RED RASPBERRY GROWING in Oregon

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The red raspberry has been an important horticultural crop in Oregon for many years, being grown both in home gardens and in commercial plantings. The favorable climate of western Oregon largely has been responsible for continued success with red raspberries there. The early development of the red-raspberry-growing industry in Oregon was to a large extent due to the introduction of the Cuthbert variety.

For many years it was the standard of quality in the Pacific Northwest as well as in other areas. In recent years, however, it has been supplanted by other types producing more and larger berries. Considerable emphasis is now being given to high production since present economic factors make high per-acre yields a necessity for profit in red raspberry growing. This bulletin furnishes information on methods of growing red raspberries that affect yields and maintenance of plantings.

Vigorous growing red raspberry fields are necessary for profitable production.
The Willamette Valley is the principal red raspberry growing area in Oregon, and all counties of this valley have some commercial acreage. The largest acreages are in Clackamas and Multnomah Counties. Other counties having considerable acreages are Linn, Marion, Polk, and Benton. Red raspberries are grown in some of the Coast counties, particularly Lincoln and Clatsop, and in the southern Oregon counties of Douglas, Jackson, and Josephine. Hardy varieties of red raspberries are also grown in eastern Oregon. The principal red raspberry-producing eastern counties are Klamath, Umatilla, and Deschutes.

Red raspberries produce heavily when grown under the most favorable conditions. Yields of 5 tons per acre are often possible and much higher yields are sometimes obtained. When continued yields of 5 tons per acre can be obtained, red raspberry production can be very profitable. All factors affecting the production of red raspberries, however, must be given serious consideration before the plants are set out. The establishment of a red raspberry planting is costly, and, unless the planting produces high yields over several years, severe losses are possible.

Locating the Red Raspberry Planting

Soil requirements. The most important factor for Oregon growers of red raspberries to consider is soil. All varieties prefer fertile soil with good drainage and a high water-holding capacity. Particular attention should be given to the nature of the subsoil, especially its depth and texture, because red raspberries are deep rooted. A root system adequate to produce and support a vigorous, high-yielding plant can develop only in soil that allows the roots to penetrate easily for 4 to 6 feet or even more. Sub-soils with hardpan or heavy clay prevent root development and can become waterlogged during the rainy season. Soil types that have tight, poorly drained subsoils such as the Dayton, Amity, and Wapato series should always be avoided.

Proper drainage is necessary since red raspberries cannot stand a waterlogged soil for more than a few days at a time. Heavy clays that are low and level are usually poorly drained and undesirable for red raspberries. Gentle slopes are more favorable, but even here underlying rocks or hard layers of clay may retard proper drainage.

Soils that lose their fertility quickly should never be planted to red raspberries. The shallow, coarse-textured types of red soils and gravelly, river-bottom soils are in this undesirable class unless unusual precautions are taken to provide fertility and moisture when needed. Naturally fertile soils that have become depleted of plant nutrients and
Plants of many red raspberry varieties die quickly on heavy, poorly drained soil.

organic matter should be restored to fertility before plantings are made. The use of manure, commercial fertilizers, and cover crops is the usual method of restoring fertility.

Climatic requirements. Climate is important in red raspberry production. Red raspberries are not adapted to such a wide range of climatic changes as other small fruits. The most favorable region for red raspberries should have a relatively cool summer, a rain-free harvest season, and mild winters. Hot, dry, windy weather during the summer retards cane growth and causes berries to be small and seedy. Rain during the harvest period results in soft berries, which spoil quickly after being picked. Excessive heat prior to harvest will cause berries to soften before they properly mature. Cold winter weather accompanied by wind often causes cane injury. Sometimes severe cane injury occurs during cold periods in early autumn. In some areas where cold winds are likely to be prevalent, windbreaks help in protecting red raspberry plants from injury. In areas where cold winters can usually be expected, only hardy varieties should be grown.

