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STRAWBERRY CULTURE.

In the development of the famous fruit sections of Oregon the strawberry has played a most important part, and is yet one of the foremost fruits on the market as to earliness and a money maker. The continuous bearers and double croppers of today give a long fruiting period which almost doubles the income of that of the old single croppers. It is of great importance that the fruit grower, who with limited capital is just going into the fruit business, should have some return from his investment before his trees come into bearing. The strawberry has been found to answer this purpose admirably, as it is producing its maximum crop at the age of one year. This plant has been the means of tiding many of our now successful fruit growers over these first few years. The plants are allowed to occupy the space between the rows of fruit trees for about the first four years, or until the trees demand the space, then they are turned under.

Fruit growers who make the strawberry a specialty seem to be making very good returns indeed. It is a fruit that is in demand in either the fresh state or canned. Those who live near canneries have no trouble in disposing of all their crop that can not be sold on the market. Where the canning factory is not available, a home canner can be bought at a very reasonable price and the grower can put up his surplus berries himself. In order to give you some idea of what can be accomplished with strawberries, I will mention some of the record-breaking beds. Mr. Wolfer of Eagle Point, Oregon, who by his success as a strawberry grower, has rightly earned the title of "Strawberry Man" in the Rogue River country. He says that he gets from one to two quarts per plant and sells them from ten to fifteen cents per quart. Mr. H. B. Steward of Myrtle Point, tells us that he has picked strawberries at the rate of nearly $1,500 worth per acre. Mr. Wilder of Phoenix holds the record by picking $1,100 worth of berries from one half acre of Senator Dunlap's. Of course these growers are experts and give their plants the best of care.

Soils—While strawberries will flourish on a great variety of soils, ranging from a sandy to a clay loam, they do best on deep strong sandy clay loam, However, any soil that will produce good crops of vegetables or of field crops will produce strawberries. One of our record breaking crops was produced on a heavy bench land. Here, however, the defects of the soil were remedied by working humus into it. While sandy soil is desirable for some varieties, and in producing early berries, it has the drawback of drying out too rapidly. Irrigation will have to be resorted to in order to prevent the plants from being stunted. Where irrigation is not practicable very sand land should be shunned.

To be sucessful commercially the soil must have certain qualities in order to produce the maximum yields; namely, an abundance

of moisture, good drainage and an abundance of plant food. An abundance of moisture does not mean that the soil is water logged. Usually the soil that is naturally well drained supplies the moisture at the time it is most needed. When there is to be a choice of slopes the earliness of the crop and the length of season will have to be taken into consideration. Berries grown on a south slope will mature earlier and are usually of a better color than those grown on a north slope. However, plants grown on a north slope will have a longer cropping season. Where the soil is light and there is a tendancy for it to dry out, it is best to choose a north slope. Very low places should be avoided, especially so where there is a tendency for the bloom to be killed by the late frost. In sections where this occurs select locations with a slight elevation above the streams.

Preparation of the Soil—While the lay of the land is very important in the berry industry, the preparation the soil receives before the plants are set very often determines whether the venture will be a success or not. A good heavy coating of manure, well composted or a good crop of vetch should be turned under. This will put a good supply of humus into the soil and aid in holding the moisture. Follow this with some highly cultivated crop to kill out the noxious weeds. The ground may now be allowed to lie until spring then plowed deeply. Deep plowing is very desirable, as this is the last opportunity to cultivate deeply during the life of the bed. If the ground can be pulverized to the depth of fifteen inches so much the better. As soon as the ground is plowed follow with the disk, as the clods are much easier broken up now than if put off until they become dry. If the ground does not break up mellow, disk it down and then turn it over and disk again. Follow the disk with the smoothing harrow, then the smoother or leveler, leaving the surface perfectly smooth. When the ground is very cloddy it is advisable to crush the clods with a roller, taking care not to pack the soil too firmly. Where the soil is very sandy it should be thoroughly firmed, as the plants will root much better than if left loose. Ground with numerous air spaces such as are found in cloddy soil, forms a very poor bed for setting plants, as has been found out by experience. If turf land is to be used for strawberry culture it would be advisable to cultivate to some such crops as potatoes or corn the preceeding year. This will break up the sod and put it in good condition to receive the plants. Sod land is often infested with numerous insect pests which are disastrous to the newly set plants. By cultivating to some other crop first the insects will be given a chance to starve out.

Propagation—The selection and breeding of strawberry plants is of the greatest importance to the grower. Some nurserymen make a practice of obtaining their plants by contracting with a man in the neighborhood who grows strawberries for the market. Usually these beds, in addition to bearing a full crop of berries, are allowed to pro-

duce as many plants as possible. As a result the plants are not as strong as those grown especially for the trade. Those who make a specialty of producing plants for the trade do not allow their mother plant to fruit or to root more than half as many plants as they would naturally do if let go. Any grower can have as many first-class plants as he needs for resetting, or planting out new fields, by reserving a small corner of his bed in which he produces nothing but plants. This plot should be made very fertile and kept well cultivated. Irrigate as often as needed. The young plants demand an abundance of moisture in order to produce good roots. Do not allow the mother plant to produce either runners or fruit the first year. When buying plants see that they are thrifty and with an abundance of good white roots. If there are dead roots at the base of the plant the indications are that it is more than one year old. Set nothing but one-year-old plants if you desire the best results.

Time for Setting the Plants—The strawberry may be set either in the fall or spring. However, this will not apply to all sections, since there are some where the winters are so cold that the thawing and freezing would force the plants out of the ground. This can be prevented, in a measure, by good mulching. Then again, the plants do not become thoroughly dormant until cold weather, and if disturbed do not have time to form new roots and establish themselves before cold weather; hence they are apt to dry out before spring. The advantage of spring setting is that the plant is thoroughly dormant, and also has a large supply of plant food in store. At this season they resemble somewhat a tuber, in that they can live for a time independent of outside nutriment. Also, they do not run the risk of drying out before growth begins.

There are no drawbacks to fall setting of plants in the Willamette Valley unless it is the weeds. This condition can be overcome by thorough cultivation preceding the setting of the plants. If it is impossible to set the plants in the fall it should be done as early in the spring as possible, in order that the plants get a good start before the dry season sets in.

Systems for Setting Plants—There are several systems for setting the berry field, namely, the hill, the hedge row, the wide matted row, and the double row systems. In the hill system the plants are not allowed to produce runners. The plants may be set to be cultivated either one or both ways. When the plants are to be cultivated both ways they are usually set either 2½x2½ or 3x3 feet. When it is not intended to cultivate both ways the plants, set about 1½x3 feet. In the hill system the energy is thrown into one plant and a strong, stocky stool with many crowns is formed. Plants set by this system can not be cropped as long as the hedge row. The new roots coming out above the old extends the root system above the surface of the ground, and

cannot withstand the drouth and cold weather as successfully as the other systems.

The hedge row systems is a modification of the hill system. Enough runners are allowed to produce plants to fill up the spaces between the hills. The rows are about the same distance apart as those of the hill system, and the plants are set from 1½ to 2 feet apart in the row.

In the matted row system the rows are marked off from three to four feet apart, and the plants are set from 1 to 2 feet apart in the row. The runners are allowed to set plants until the rows become about two feet wide. Plants should not be allowed to grow closer than six inches to each other, as this distance has been found to give the best results.

In the double row system, two rows are set about 18 inches apart, then a space of three feet is left and two more rows set. This system gives a large amount of plants per acre, also makes irrigation easy. The water is run down between the two narrow rows.

Care of Plants Before Setting—It is very often the case that plants are received several days before the ground is ready for setting. Since the plants come tied in bundles and packed in damp moss it is very necessary that they be opened and spread out to prevent molding. The only safe and economical way is to heel them in. Select a well-drained piece of land, remove the trash, if any, and spade up deeply. Level off the soil and cut a trench deep enough to admit the roots without doubling up. One side of the trench should be nearly perpendicular. Lay the plants on the perpendicular side of the trench so that all of the root system comes below the surface, but not so deep that the crowns may be covered. In the latter instance the crowns will rot if allowed to remain in the ground for any length of time. Spread out the roots and place the plants so that they barely touch. Fill up the trench with fine soil and pack down firmly with the foot. Be sure there are no air spaces left among the roots. Be sure that the roots do not extend above the ground. If there is any danger of the plants freezing, cover over with a light coating of straw. Do not put it on very deep as the plants are liable to be smothered.

Setting the Plant—It is very important that the plants be carefully pruned before setting. The roots can be cut back with a pair of shears or a sharp knife, clipping off about one-third to one-half of their length. When the plants are heeled in before settling it is best to put off pruning until the time of transplanting. In trimming the tops all dead leaves, stems, and all large leaves should be removed, as in Plate 1. In pruning the plant be very careful to see that the roots do not become dry. It is a good practice to dip the plants in a bucket of water and wrap in paper, including about 25 plants to the bundle, then the workmen can handle them without fear of drying out.

The ground having been given its final harrowing, mark it off at the desired distance with either a marker made for that purpose, or if it

is desired a wire or garden line can be used. Some growers say that the rows should run north and south, and never east and west. The reason is that in the latter case one side of the row will receive more sunshine than the other. The methods used in setting the plants are numerous. Some growers simply run a furrow, drop the plants so that they rest against the land side, cover with a hoe and tramp the soil down with the foot. The remainder of the furrow is filled during cultivation. Another practice is to open the ground with a spade, insert the plant, and press the soil with the foot firmly against the plant. Setting with a trowel or dibber is the most satisfactory and surest method of getting the plants in the ground properly. The plants should be set so that the crowns are just even with the surface of the ground. This can not be done successfully when the plant is dropped in a furrow and covered with a hoe, neither is the spade method a success. Where the dibber is used this can be done, also the roots can be spread out so that each will come in contact with the soil, thereby insuring a rapid growth from the first. See to it that the roots are not exposed after setting, or that there are no crowns covered. See Plate 11. In the former case the plants may grow but will be worthless, in the latter they simply rot.

