For a fall pear, the Bartlett is, of course, the favorite. Its principal defect is that it generally yields only a partial crop in the "off" year. Clapp's and Flemish Beauty are second and third to Bartlett. Neither ship as well as the Bartlett. Sheldon is one of the best of the fall varieties. Beurre Bosc and Beurre Clairgeau are special favorites with some growers in Oregon. The former is a large, russety pear with a long neck; well flavored, melting and delicious. It ripens the first of October. It is a fairly good shipper. Beurre Clairgeau is yellow, shaded with red; well flavored; the tree grows well and is an early and prolific bearer; good for the market because it ships well; ripens in November.

Garber, Kieffer, and Le Conte are good for quantity and that is about all. A good price may be received for them at first, but the public will not be long imposed upon by fruit as tasteless and insipid as Garber, Kieffer, and Le Conte pear, and Ben Davis apple. All three of these pears are wonderfully prolific, and are quite free from blight. It is said they can well, and that they are fairly good when cooked. Considerable money is being made with them at present in some parts of the South.

In flavor, keeping and shipping qualities, the Winter Nelis is
far the best winter pear. It is, however, oftentimes a shy bearer and tender in growth. The tree has no beauty to recommend it. The Lawrence is one of the best late pears. The tree is very hardy, and an early and abundant bearer. Anjou is another good winter kind that will sell in any market.

U. P. HEDRICK.

Corvallis, Oregon, Feb. 1, 1896.