Previous crops. Crops grown on the soil before planting of red raspberries may leave diseases or insects that seriously injure plant growth. Potatoes, tomatoes, eggplant, and even strawberries or black raspberries often are affected with a disease called Verticillium wilt. Verticillium in the soil may cause serious injury to red raspberries, especially if the berry varieties planted are very susceptible. Red raspberries are also readily attacked by the crown gall organism that may be in the soil where blackberries, black raspberries, and fruit trees have been grown. Crown gall may do considerable damage at times to red raspberries, and, if the causal organism is known to be in the soil, raspberries should not be planted. Previous crop plants may also leave various insect pests that would attack red raspberries; the crown moth (borer), often serious in strawberries, also is damaging to raspberries. The weevils that attack strawberries can also do serious injury to red raspberries. In general, it is not safe to plant red raspberries after some crop fails because of insect attack or disease.

Market outlook. The market for red raspberries is a matter of serious consideration for growers. In some areas the local market is the only available outlet. In such localities, people contemplating growing red raspberries must consider production already in the area. If too many are being grown, the local market is oversupplied and prices are low. Transportation is a factor in securing an outlet in a distant market, and the quality demanded, by either a fresh market or a processing plant, must be considered. In western Oregon, processing plants are located near the production areas, and for the most part transportation is not a serious problem. Population is also high-
est in the Willamette Valley, and local fresh markets are important there. Therefore, more attention probably should be given to supplying the needs of local markets than in the past. However, the principal outlet is with processing companies.

**Availability of pickers.** Red raspberries must be picked immediately upon ripening. If an adequate number of pickers are not available to keep the ripe berries picked, considerable loss may be incurred. Growers, therefore, should make sure harvest help can be obtained before they establish a planting. Difficulties may be encountered in getting pickers should a grower have a large planting in a low population area or where other growers compete for the labor.

### Preparation of Soil for Planting

Most soils in Oregon available for red raspberries have been planted to other crops for several years. Such soils may not have the desirable physical properties or fertility for the best growth of red raspberry plants because the organic matter content is depleted. Organic matter is the most essential constituent of fertile soils and gives heavy soils a looseness that makes them easy to cultivate and prevents stickiness and clodiness. Organic matter also increases the moisture-holding capacity of light soils and cuts down erosion. Soils high in organic matter make plant food elements available, and they are not likely to be deficient in minor elements.

**Addition of organic matter.** Barnyard manure is one of the best sources of organic matter, but now it is seldom available in large quantities. A heavy application (20 to 30 tons per acre) to a soil of average fertility before planting is usually sufficient. Poultry manure is also very effective, but since it is richer in nitrogen not more than 10 to 15 tons per acre should be used.

Cover crops have been used extensively for improving soils that have been cultivated a long time. They cannot be relied upon to increase organic matter content except for short periods, but their use can help reduce rapid depletion.

When cover crops are to be used in preparing soil for red raspberries, a plan should be worked out 2 or 3 years before planting. Such a program will increase the amount of organic matter in the soil just prior to planting. Cover crops that produce a great quantity of vegetation usually are best since they add more organic matter than the less vigorous kinds. Clovers and other legumes are especially good because they fix soil nitrogen. Austrian winter peas with or without rye or wheat often is used. Rye alone, especially Abruzzi, is effective in increasing the quantity of material incorporated into the soil.

Cover crops such as hardy rye, barley, wheat, or oats, along with vetch, can be planted in autumn and plowed under in spring. Then cover crops such as Sudan grass can be grown during the summer.

The most effective way of increasing soil organic matter is through the plowing under of a heavy sod. Grass provides more organic matter for return to the soil than any other crop, and its extensive root system aids in preserving its tilth. At present, there are in Oregon rather large acreages of...
grasses grown either for pasture or for seed. Therefore, wherever possible, a heavy sod should be used in preference to cover crops in supplying organic matter to soil for red raspberries. The grass should have made good growth for at least 4 or 5 years. Sod should be plowed under about 1 year before planting of red raspberries so it can decompose and the soil can be easily prepared.

**Preparation immediately before planting.** Soil for red raspberries should be prepared in about the same way as a seed bed for grain or grass. The soil should be worked to a depth of about 10 to 12 inches so the roots can be surrounded by loose soil. At present, various implements are suitable for loosening soil. In the past, fairly deep plowing was practiced followed by discing and harrowing to loosen the soil and break up the clods. In recent years, rotoavers or rototillers, efficient in preparing soil for planting, have come into use. Immediately after their use, it usually is best to firm the soil somewhat. Rollers or packers, along with spring-tooth harrows and similar equipment, often are used. Soil should not be worked when very wet or very dry. When finally prepared, the soil should have a fine, moderately loose texture, and the surface should be relatively smooth. Leveling western Oregon soils, however, is not recommended since they usually are not deep enough to allow movement over them without disturbing their uniformity.