Cultivation—The cultivation of the strawberry should begin as soon as the plants are established, and continue up to the first of September. Do not cultivate for weeds as this is only a side issue, but cultivate to keep the soil mellow and conserve the moisture. One of the best implements for the strawberry is the 12-toothed harrow or Planet Junior. Plate 3. This implement thoroughly loosens the soil and keeps it level. There is a place on the side for attaching a disk that keeps the runners trimmed off the sides of the rows. Very weedy fields can be easily cleaned up by attaching hoes similar to those used on the hand Planet Juniors, and shaving of the top of the soil. When the plants are set so that they can be cultivated both ways there will be very little hand work if a clean field is desired. However, if the grower begins work as soon in the spring as the soil is dry enough, and not let the weeds get a start, there will be little trouble.

The summer pruning of the strawberry is not practiced as much as it should be. This practice is of vital importance to the life of the plantation. What we mean by summer pruning of the strawberry is the practice of keeping the runners and bloom off for the first year. First year plants require all their strength to produce a good strong crown and root system. When the plants are allowed to crop the first year it is done to the injury of the second year's crop.

Irrigation—It is a well-known fact that for strawberries to succeed they must have an abundance of moisture. In sections where the rainfall is not sufficient the lack of moisture may be supplied by irrigation. In sections where there is a heavy winter rainfall the moisture can be conserved by proper cultivation. It is possible where good

cultivation is combined with irrigation to make a big saving in the amount of water used. The two principal methods of applying the water are the overhead and ditch system. The overhead system requires a pressure of not less than 40 pounds to do good work. The pipes that convey the water are placed on supports at the height of seven feet. This allows a man to walk underneath when cultivating or picking the fruit. There is a small nozzle to each foot of pipe, throwing a fine stream of water. Each pipe will irrigate about 35 feet on each side, provided there is no strong breeze blowing. The cost for the pipe and installing will be about $75 per acre. The ditch method is the one most commonly used in Oregon. Plate 4 shows the water running between the rows. Where the rows are wide it is necessary to run a furrow down each side of the row; narrow rows require only one ditch. No more water should be used than is required to wet the soil. Never allow the water to run through the field and out into the road or other fields. The surplus water is sure to wash out a large amount of soluble plant food. Cultivate the field as soon as the ground becomes dry enough to do so without puddling. This will prevent the soil from baking and conserve the moisture. The number of times the grower will have to irrigate will depend on the condition of the soil, whether sandy or not, or whether the field is located in one of the semi-arid regions. In the Hood River district, heretofore, the berry fields have not been irrigated less than five times per season. The grower should irrigate just as often as the soil needs it; keeping the soil well supplied with moisture, especially during the fruiting season. After the crop is picked one or two irrigations is sufficient. Where the ditch system is used, the water should be run the entire length of the row as soon as possible. This allows the plants more nearly an equal amount of water, than where it is allowed to run down the row at will. The furrows should be deep, and as soon as the moisture begin to show on the side of the plant opposite the ditch, cut off the water. Don't water-log the soil. When the system of allowing the water to run down the row at will is used the plants near the flume always receive too much water. Where the overhead system is used all that is necessary is to turn the pipe as the ground becomes sufficiently watered, bringing the water onto new ground.

Fertilizers—The amounts and kinds of fertilizers applied to strawberry fields, in a great measure, depend on what the past scrops were, and also in what condition the ground was left. As has been mentioned above, good stable manure, well composted, is one of the best fertilizers that can be applied to strawberries. Never apply manure with a large amount of straw mixed with it, especially if irrigation is intended, as it will cause no end of trouble in running the water down the rows. Apply the manure before breaking the ground, so that it will be thoroughly incorporated into the soil during the preparation for setting the plants. It is sometimes advisable to apply a light coating

of stable manure between the rows just before fruiting and work into the soil with a cultivator. As barnyard manure cannot always be obtained in sufficient quantities, commercial fertilizers will have to be substituted. In fact, many growers prefer the latter, as it is easily applied, also will give quicked results. Commercial fertilizers also have the advantage of being free from weed seeds.

A good fertilizer can be made by mixing together three parts of hardwood ashes to one of ground bone. Apply from one to two tons per acre, depending of course on the condition of the soil. Nitrate of soda applied when the plants are in bloom has been found to be very good. This fertilizer is very soluble and results are obtained almost at once. The color and size of the plant is improved, and larger fruit is produced. Large applications, however, have been found to decrease the shipping qualities of the fruit, as the berries become overgrown and soft. In applying natrate of soda one should be very careful not to leave particles adhering to the leaves, as it has a very caustic effect on green tissue. If small amounts are used, it can be sown broadcast and the plants brushed, to remove the particles, by dragging a light brush over them. Where large amounts are used it should be drilled in a few inches from the plants, and the soil cultivated frequently to prevent the nitrate from being carried to the surface and deposited where it will burn the plants.

Mr. Wolfer has a unique method of applying nitrates to his strawberries. He dissolves saltpetre or nitrate of soda in water at the rate of 1 ounce of the nitrate to 12 quarts of water, and applies by pouring one pint of the solution on each hill. The apparatus he uses for applying the solution resembles a long bucket with an outlet at the bottom. The flow is controlled by a valve which has a rod extending up to the top of the can, and can be operated as you walk down the row.

It would be impossible to recommend any one fertilizer as being absolutely the best; however, there are some that we know have proven satisfactory; such as nitrate of soda, stable manure, and hardwood ashes. The amounts required per acre depend on the condition of the soil and the kind of fertilizer used. The growers who use nitrate of soda have found that about 200 pounds per acre gives the best results. Where it is wished to apply a fertilizer containing the three principal elements of plant food, a mixture is made, containing them at about the rate of nitrogen 3 per cent, potash 9, and phosphoric acid 7 per cent. This mixture is applied at about the rate of 500 to 800 pounds per acre. Where the beds are run for several years it is necessary that some such fertilizer as this be used to keep up the vitality of the plants.

Harvesting and Marketing—Strawberries should be picked every day to insure first-class fruit. It is a fruit that responds to good handling. Over ripe or bruised berries will not ship. Never pick the berry when wet. Wet berries always look uninviting and will not sell

to an advantage. Do not allow the carriers to stand in the sun any longer than is absolutely necessary. Get them under shelter as soon as possible, as every minute the sun shines on the berries after picked the quicker they will break down. Be careful to see that the pickers pick the fruit with the stems on. A berry with the stem off is not fit for shipping, as it will immediately break down. The best pickers scarcely touch the fruit, but pinch off the stem with the thumb and forefinger. A carrier holding six boxes or hallocks is used to carry the berry from the field. Each picker is supplied with two carriers during the cooler part of the day, but they should use only one during very hot weather, as some of the berries will be exposed to the sun too long if allowed to stand in the field while the second carrier is being filled. The berries are taken to the packing shed where they are prepared for the market. Here they are emptied on small trays and the defective and small berries are removed. These trays are made by tacking cheese cloth over a frame about 3x3 feet square. One packer can keep three pickers going. The packer puts up from 12 to 20 crates per day, each crate holding 24 one-pound boxes. Plate 5 shows a well put up crate of berries.

The boxes or hallocks should be made of spruce or cyprus. However, there are some good paper boxes that are being put on the market, and are finding favor with some of the growers. Plate 6 shows a pony express crate which is very convenient for handling berries on the local market. In fact it is a portable ice box or refrigerator, the ice being placed in the top keeps the berries cool while marketing. There are some machines on the market for putting together berry boxes. Plate 7 shows one in operation. Two girls can make as high as 8,000 boxes per day with one of these machines.

The fruit must be disposed of as soon as picked. The culls and over ripe fruit may be sold at the local canneries. Sell nothing but first-class fruit on the market. In hauling the fruit to the market every precaution should be taken to protect it from the dust and heat. A good covered spring wagon will be found to be of a very great advantage. In loading the car be sure to leave sufficient space for thorough ventilation. Plate 8. Brace each layer of boxes so there will be no danger of shifting. Never fill the center or top of the car, as this is always the warmest, and the fruit is most likely to break down here first. Brace the center of the car so that the load cannot shift lengthwise of the car. Nothing but refrigerator cars should be used in shipping strawberries, and the fruit should be cooled before loading. Small shipments to be sent short distances may be shipped by express. The number of crates required to fill a car is about 630.

Varieties — The choice of varieties will depend, somewhat, on whether they are to be grown for home consumption or for shipping. For home consumption you would choose for size, color, flavor and bearing qualities without any special reference to shipping. It is

a well known fact that many of our very best flavored berries are not good shippers, while some of the good shippers are not of the best as to flavor and texture. Those who grow with the intention of selling to the canneries will have to choose varieties that will not become mushy after being put up; however, good shippers usually make good canners. In order not to have the whole crop ripening at once, select varieties that will ripen their fruit in succession. With the advent of the double croppers we practically have two seasons each year; thus giving the grower a long fruiting period, or what is practically two bearing seasons. Some of the varieties that have been giving good success in this State are the Clark's Seedling, Clyde, Oregon Everbearing, Magoon, Senator Dunlap, Hopkins Choice, 16-to-1, Warfield, Excelsior, and Arizona Everbearing. Some new varieties that promise to make good are the Autumn Bell, Gold Dollar, Beaver, Pine Apple, and Rock Hill Seedling, all of which are double croppers. Some of the other good double croppers are the 16-to-1, Clyde, Warfield, Excelsior, Hopkins Choice, and Magoon. In districts where two crops can be matured almost any variety that will produce many crowns and a good runner growth in one season will succeed as a double cropper.

Sex of the Strawberry—In selecting plants the sex is a very important point to be taken into consideration. There are a large number of good varieties of strawberries that are self-sterile, and require some variety that is an abundant producer of pollen to be planted in connection with them. The nursery men are well aware of this fact, and have indicated the fertile and sterile varieties by the use of some symbol or letter placed before the name of each variety listed in their catalogue. All that is necessary for the grower to do is to include enough of the pollen bearing plants to set every third or fourth row.

Old Beds—There is always considerable conjecture as to what to do with the old beds. Some of the growers mow their beds after the crop is harvested, and rake off and burn the trash. Plate 9. The bed is then watered and cultivated. Another irrigation is applied about August the first. A good application of some commercial fertilizer will aid greatly in forcing a strong plant growth. Now is the time that the plants are preparing for the next year's crop, and every effort should be made to produce strong crowns. Double croppers should be given a short rest after the first crop is picked, then irrigated and given the same treatment for the second crop as that for the first. Growers differ as to the length of time a bed ought to be allowed to bear before plowing up. It seems that many of the growers fruit their beds too long. The first and second crops are the best, and usually after that the beds begin to fail. There are some exceptions to this, however, but it is not the rule. No bed should be allowed to produce over four crops; better only two, then the field should be plowed up and cultivated to something else for at least one year before setting

to berries again. This will give some of the berry diseases a chance to die out.

Pests—Some of the most common pests of the strawberry are the crown-miner, root-borer, leaf-roller, and leaf-blight. The crown-miner, as the name suggests, works in the crown of the plant, hollowing it out and killing the plant. The only effective remedy is to dig up and burn the plants that are infested, before May the first. By mowing and burning the bed soon after the crop is picked the leaf-roller is held in check. For the leaf-blight spray with the 4-6-50 Bordeaux mixture recommended in Bulletin No. 75 of this Station. The mildew sometimes bothers the plants, but can be held in check by dusting with flour of sulphur.

RED RASPBERRY CULTURE.

The Pacific Northwest is famous for its red raspberries, and especially is this reputation well established west of the Cascade Mountains. Here the climate and soil conditions are such as to give a wonderful growth and great productivity, the plants seeming to revel in the large stores of food that are supplied. This is rather contrary to what is generally expected in red raspberry culture. The berries have been shipped as far east as Chicago in good condition, and with the installation of chilling plants and improved methods of cultivation a large market can be built up in the Middle West for these luscious fruits.

Soil—This berry will grow in a great variety of soils, but to give the best results should be planted in a well drained soil, one which is retentive of moisture. Many of our so-called lighter soils, containing considerable silt and sand, seem to produce large crops of this berry. Such sections as Puyallup, Washington, and Russellville, Oregon, have won special reputation on such soils. A sandy loam, sub-irrigated, intensely cultivated, and well supplied with decomposed barnyard compost, will give a heavy yield. I have seen the canes on such soils make 10 feet of growth and even greater. Ordinarily there is danger of giving the red raspberry too much nitrogen, but our Pacific Coast soils will take enormous amounts of humus and nitrogen without any bad effects. Soils which naturally suffer from drouth, or those which become waterlogged, should be avoided.

Preparation of Ground—We have here a crop which responds splendidly to good preparation. Deep plowing and thorough harrowing should always be given before plants are set. In some cases it will pay to plow several times, the aim being to get a deep, thoroughly pulverized condition of the soil. Many a cane fruit plantation has been a dismal failure because of poor preparation of the soil. Soils that are somewhat deficient in humus and nitrogen will be greatly benefited by first plowing in a crop of vetch, alfalfa, crimson clover, field peas, or other leguminous crop. This will give the cool, moist condition that raspberries naturally thrive in.

Propagation—The red raspberry is propagated by means of suckers or sprouts. These are always produced very abundantly,—in fact, too abundantly for commercial growing. Many of them must be removed or else the rows became overcrowded. Often they will sprout up between the rows. A cultivator with square-pointed teeth, or one which gives a whirling motion, will destroy many of them.

Setting the Plant—Plants may be set in either the spring or the fall. For high altitudes or regions more or less subject to winter-killing, spring planting is preferable. The plants are set at varying distances. A common method is to start the plants three feet apart in the rows, allowing six feet of ground between rows. Sometimes they are grown in the hill system, being planted five by five.

Cultivation—To mature a heavy crop of large berries requires thorough cultivation, the frequency and depth of which will be determined by the nature of the soil. The problem is to save the moisture, by producing a soil mulch on the surface. The finer this is, the better will be the results. All weed growth should be kept down. Towards fall cultivation should cease, as intensive late cultivation encourages growth which is very soft and subject to winter-killing. A cultivator as shown in Plate 3 is quite satisfactory, but there are other special tools that are good. One of these is a spring-tooth cultivator which has three large teeth. By means of levers these teeth can be so adjusted as to throw dirt away from or toward the plants, or else may simply scratch the soil. Another very good tool can be made by any blacksmith. Choose some old plow which has passed good service and in place of the mouldboard attach an old cart wheel in a horizontal position. This should be fastened on an axle. Upon the rim and spokes of the wheel fasten spike teeth in such a way that as the wheel whirls the entire ground is scratched. By means of the plow handles the impiement is easily controlled.

Fertilizers—In our average soil the fertilizer that seems to give the best results is one well supplied with nitrogen. Nothing is better, probably, than barnyard manure. By liberal applications and intensive cultivation, Senator Paulhamus, of Puyallup, Washington, has produced five hundred crates to the acre. As seen in Plate 10, his vines are brought to a height of from five to six feet and then are allowed to come over to the ground, making a growth of ten feet, the canes bearing luscious berries clear to the tips.

Pruning—Red raspberries should not be summer pruned as this practice often seems to encourage winter-killing. It is a good practice to remove the old canes directly after fruiting. By so doing you aid in keeping the bed free from disease. These canes should be burned as soon as removed. In spring further pruning will be necessary. The plant throws up so many suckers that if they were all allowed to grow the canes would become very weak. All the weaker young growth should be removed. In cases where the grower has been unable to

mature berries to the tips of the cane, it is advisable to head back somewhat the fruiting cane.

Training—Where berries are grown to the hill system, the training is very simple, a pole or stake being driven down into the center of each hill. The canes can be tied or wired to these stakes. A common practice is to set posts from 10 to 20 feet apart, according to size, and at a height of three or four feet from the ground, cross-pieces are nailed on these posts. From the ends of the cross-pieces wires are strung, one wire on each side. This is a simple system and it serves to keep the cane within bounds and thus aid in the cultivation. Senator Paulhamus has a rather unique system. In addition to the posts and cross-pieces above mentioned, two poles and an extra wire are used. One of these poles is nailed from post to post directly above the cross-piece. It serves to separate the old from the new wood, thus facilitating greatly pruning and harvesting. An extra wire is strung from the top of the posts and directly above this is fastened the second pole. This is placed on the opposite side of the post from the first-named pole and serves as a protection for the canes. Otherwise considerable breakage would take place over the wire. This system is illustrated in Plate 10.

Harvesting—Picking should be done in the cool of the day and only a few berries should be held in the hand at any one time. Never expose the fruit to the hot sun. Carriers of small capacity should be used and as soon as possible after picking fruit should be taken to the packing house. The rule for long shipment is to pick as soon as the berries will come from the vine. The Red Antwerp can be picked before it becomes real red. An average yield would be about three hundred crates, a crate holding two dozen baskets, making a total weight of from 20 to 22 pounds. Much greater yields than this are often realized.

Marketing—The berries should be handled carefully and rapidly. If it is necessary at any time to pick out soft berries from the crate it is unwise to do this by hand, as in so doing the warm and heavy hand often crushes the fruit. A toothpick will remove any such berries very easily. Berries can be sent by pony express. One of these holds about two and one-half crates, has an ice box on top, which should be frequently replenished. While these are an aid, they are not so satisfactory as pre-cooling followed by carload shipments in iced cars.

Life of Plant—In many cases this is not over eight or ten years, but at Russellville, Oregon, this past fall I found plantings of from 15 to 25 years of age still in very vigorous condition.

Varieties—The Marlboro is a berry that is increasing in popularity and is often planted with the Cuthbert. It ripens and is out of the way before the Cuthbert is ready. The Cuthbert is practically our standard market variety. The Red Antwerp is a good bearer but should not be left on the vines too long, else it becomes hard to remove.

The Superlative, of comparatively recent origin, was expected by some growers to revolutionize the industry. It is a heavy bearer of fair quality but is a poor shipper, and soon after gathering takes on a dull or dead color, thus losing its attractiveness.

THE BLACK-CAP.

Black-cap growing is an industry that has been badly neglected in this State. It was formerly believed that we could not grow these berries successfully. Early growers were told that the conditions were such that the berries would dry on the vines before maturing, but such is far from the case, as it has been thoroughly demonstrated in various sections of the Northwest that this berry can be grown with the highest degree of success. An income of from $100 to $250 an acre can be realized by drying the fruit, while there is an increasing demand for fresh fruit for local trade and for canning purposes.

Soil—This fruit is a lover of deep, well drained, moist soils and prefers a soil that is cool and abundantly supplied with humus. Like the blackberry, it revels in the cool, moist soils of the mountains, where some shade is afforded. It can be grown, however, when properly handled, on a large range of soils. In the red soils in the vicinity of Newberg it grows well. Five thousand dollars' worth of dried berries are shipped from that point each year. The volcanic ash soils of Eastern Oregon will grow this fruit when properly irrigated and supplied with humus.

Preparation—Only deep and thorough preparation will give good results. Soils that tend to be somewhat heavy should be plowed and harrowed several times. Unless the plants make a good growth the first year, the plantation is rarely profitable. In many cases some leguminous crop should be added to the soil before planting. This will supply humus, hold the moisture, furnish nitrogen, and give the desired coolness.