### Selecting Varieties To Plant

Varieties of raspberries adapted to the existing climatic and soil conditions as well as the needs or requirements of the market outlets must be selected. In areas with low winter temperatures, hardiness is a major consideration. In the commercial areas of western Oregon, the requirements of the processing plants are of chief importance. Many red raspberry varieties have been grown in Oregon from time to time. For many years, the Cuthbert was most favored and grown almost exclusively. In recent years, however, this variety has shown decided lack of hardiness and yields have been low. Other more profitable varieties have taken its place. It is now grown only to a limited extent. The types described in the next section are those known to thrive in Oregon or that appear promising for several sections.

**Varieties of red raspberries.** (Standard or single crop varieties known to succeed, or promising for Oregon.)

**Canby.** Oregon origin—introduced 1953. When well grown, Canby produces very straight canes of large diameter. It is often spoken of as the thornless red raspberry, the canes being perfectly smooth. Because fruit buds are spaced close together along the cane, this variety produces high yields under good growing conditions.

The Canby, however, has not succeeded in heavy and poorly drained soils. It is important, therefore, that the soil be of loose texture, deep and well drained. Under good conditions, yields of 5 to 8 tons per acre have been obtained. Most of the crop is harvested relatively early in the season. The ber-
Canes of the Canby variety are thornless.

Rishes are medium sized to large, bright light red, medium firm, and have a mild, pleasing flavor. The Canby is good for local markets but must not be overripe when picked. It is also suitable for the frozen pack and for preserves and jams.

Cuthbert. New York origin—the Cuthbert, an old variety introduced into the Pacific Northwest early in this century, was the principal one grown for many years, but it is difficult to get good yields. Winter injury has been serious, and in recent years growers have found other types that outyield the Cuthbert. The Cuthbert is a vigorous grower under most conditions, but its yields have never been high. The fruit of Cuthbert is dark red, medium firm, never of more than medium size, and often small. Its intense flavor is generally considered better than that of other red raspberry varieties. The fruit is well adapted for both local and distant marketing, as well as for canning, freezing, jams and preserves.

Goldenwest. Washington origin—introduced 1953. Goldenwest berries are light yellow, slightly pink when fully ripe. They are considered a novelty for growing only in home gardens. The plants are vigorous, and the flavor of the berries is good. The Goldenwest is desirable for those wanting raspberries without much color.

Newburgh. New York origin—the Newburgh, grown in Oregon for 25 years, is the most adaptable of the varieties now grown in this state. It is fairly hardy in areas east of the Cascade Mountains. Because of wide adaptability, it is popular as a home-garden variety. The Newburgh, however, has not met with the favor of processors because of light color and lack of flavor. The fruit is large, medium firm, attractive looking, and acceptable as a local-market berry.

Puyallup. Washington origin—introduced 1953. The Puyallup, while vigorous and productive on well-drained soils of high fertility, is not adapted to heavy, poorly drained soils. It was not hardy during the November freeze of 1955. The fruit is large, rather soft, light red, and has a mild, pleasing flavor.

Sumner. Washington origin—introduced 1956. The Sumner appears to be well adapted to somewhat heavy soils, even though they are not well drained. This variety is apparently hardy in Oregon. It is productive and the canes are fairly strong and upright. The fruit is of medium size, firm, medium dark red, and has an intense flavor nearly equal to that of the Cuthbert. It seems to be well adapted for canning, frozen pack, preserves and jams. The Sumner seems to have considerable promise and should be tested extensively for commercial and local market use.
Taylor. New York origin—the Taylor has been grown to only a limited extent in Oregon. Although its adaptability has not been fully determined, Taylor seems to behave as Newburgh does. It is not a consistent heavy yielder, but is generally vigorous. The fruit is of medium size, medium firm, medium red, and has a mild flavor. It is fairly good in the frozen pack but not desirable for canning.