Propagation—Propagation is very simple. New plants are produced by rooting the tips. By placing a little dirt just back of the tip and pressing it lightly with the foot, roots are forced out and new plants produced.

Setting Plants—This may be done in either fall or spring. In Western Oregon, February and March plantings often give good results, while sections of Eastern Oregon do better with spring planting. Deep planting is generally resorted to,—from three to four inches. The young plants should be cut back to one or two buds the first year, otherwise the growth will be very weak. The distances of planting vary. Six by six is used quite commonly, while others prefer four by eight.

Cultivation—Unless very intensive cultivation is practised the berries dry on the canes and are worthless, or even, if harvested, are small, hard, and seedy. A well-grown, juicy black-cap is a delicious

fruit, and when so grown finds an easy market. The tools used are much the same as those described for red raspberry culture.

Fertilizers—Like the blackberry, the black-cap thrives in soils well supplied with nitrogen and humus. The plowing-in of leguminous crops and heavy applications of stable manure will give the desired results.

Pruning—Summer pruning should always be resorted to. When the canes have reached from two to four feet in height, the ends should be pinched off. This will force out the lateral buds, causing the cane to branch. Occasionally these branches have a tendency to grow too long and rank. When this happens, they in turn should be pinched back. Some summer pruners have made a serious mistake. They allow the canes to grow to a height of six or eight feet and then cut the canes back to two or four feet. They never do this more than once, for this kind of pruning removes all the fruit. The pinching of the tips is very essential, as it means a better quality of fruit, well down near the ground, and much more easy to handle. As soon as fruit is picked it is well to remove old canes. Winter pruning should be carried on in the spring just before the growth starts. Where too many canes are growing, thin out the weaker. If the lateral growth caused by summer pruning is too rank, cut it back moderately. Where no summer pruning has been done light pruning is often advisable in the spring of the year, as this reduces the number of clusters and often produces better berries.

Training—Black-caps have rather stiff, upright canes. Especially is this true where summer pruning is practised, so that under ordinary conditions no wires or trellising are necessary. Some growers handle the training much the same as that of the red raspberry, using the posts and wires to confine the young growth and to keep the canes within bounds.

Harvesting—Where berries are to be sold in the market by the basket, they are always picked by hand, but for drying purposes the fruit is often gathered by more or less mechanical means, the cost being only about one-half that of hand picking and taking much less labor. In eastern sections, where the black-cap is an important industry, the berries are gathered by beating off with an instrument much like a small tennis racket. The harvester wears a sort of canvas apron, which has a shoe, thus preventing catching in the vines. The apron is thrust under the bushes, which are then beaten with the racket. Generally the bushes are gone over three or four times. While one may lose some berries on the ground and others may remain on the bushes, nevertheless, the loss is many times over made up by the cheapness and facility with which the fruit is gathered. For further particulars on this system, read "Bush Fruits," by Card. I may add that the Gregg does not handle as well as the Ohio for mechanical harvesting. Some growers have allowed the berries to dry

on the bushes and have then attempted to beat them off unsuccessfully. However, Mr. M. B. Sherman, of Payette, Idaho, has a unique method which, will be described later. With good care, a yield of a thousand pounds of dried fruit can be taken from an acre. The selling price ranges from $450 to $500 a ton. With proper management one should net $150 an acre. Berries may be dried in various ways, some growers having used prune driers. In the vicinity of Newberg the fruit is generally dried in the sun on trays. These trays are made out of laths and light muslin. They can be easily handled, as they measure from three to four feet square. Each tray will hold from 16 to 18 pounds of berries. It takes about three days of good sunshine to dry the berries and while they are drying the stems and leaves can be easily picked out. Care should be taken not to dry the berries too hard, neither should they be stored too moist. Sometimes it is customary to store them in bins, where they are usually shoveled over several times. The product is generally sold in sacks.

Life of Plants—Under ordinary conditions the life of a plantation is about eight years, but with good care and rich soils it will last much longer.

Varieties—In the United States at large the Ohio is the leading drying berry. It is a very heavy dryer but is too seedy, and of ordinary quality. The Gregg is the leading variety on the Pacific Coast. The Kansas is a berry grown somewhat for table use. It matures about a week earlier than the Gregg. For table use the Cumberland is increasing in popularity, probably due to its rich, wild flavor.

Black-Caps as Grown by M. B. Sherman, Payette, Idaho—Mr. M. B. Sherman, of the Payette Valley, Idaho, has a very unique system of growing black-caps under irrigation. His soil is sandy volcanic ash. The rows are placed seven and one-half feet apart and the plants placed 18 inches apart in the rows. Two plants are placed together and he prefers two-year-old roots. The first year the plants are allowed to grow normally, but after that are given special treatment. In the spring of the year the irrigation furrows are made on either side of the row. The plants are then bent over by means of the fork-like implement shown in Plate 2. The tines of this fork are placed over several canes and then by a twist of the handle are easily bent over, and in some cases partially broken. Thus the bearing canes are virtually on the ground, as shown in Plate 12. After the old growth is bent over, the new growth is pinched back about a foot from the ground. This causes a strong lateral growth. When the fruit is ripe men are sent into the field, who cut the fruiting canes at about the point at which they were bent over. These canes are then stacked in much the same way as corn. After a few days they are loaded into a tight wagon bed and are threshed out with a four-tine fork. After threshing, the berries are run through a machine which has a double set of rollers. These rollers break off what short stems may remain on the berries.

Two men can cut and shock two and one-half acres a day. One man can clean the berries from a single acre in a day. With this system of handling black-caps, two men can do about all the work for 40 acres, with the addition of an extra hand for one month during the harvest time.

BLACKBERRY CULTURE.

The blackberry is a native of America, and is found growing in abundance over a wide range of country. It is perhaps due to its abundance in the native state that its cultivation and improvement had received no attention until the latter part of the last century.

Soils—The soil demanded by the blackberry is one that is fertile, well drained, and retentive of moisture. A good clay loam is considered desirable. If the soil is lacking in plant food it may be supplied by means of commercial fertilizer or stable manure.

Propagation—Blackberries are very easily propagated. Suckers usually come up in abundance, supplying all the plants that are desired. If it is necessary to increase the sucker growth it can be done by cutting the roots with a spade at a distance of eight to ten inches from the clump. New varieties are often multiplied by selecting roots of one-fourth inch or over, and cutting them into pieces of about three inches in length. If it is necessary to dig the roots in the fall the cuttings can be stored in damp sawdust until spring. Prepare the ground, mark off with furrows three feet apart, and drop the cuttings about six inches apart, covering to about three inches in depth.

Setting the Plants—The soil should be prepared as for any other bramble. The plants can be set either in the fall or early spring, preferably in the spring, when there is danger of freezing or drying out during the winter. If the plants cannot be set in the early spring they should be set in the fall and protected, when necessary, by mulching. Either the hill or hedge row system can be used. Where the hill system is used the plants can be cultivated both ways. Some growers prefer the hill system, as cultivation is easier, and where the soil is lacking in fertility, larger berries are produced. However, where the soil is congenial large crops of berries are produced by either system. The distance apart the plants are set depends on the system used. In the hill system the plants are usually set seven or eight feet apart each way; in the row system the rows should be eight to ten feet apart and the plants three feet apart in the row. Mark off the field both ways, and run a deep furrow one way for setting the plants. Cut back the tops of the plant to about six or eight inches, prune the broken roots and cut back the long ones to five or six inches, then place the plants in a bucket of water or a box lined with wet burlap, exposing the roots to the air as little as possible. One man can drop the plants and two others set. The dropper should keep just in advance of the setters. Spread out the roots along the furrow and pull the dirt over them and press it down firmly with the foot. Finish covering with

loose dirt to prevent baking or drying out of the soil. The plants should be set a little deeper than they were in the nursery row. With rows eight feet apart and plants three feet apart in the row 1,815 plants will be required to set an acre. Some growers advise planting more than one variety in a field, as some are only partly self-fertile.

Cultivation—It is not necessary to discuss the cultivation of the blackberry extensively here, as the methods are very similar to those given for the other brambles. It is sufficient to say that it should be thorough. Begin as early in the spring as the ground can be worked with safety, and go over the field at least every ten days, keeping up a good dust mulch to conserve the moisture, as drouth is one of the greatest enemies of the blackberry, especially during the fruiting season. A shortage of moisture at the ripening period often causes a loss of 50 per cent or more of the fruit by sunburning. Cultivation is the most available method of supplying moisture, and can to a large extent be made to take the place of irrigation.

During the winter months, especially in the Willamette Valley, the rainfall is excessive, and it has been found necessary to run furrows around each row, throwing the dirt to the plants, leaving open ditches to drain off the surplus water. When the berry patch consists of only a few hills mulching can be resorted to instead of cultivation. Those who have tried this method report good success. In selecting material for mulch avoid that which contains such weeds as mustard, as they will cause no end of trouble in exterminating. The coating of mulch should be at least one foot in depth.

Fertilizers—Unless the soil is very fertile some form of fertilizer will have to be used, and especially so if the field is continued to cane fruits for any length of time. Some fertilizer that contains nitrogen is very desirable. Humus will also have to be added. Good barnyard manure is perhaps the best all-round fertilizer that can be used, as it supplies both the nitrogen and humus. Cover crops, such as the vetches, may be used, but they will have to be turned under before they reach very large size, as they will be hard to handle.

Pruning—The proper pruning of the blackberry is very simple as well as important. The amount of pruning required will be governed by the variety, soil, and climate. The large growing sorts will naturally require more pruning than the more moderate growers, also berries grown on poor soil will need less heading back than those grown on very fertile soil. The ease of pruning depends on whether it is done at the proper time or not. Where the soil is very fertile the canes will make growths of from 10 to 20 feet in height. Canes of this height are out of the question when it comes to picking the fruit. This difficulty can be overcome by proper summer pruning. The field should be gone over as soon as the shoots are two or three feet in height and the tops pinched out. This will cause side branches to put out near the ground, producing stocky self-supporting canes. If the

side branches show a tendency to grow too tall, pinch out the bud. Never allow a cane to grow ten feet high then cut back to three or four feet. By doing this you will remove the larger part of the next year's crop.

The removal of the old canes at the correct time is very desirable. Very often they are allowed to remain until the winter pruning. However, this is a mistake, as they remove a large amount of plant food and moisture from the soil; and also are often diseased, offering a fertile source of infection for the new canes. Therefore, cut out the old canes as soon as the crop is picked, clean up the field and burn the trash.

Winter pruning should be done just before the sap starts, or after all danger of winter-killing is past. It consists of thinning out the canes and slightly heading back the long side branches. The amount of wood that will have to be removed depends on the vigor of the plant. If the variety has a tendency to produce a large number of weak canes the clumps should be thinned out enough to insure good marketable berries.

Picking and Marketing—The system for picking blackberries is the same as that for other small fruit. When picking for the home market be sure that the berry is ripe, as blackberries have a tendency to color up before they are fully ripened. Where long shipments are expected the berry will have to be picked as soon as well colored. Never leave the berries in the sun after picking, as a bitter flavor will be developed spoiling the fruit for use in the green state. When putting up the fruit for shipping use the kind of crates and boxes recommended for the strawberry. There is also a good demand for berries in the dried state. When put up in neat packages they bring good prices. The weight is also reduced to about one-fourth, thus materially reducing the cost of shipping.

Life of Plants—The vitality of the blackberry bush does not need to be discussed here, as any one who has ever tried to exterminate a plantation is well aware of their tenacity of life. However, the length of time a blackberry plant will produce good fruit depends on its care. As a rule they will be profitable longer than any other cane fruits. As soon as they begin to fail the plants should be removed and the soil used for something else for a few years. To kill out the patch mow off and burn the bushes as soon as the crop is picked. Plow deeply and go over the ground with a spring-tooth harrow, removing as many of the roots as possible. Keep down the suckers by persistent cultivation. Every small piece of root left in the soil will produce a sucker, and it may require several years before they are entirely exterminated.

Varieties—What varieties of blackberries that do the best in Oregon has not been fully determined, as the industry is comparatively new. As Oregon is the natural home of small fruits, it will be found that

there are a large number of varieties that will be of value to us. Those that have been proven to be of the most value are the Eldorado, Mammoth, Lawton, and Kittatinny. The Eldorado is a good home berry on account of being a long cropper and of very fine flavor. Not a first-class market berry, however, on account of it being a shy bearer. The Mammoth is desirable for market as it is very early, the crop being picked before the last two named come into season. The Mammoth differs from the other varieties in that the canes have a trailing habit. The Lawton and Kittatinny can be depended on for the main crops, as they are heavy bearers and the fruit is of first-class quality.

LOGAN AND PHENOMENAL BERRIES.

The logan and phenomenal berries have of late attracted a great deal of attention among the fruit-growers of Oregon, especially so in the Willamette Valley. Almost every householder who attempts to grow small fruit has a few of these plants.

In general appearance the two plants are very much alike. Both have a trailing habit with leaves and canes of similar color and shape. The only noticeable difference is that the leaves of the loganberry are a trifle darker than those of the phenomenal berry. The fruit is also very similar, that of the phenomenal being somewhat larger than that of the logan, and with the sell rows more irregular. In general appearance the two berries resemble extra large blackberries, though not of so dark a color. The flavor of the two berries is very much alike; that of the phenomenal being somewhat milder than that of the logan.

The parentage of the two berries is similar. The loganberry was produced by Judge J. H. Logan, of Santa Cruz, California. It is a hybrid resulting from pollenating the Aughinbough blackberry, a wild variety of California, with the pollen of the Antwerp raspberry. It partakes of both the flavor of the blackberry and raspberry. The phenomenal berry is one of Burbank's productions. It is a cross between the "Improved California Dewberry" and Cuthbert raspberry.

The logan and phenomenal berries are not as hardy as the blackberry and raspberry. Zero weather will often kill back the vines. However, if they are laid on the ground and covered with straw they can be grown in almost any part of the United States where the other brambles are found to thrive. Here in Oregon, especially west of the Cascades, the climate is ideally suited to their growth.

Soils—The soil requirements of the logan and phenomenal berries are similar to that of the other brambles; plenty of plant food and moisture at the proper time. Good surface drainage is absolutely necessary. A rich dark loam gives the maximum growth. A clay subsoil is preferred to one that is sandy or gravely, as the latter does not hold the moisture as well as the former. Sandy loam produces good crops provided the subsoil will hold the moisture. The preparation of

the soil will be the same as that for the other brambles. Here it will suffice to say that it must be thorough.

Propagation—The propagation of the logan and phenomenal berry is very simple. We find that wherever a tip comes in contact with the ground and becomes covered with soil, it takes root. However, where plants are desired for transplanting it is best to cover the tips with several inches of soil in early fall. During the fall and winter these tips will take root, producing good plants for setting the next spring. Some growers have better success with plants of this age than with those grown in the nursery row for one year. They say that more of the plants will live, and also produce stronger and more vigorous canes.

Setting the Plants—Heretofore there was only one system for setting these plants, and that is where the plants are set far apart and high trellises used. This system is used very extensively as yet. The plants are set 6x10 or 8x8. The latter distance will give about 680 plants per acre. Another system is where the plants are set 3x6 feet and a trellis of four feet in height is used. The number of plants per acre by this system will be about 2,420. The real difference between the two systems is in the method of pruning and training. The operation of setting the plants is similar to that just given for the blackberry.

Trellises—The trellis must be put up substantially. Use good strong posts, oak or cedar, and set not over 30 feet apart. It is better to set the posts only 25 feet apart. As to the depth the posts should be set in the ground will depend on the nature of the soil. Sandy soil will require a deeper set post than a soil of a clayey nature. However, they should not be set less than two and one-half feet in depth. Brace the end posts firmly, as when the ground becomes softened by the winter rains there is a tendency for the posts to give and allow the wires to sag. After the posts are set there should be from four to five and one-half feet extending above the ground, depending, of course, as to which system of pruning and training is used. Now,

Setting the Plant—Plants may be set in either the spring or fall. beginning about two and one-half feet above the ground, fasten two or three No. 12 wires to the posts, spacing them equal distances apart.

Some novel methods given in the "California Horticulture" are as follows: "The plants are planted in squares 8x8 feet. Drive three stakes one and one-half feet into the ground, using 2x2 six-foot posts. Nail an old barrel hoop on top of the posts and another two feet from the top. The shoots are trained over these hoops. Another method is to set 4x6 seven-foot posts 20 feet apart and nail 2x2 18-inch cross ties to each post. Set the posts three feet in the ground and string two No. 12 galvanized wires on the cross ties, holding them in place with staples. The new shoots should be trained across and wound around the wires from one wire to the other."

Cultivation—Cultivation should be thorough. The late Mr. A. M.

Aspinwall, of Brooks, Oregon, says in his article on logans in "Better Fruit," that he prefers to use a large plow both in the fall and spring. In the fall he throws the soil to the plants, leaving an open furrow between each row, thereby insuring good surface drainage during the winter. In the spring the soil is thrown back from the plants. Cultivation should begin as soon as the soil can be worked with safety. Do not plow to a depth of more than two inches when running close to the plants, as they put out numerous fine roots close to the surface, and will be seriously damaged by root pruning. After the spring plowing go over the ground with a disc and harrow until the surface is well pulverized to a depth of two or three inches. In subsequent cultivation go over the field with a weeder at least once per week until the middle of August or the first of September. If the ground is cloddy follow the weeder with a clod masher or leveler, keeping up a good dust mulch.

Fertilizers—Where the soil is lacking in fertility it can be supplied by applying stable manure or some commercial fertilizer. If lacking in humus or nitrogen, turn under a good cover crop, such as vetch.

Pruning—As a rule logans and phenomenals need but little pruning. They should not be thinned out until at least one-half dozen canes have formed in a hill, then remove the weaker. However, if the plants have a tendency to produce weak canes they should be thinned down to three or four canes per hill and fertilizer added to encourage a strong growth. Cut out the old canes as soon as the crop is picked and clean up the field and burn the trash. Keep the young shoots tied up to the wires, otherwise they will be seriously damaged by the cultivator. Heading back is practiced by a few, especially those who use the close system of planting. The plants are brought up to the top wire and tied in a bunch, allowing the tops to extend along the wire almost to the next plant, then clipped off. Where this is practiced the new shoots are not tied to the wire until after the crop is picked and the old canes removed. To prevent the new shoots from being damaged by the cultivator they are pushed up against the row and held in place by a small stake. Where the plants are set far apart heading in is not practiced. The canes are wound around the lower wires and allowed to grow until the old stocks are cut out. After the old canes are removed the new ones are tied or wrapped around the wires so as to make each wire carry its part of the load, also giving the maximum space to each shoot.

Harvesting—The time of harvesting varies with the locality. As a rule the harvest extends from the last week in June to the first of August, lasting about six weeks, with the maximum yield about the middle of July. The fruit is easily picked, as the canes are trained with this in view. Pickers say that they had rather pick logans and phenomenals than any other kind of cane fruit. The apparatus described for picking strawberries will answer admirably for this fruit.