Washington. Washington origin—introduced 1938. Washington is vigorous under good growing conditions, and yields up to 8 or 9 tons per acre. It is not adaptable to heavy or poorly drained soils, and even on lighter soils sometimes the yields have not been satisfactory. The berries have been generally small in Oregon. They are relatively dark red and have an intense red raspberry flavor, very desirable in freezing, canning and preserves. Its lack of firmness, however, is objectionable. This variety is also susceptible to red rust and anthracnose.

Willamette. Oregon origin—introduced 1942. The Willamette has now become the leading variety in Oregon, and is fairly well adapted to the different soil types. However, plants grown on heavy, poorly drained soil sometimes die. The Willamette is usually productive and has been popular with growers because of its large size, firm berries, and ease of picking. The berries of Willamette are larger and firmer than those of other varieties now grown in the Pacific Northwest. They are dark red and somewhat acid, but lack an intense red raspberry flavor. Processors like their size and firmness, but object to the acidity and lack of flavor. Their firmness and size make the Willamette well adapted to local and long-distance markets. Color and firmness are particularly well retained by canned and frozen berries.

Fall or Everbearing Red Raspberries

Many homeowners in Oregon like to have red raspberries over a long season, and the late-summer or fall-types, the so-called everbearing varieties, are suitable for this purpose. Also in some sections of eastern and central Oregon, spring frosts do considerable damage to the spring crop, or winters may be severe enough to kill the canes. The late-summer or fall-types that produce fruit the same year the canes develop are suitable for such areas. A late crop can be obtained in the fall even though the canes produced the previous year were winterkilled. The varieties listed are those most popular for this use.

Ranere (St. Regis). New Jersey origin—Ranere is an old variety that has been grown for many years in Oregon and is generally considered reliable. The fruit, however, is small to medium sized, dark red, and rather soft, but it is of good quality and very early.

Indian Summer. New York origin— the Indian Summer is a vigorous-growing variety, but the berries are somewhat crumbly and yields have not been as high as desired. The berries, however, are of good quality. Indian Summer has been extensively grown in recent years.

September. New York origin—the September, a relatively new variety, appears to be the most reliable fall-bearing type now grown in Oregon. The fruit is medium sized, round, firm,
bright red, attractive, and of fair to good quality in late summer. The spring crop ripens earlier than other red raspberries, but the quality is not equal to that of other spring-bearing varieties grown in Oregon.

**Red Raspberry Planting Operations**

**Selecting the planting stock.** Plants must be free from all diseases, true to name, and uniformly vigorous. Desirable planting stock of the principal varieties is now being produced by several Oregon growers under the “Register of Merit” program. This stock is inspected several times each year by a representative of Oregon State College, and only the most desirable stock is registered for planting of new fields. Local county extension agents can give the sources of this stock.

Plants that came up as shoots during the summer and fall are commonly used for planting in the fall, winter, and early spring, especially if they have to be transported some distance. The current-season shoots, which come up in early spring, are suitable for spring planting if conditions are favorable. If spring shoots are dug when they are 4 to 10 inches in height and immediately replanted during cool, cloudy weather or even in rain, they will continue to make rapid growth. Warm weather with wind and sunshine, however, may be fatal to the shoots, and planting under these conditions should be avoided.

Red raspberry plants should be dug so that a portion of the root, about 4 to 6 inches, is attached to the cane. The canes are usually cut back from 12 to 24 inches at the time of digging, but after planting may be cut back to approximately 6 inches.

Plants developed the previous season should be dormant when dug. If conditions are not immediately favorable for planting, the plants can be “heeled in” or held in cold storage for some time. If they are “heeled in,” a trench deep enough to receive the roots is dug, and soil is placed firmly over the roots, leaving the canes exposed. Plants held in cold storage should have some packing material around them or be put in ploofilm bags or wrapped in ploofilm, to keep them from drying out. The temperature of the storage should be from 30° to 32°F. If current-season shoots are used, they must be kept turgid. When current-season shoots are to be transported from the place of digging to a planting area, they may be kept in damp burlap, in buckets of water or in ploofilm bags.