The stage of ripeness at which logans and phenomenals are picked depends on whether they are to be sold on the home market or shipped. When picked in the red stage they will ship remarkably well. Mr. Weeks, of Salem, Oregon, ships his phenomenals as far as Boise, Idaho, with fine success. On the other hand, if the berries are allowed to reach the dark purple stage before picking they will not stand up for any length of time, and will not ship at all. The field should be gone over at least every other day in order to pick the berries in the best condition. To do this it will require at least 10 pickers per acre, as these plants are huge croppers. Six tons of berries per acre is not an unusual yield, while some growers report as high as eight tons. The market for logans and phenomenals is the same as that for other small fruits. In some sections the home market is overstocked on account of the large number of garden patches. In this case the grower ships his fruit or sells at the cannery. These berries can also be dried and put up in small packages and sold. Perhaps this is one of the most profitable ways of disposing of the surplus crop, as the weight is reduced to one-fourth and the product can be shipped without fear of deterioration.

THE DEWBERRY.

The dewberry, or as it is often called, the trailing blackberry, is becoming very popular in some sections of the State. They are enormous croppers, producing large luscious fruit of a remarkably fine flavor, which ripens early in the season. They demand the same kind of soil and treatment, as to setting, cultivation, and pruning, as that given for the loganberry. Set the plants three feet apart in rows which are six feet apart. The canes are trained on trellises similar to those used for the logan, except they are somewhat lower. They propagate by means of rooted tips. There are very few varieties grown commercially as yet. The Gardena is becoming quite popular. It produces an abundance of large, glossy black berries of excellent flavor. The Lucretia, one of the older varieties, produces large yields of fine berries, which are unexcelled in flavor and texture.

GOOSEBERRY AND CURRANT CULTURE.

The gooseberry and currant industry is as yet very poorly developed in this State. The supply falls far short of the demand. Those who grow this fruit say that they find a ready market for all they produce at from 5 to 7 cents per pound on the home market, or sell at a contract price of 3 cents to canneries and clear as much as $200 per acre.

Soils—The soil required is that of a deep porous nature with a good supply of plant food and moisture. Where the sun is strong a northern exposure is desired. Any soil that will produce good blackberries and raspberries will produce good gooseberries and currants. The soil can be kept fertile by applying stable manure or commercial fertilizers. Cover crops may be grown among the bushes, but as the

plants are set close together there will be some difficulty in turning it under. Wood ashes have also been found to be of value as a fertilizer.

Propagation—Probably there is no fruit that propagates with more ease than the gooseberry and currant. Well ripened shoots of one season's growth, cut into eight-inch lengths, when handled properly, root very readily. Cuttings can be made either in the spring or fall. Fall cuttings are set out and rooted before cold weather and will necessarily have to be made early in the season. Cuttings made in February are stored in damp sawdust until time for setting in the nursery row. Cut the base square and the tops with a slope so one can be distinguished from the other, as it is very necessary that the top be up when in the ground. Prepare the nursery land as soon as it can be done with safety, and mark off in rows three feet apart. The cuttings should be set about six inches apart in the row, and deep enough so that only the top buds are above the ground. Pack the soil firmly against the cutting so that there will be no air spaces at the bottom. If air spaces are left the cutting will not grow. A quick way to set cuttings is to plow a furrow, set them against the land side and pack the dirt back in with the foot. Gooseberries do not root as readily as currants, especially such varieties as the Downing and English types. Here sometimes mound layering is resorted to. Cut back the bush to force an abundant sucker growth. About July 1st mound up with earth, leaving only the tips of the shoots exposed. It requires about two years to produce a well-rooted plant of the English type; the American will root in one year.

Planting—Thorough preparation of the soil is very essential. Give the ground a heavy coating of manure and plow deeply, sometimes it is advisable to subsoil. The soil should be pulverized as deeply as plowed, harrowed, leveled, and marked off. The distance apart the plants are set depends on whether they are to be cultivated one or both ways. If they are to be cultivated one way the rows can be marked off six feet apart and the plants can be set four feet apart in the row. Where cultivation is desired both ways 5x5 feet has been found to be satisfactory. In planting a deep furrow is run one way. The plants are set by placing them in the cross, raking some fine dirt in and tramping it firmly against the roots. Be sure that the roots are spread out to give each individual root as much room as possible. Finish filling the furrow with loose dirt to prevent baking and evaporation. The remainder of the furrow will be filled by subsequent cultivation. The plants can be either set in the fall or early spring before growth begins.

Cultivation—As the gooseberry and currant have a tendency to produce roots near the surface, it necessarily follows that cultivation will have to be very shallow. A spring-tooth harrow is found to be very effective. The ground should be gone over at least every 10 days

to keep up a good dust mulch to conserve the moisture. Where the patch is small mulching can be used to a good advantage, as it retains the moisture and keeps down the weeds.

Pruning—Success in growing either gooseberries or currants depends in a large measure on the pruning. There are two systems of pruning, the tree and the bush forms. Here in this State it is best to prune to the bush form. If the bush is left to itself it soon becomes a mass of shoots, none producing good fruit. The best fruit is produced on the one-year-old wood; however, older wood bears, but the quality of the fruit decreases as the shoots increase in age. A large number of shoots are produced each year, many more than is necessary for the good of the plant. The weaker of these must be cut out, leaving from four to eight, depending on the strength of the bush, which is considered sufficient for a commercial plantation. The canes should be renewed every three years, that is, pruning should be so done that there will be no canes of over three years of age. When the plants are weak it is advisable to head back the canes in order to produce good, marketable fruit. Proper pruning can be made to take the place of thinning with gooseberries; with currants it was found that by clipping off the outer half of the flower cluster, larger and better fruit was obtained.

Harvesting and Marketing—Gooseberries are marketed in the green state, and can be stripped from the canes. The pickers supply themselves with thick leather gloves, to prevent the thorns from injuring their hands, strip off all the fruit from the canes. A large amount of leaves and trash is removed with the berries, but as they are run through a fanning mill the trash is all blown out. The fruit is marketed in berry boxes or in bulk, depending on whether it is sold on the market or at the cannery.

Currants will necessarily have to be handled somewhat differently from gooseberries, as they are picked in the ripe state and are very easily bruised. They should be picked dry. Currants picked wet will soon spoil. To pick the cluster grasp it at the base with the thumb and forefinger, severing it from the shoot, using care not to bruise the fruit. Never allow the pickers to strip the fruit as with gooseberries. As soon as the skin is broken the juice begins to run, and a few damaged berries will spoil a whole box. The fruit sells well when put up in the same manner as strawberries. Five-pound packages are very desirable for the home trade, as this is a very convenient size for those who desire to put up jellies and jams.

Life of Plants—The length of time the plantation will produce good marketable fruit depends on the care it is given. Some growers say that with the best of care they find that it does not pay to crop their plants longer than eight years. By the end of that time the plants require so much attention in order to produce good fruit that it is a source of expense rather than income. The plants should be grubbed

up as soon as they begin to produce inferior fruit. In order to keep up your production of fruit, have a new field of plants ready to come into bearing by the time the old one is grubbed out.

Varieties—The varieties of gooseberries and currants that have given the best results in this State are the Oregon Champion, Industry, Red Jacket, and Pearl; and for the currants, the Perfection, Fay, Cherry, and White Grape. Of the gooseberries named, the Oregon Champion is perhaps the most satisfactory. It is a large berry of excellent flavor, a prolific bearer, and resistant to mildew. The Pearl is a good cropper, but the fruit has a tendency to be woody. As to currants, the Perfection and Fay seem to be in favor. Both are of the red type, good bearers, hardy, producing large, fine-flavored fruit.

CRANBERRY CULTURE.

Oregon is classed among the cranberry-producing states, and although the acreage at the present time is comparatively small, the indications are that in the near future several hundred acres will be found in bearing. Our coast counties, such as Coos, Lincoln, and Tillamook, have quite extensive areas of bog and swamp land that are adapted for cranberry growing.

The cranberry is a very easy crop to grow, but nevertheless is very exacting in its requirements. Some of the essentials for successful culture are proper soil, abundance of good, coarse sand in the neighborhood, and proper drainage. Another condition which, while not absolutely necessary, is very desirable, is the presence of a living stream of water.

Choice of Location—The alluvial soils are practically the only ones that will grow the cranberry successfully, and among these the peat and muck soils are much to be preferred, as a mixture of a certain amount of sand with this peat and muck seems to produce the ideal soil. Clay soils are to be avoided. In choosing the location, the water table is a very important item. The bog should allow a sufficient drainage to keep the water table about a foot below the surface. It may be desirable at times to bring the water nearer the surface, but under many condiions a drainage of at least a foot is desirable. The presence of wild cranberries is always a very good indication. An abundance of sand is necessary in establishing a bog. A location should therefore be chosen where an abundance of sand can be obtained cheaply.

Preparing the Ground—First of all, the drain should be put in. The open ditch system is the one more commonly used. Following the drainage, all trees and shrubs shuold be taken out. The bog is then ready for scalping or turfing. By this we mean that the top layer of the bog is removed to a sufficient depth to eradicate all roots of grasses and rushes. This should be followed by careful grading, which is very important. Should the soil at this point become compact, it

is often very desirable to plow and harrow. We are now ready for the sand. Generally three or four inches is sufficient. This sand should be free from clay and from weed seed, and somewhat coarse in character. In placing sand on the bog, care should be taken not to mix it with the subsoil. Where there is any question of inability to hold sufficient water to mature the berries in good shape, dikes and gates should be constructed so as to raise the water table. Flooding is useful in fighting frosts. The indications are, however, that our coast counties are not subject to such danger. Flooding is also practiced in fighting insects, and while we do not seem to have any at present, the future may supply us with abundance.

Propagation and Planting—The cranberry is generally propagated from cuttings 10 to 15 inches in length. The distances for planting vary—9x18 inches; 12x12; 18x18 ,are distances commonly used. The plants are generally set by means of a tapering spade or wedge-shaped dibble. The instrument is placed in about the center of the cutting and forced into the ground. It is desirable to set the plants in at a low angle, and if all are pointed in the same direction they will tend to cover the bog more quickly than if planted otherwise. It is safe to count on 10 barrels of cuttings to the acre. Where these are to be shipped a considerable distance, care should be taken to prevent heating. The plants are generally set in the spring, and where there is no danger of the bog drying out can be set as late as June.

Varieties—The cranberry is generally classed according to its shape, such as Bell, Cherry, Bugle, or Olive. During the past few years a large number of varieties have been placed upon the market, and there is a fine field of experiment developing new varieties. Among some of the leading varieties can be named Early Black, McFarline's, and Centennial.

Cultivation and Management—For the first two or three years the bog will need considerable attention, as all weeds and grass must be kept out. The first year the plants can be hoed, care being taken, however, not to work the soil deeply, for if the peat is brought to the surface it gives a footing for weeds. The second and third year, a little hand weeding will be necessary. Some attention should also be paid to the water table. If allowed to get either too high or too low, the plants will not make good growth.

Harvesting—Harvesting is generally done on contract at so much per basket or bushel. Both hand and machine picking are practiced. It is customary to line out the bog and give each picker a definite territory. This insures clean picking. The yield seems to vary considerably. Bogs that will average 100 bushels can be considered bonanzas. The indications are that the yield on the Pacific Coast will be very high, some of the reports being almost unbelievable, ranging from 300 to 800 bushels per acre. After picking, the berries are generally run through a fanning mill, are graded according to size and color, and

are then stored for five or six weeks. They should be stored in crates, care being taken not to allow the store house to become too warm. In no case should the sun be allowed to shine on the stored berries. They will be found to develop a great deal of color under ordinary storage.

Cost of Bogs—The cost of preparing a bog will vary materially The amount of trees, undergrowth, difficulty of scalping and sanding, all have an influence. The cost will range from $100 to $400. This heavy cost of preparing has kept many persons from entering the business. It should not do so, however, for a successful cranberry bog will often at the end of the fourth year have paid for all expenses, even though these total from $200 to $300 per acre. From the fourth year on, yields are heavy on good bogs, and as a result they are easily worth a thousand dollars per acre.

Prices and Market—The prices for cranberries vary quite materially. Rarely do they go below $7 per barrel, and very seldom exceed $12. One need have little fear of over-production. Cranberry land, compared with ordinary fruit land, is very limited in area. A fair market can be found on the Pacific Coast and there are good possibilities for building up a trade in the Rocky Mountain and Middle Western states. The nearness to shipping ports will also aid materially in cheap distribution.

Fig. 2. Fig. 1.

Plate 1—Pruning the strawberry. Fig. 1, plant unpruned; Fig. 2, plant properly pruned.

Plate 2—Tool used by Mr. Sherman for bending over Blackcaps.

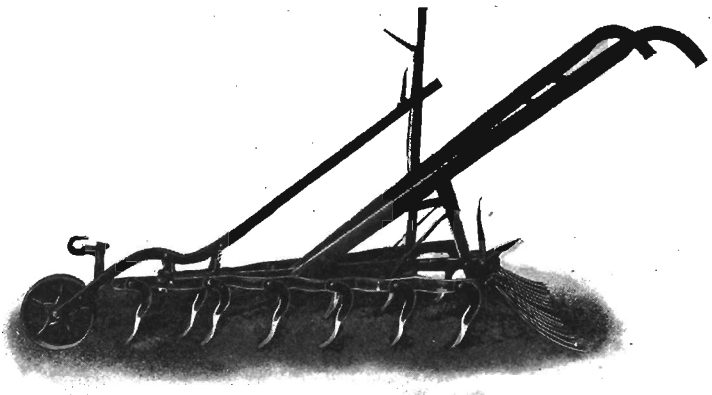

Plate 3—Planet Junior, a first class tool for small fruits.

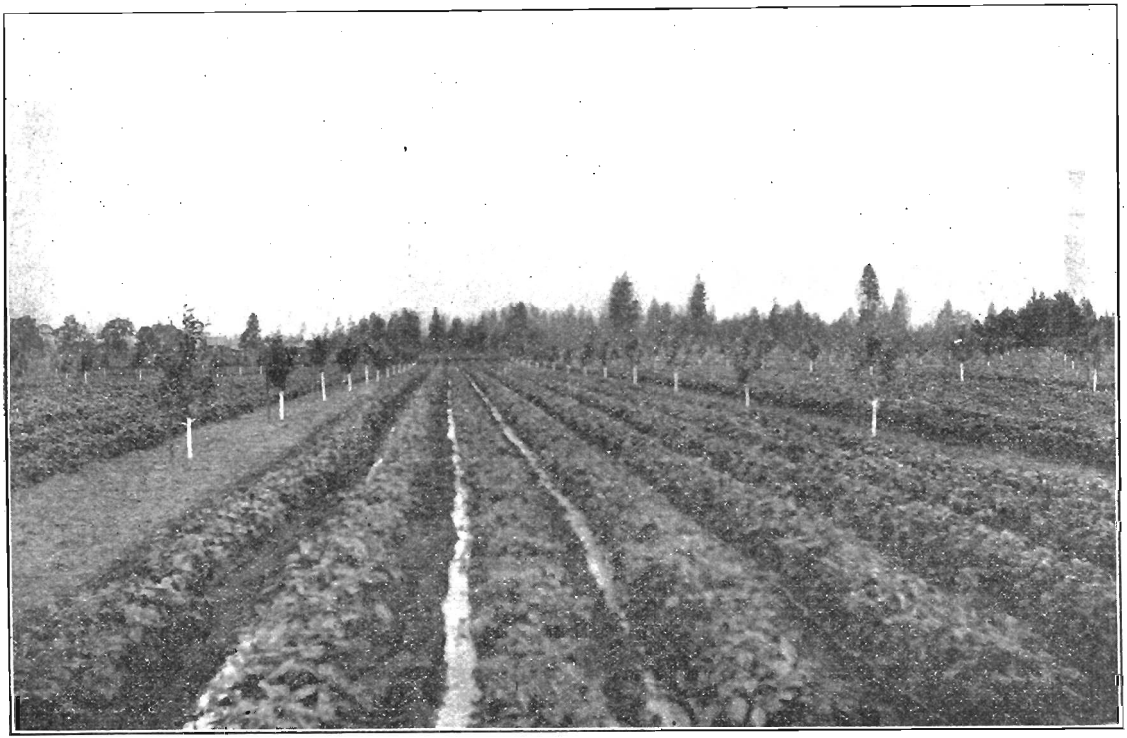

Plate 4—Irrigating strawberries, also showing method of utilizing land until fruit trees demand the space.

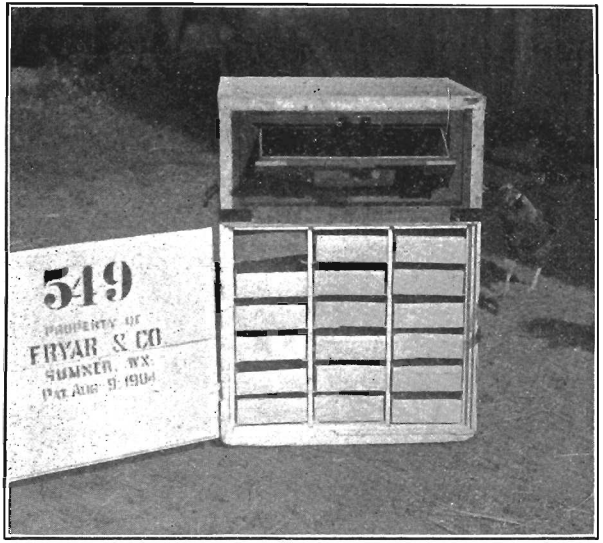

Plate 6—Pony express, portable ice box for shipping berries, showing ice chest open at the top, and door to berries at bottom.

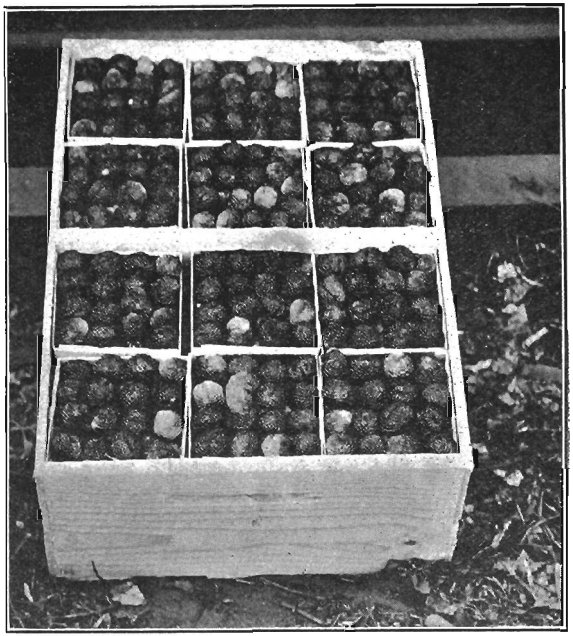

Plate 5—A well packed crate of strawberries.

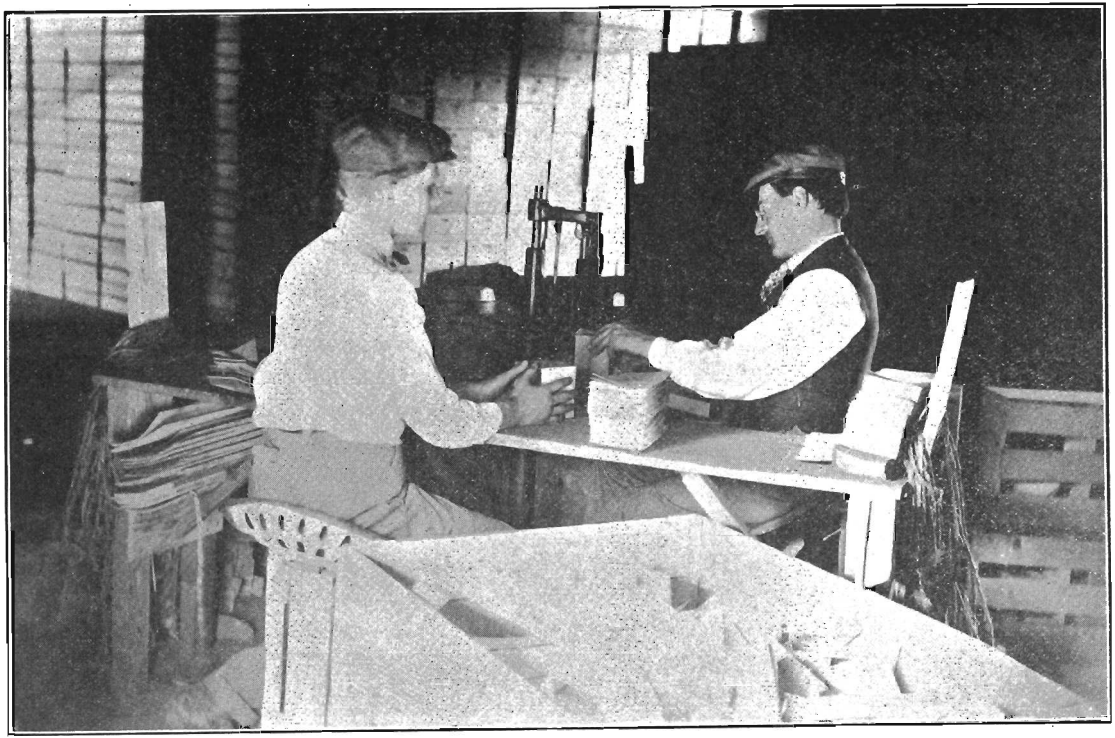

Plate 7—Strawberry box machine in operation.

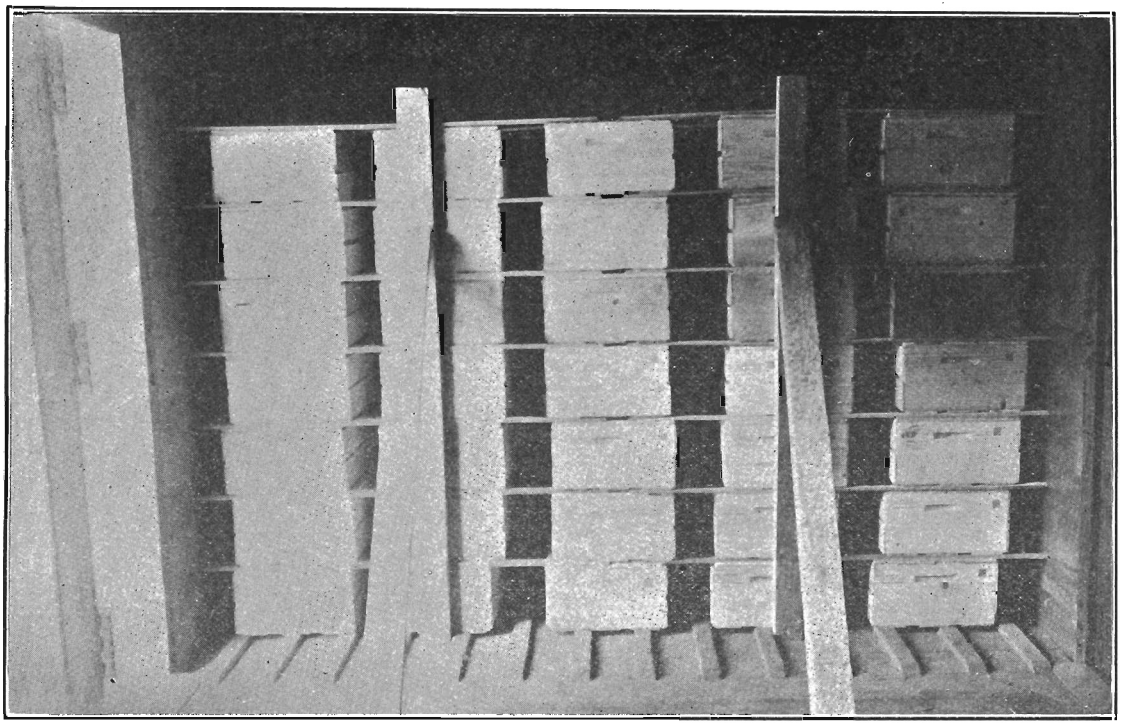

Plate 8—Carload of berries showing method of loading, the small slats between the crates are nailed to each to prevent shifting from side to side.

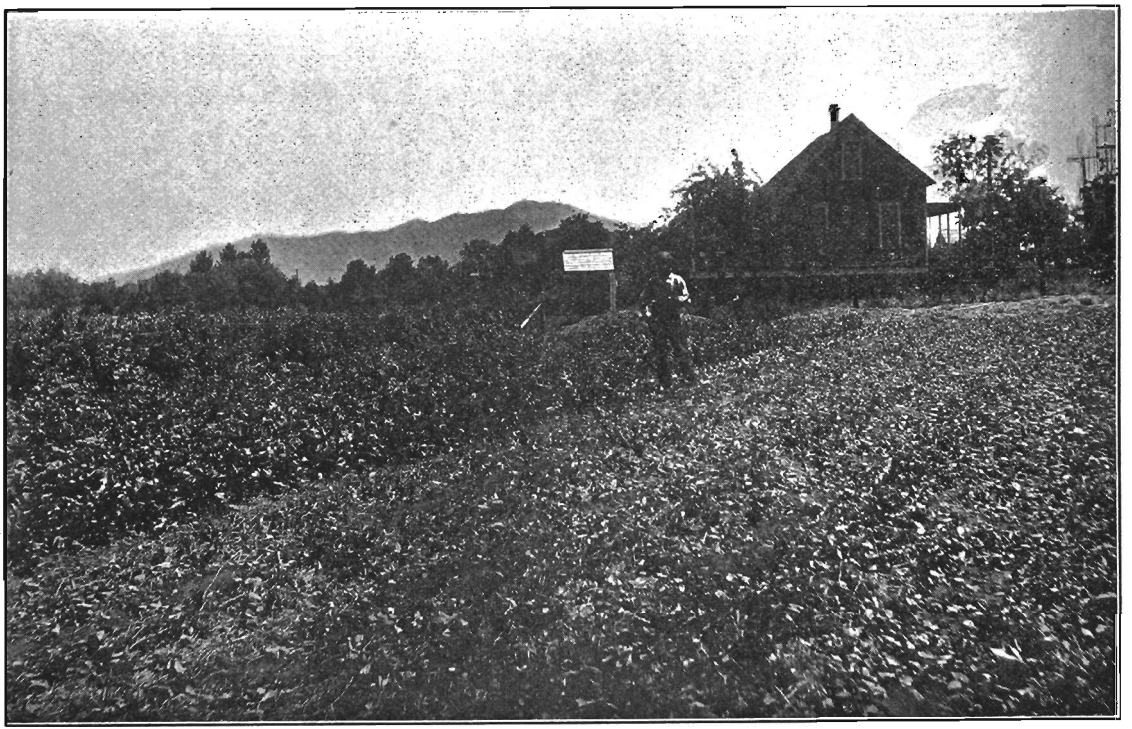

Plate 9—Mowing strawberry field after crop is picked.

Plate 10—Red Raspberry patch owned by Senator Paulhames of Puyallup, Washington, showing remarkable growth of canes, also method of training and trellises.

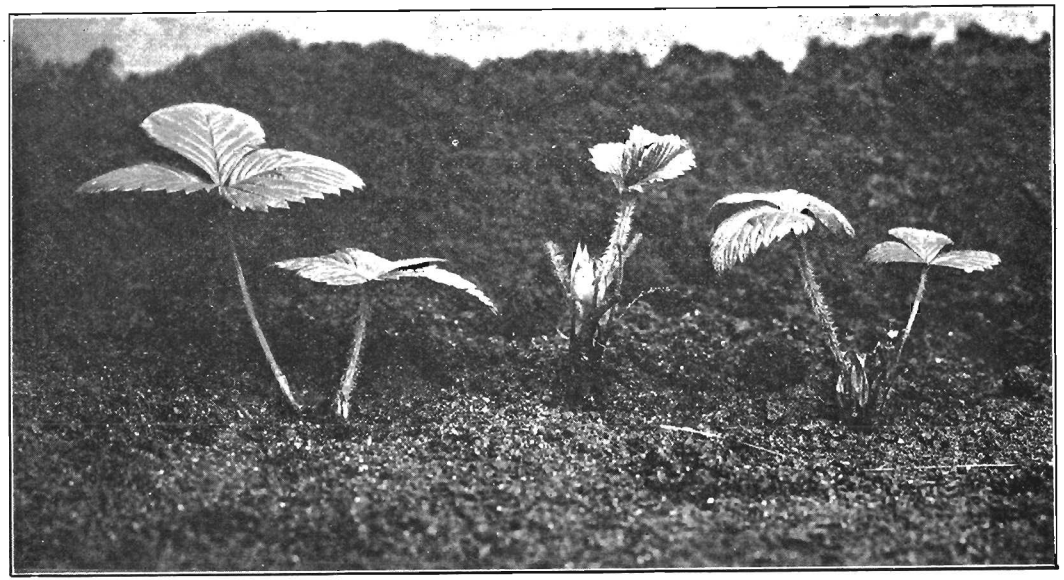

Fig. 1. Fig. 2. Fig. 3.

Plate 11—Proper and improper method of setting strawberry plants. Fig. 1, plant set too deep; Fig. 2, plant set too shallow; Fig. 3, plant properly set.

Plate 12—Field of Blackcaps owned by Mr. Sherman of Payette, Idaho, showing the Sherman method of handling plants.