**Time of planting.** Red raspberries may be planted from late fall to spring. Late fall or winter planting is often advantageous where winters are relatively mild, since root growth can continue during the winter. November is usually the best time to begin fall planting, and, if weather permits, the planting can be continued until the following May. The major disadvantage of fall planting is that the soil is often too wet. Most plantings are, therefore, made in the spring, to insure a proper start before arrival of hot and dry weather. Irrigation is essential to survival, should dry weather follow immediately after planting.
Systems of Planting

Linear system. Red raspberries are most commonly grown in a row of hills by the so-called linear system. The plants are usually set 2½ to 4 feet apart in the row, but occasionally a space of 4 to 5 feet is left between plants. Only the shoots that start close to the original plant are allowed to remain and grow; other shoots coming up between the plants are cut out.

Hedge-row system. The hedge-row system is common in eastern states, but is not used much in Oregon. In this system the shoots are allowed to grow between the originally set plants; in time they produce a continuous row or hedge of plants. Under good growing conditions, the hedge-row system may give larger yields than the linear system. The cost of maintenance, however, may be greater because of more difficulty in thinning the canes and keeping out weeds.

Distance between rows. Under the linear and hedge-row systems, the distance between rows is determined by the equipment used in caring for the planting. Yields are generally greater when the width between rows is 6 feet or less. When horses were used to draw equipment through the rows, distances of 6 or 7 feet were common. Upon the advent of tractors, widths of 8 to 10 feet were required to prevent injury to canes. Recent developments in tractor design, however, are making possible the use of less space between rows.

Setting the Plants

Most red raspberries are planted by hand. A spade or shovel is used to make a hole large enough for spreading the roots. The plant is set into the hole a little below the depth at which it grew. Loose soil is then returned to the hole and pressed firmly against the roots. When the soil is loose and the plants are not oversize, satisfactory planting may be done by plunging the spade well down and moving it forward or backward. The plant is set down into the opening as the spade is drawn out. The soil then falls against the roots and is made firm with the feet. Some growers, however, plow a deep furrow and place the plants along one side of it. Then the soil is returned by plowing another furrow. This method is satisfactory only if care is taken to see that the soil is pressed tightly against the roots, and the plants are set at the proper depth. Usually only one plant is set per hill. Some growers set 2 plants to make sure that one grows, and thus avoid the necessity of replanting.

Care of the Plantation

Cultivation. Cultivation should be done primarily for control of weeds. Because they compete with the raspberry plants for moisture and plant food, weeds should not be allowed to develop during the growing season. Deep cultivation, in excess of 1 to 2 inches in depth, should never be practiced. Raspberry roots are found in great abundance just beneath the surface, and deep cultivation destroys many of them. Some raspberry plant-
ings have been permanently injured in this way. Recently growers have found that through the use of chemicals for the control of weeds and raspberry shoots, cultivation can be reduced to a minimum, thus avoiding the possibility of injuring the roots. Information on materials to use in chemical control of weeds should be obtained from the local county agent, since herbicidal practices are new and many new materials and methods of application are coming out.

**Irrigation.** Because drought during the summer is common in most parts of western Oregon, irrigation is usually advantageous. Irrigation is always necessary in all areas of southern and eastern Oregon. There the rill or furrow method of applying water is the usual practice and is effective, especially where the soil can be leveled for uniform gravity flow of water. Soils of western Oregon, however, lack uniformity, and the only practical method of irrigation is by the sprinkler system.

Irrigation, however, is not always needed in western Oregon since in some years there is considerable rainfall in the early part of the summer before the berries are harvested. In most years and on most soils, a good application of water just prior to harvest is probably all that is needed, unless rainfall during the spring has been unusually deficient. In this case several irrigations should be applied before harvest. Irrigation by the sprinkler method during harvest is to be avoided as much as possible, since berries may be injured and subsequent loss from decay may occur. Plantings on a rather light soil that loses moisture quickly may need irrigation during the harvest period, and after harvest until the autumn rains begin. Plantings on heavy soils probably will not need irrigation after harvest unless the autumn is unusually dry. Sometimes irrigation in late summer may cause more than the usual amount of late-summer growth, resulting in injury if freezing temperatures occur in early fall.

**Mulching.** Mulches of straw or hay have not been generally used for raspberries, although higher yields have sometimes thus been obtained. Growers object to the use of mulches because of the fire hazard. Sawdust may be used for the purpose, although the cost of application is usually too great for commercial plantings. It may, however, be used in home gardens. Mulches prevent the loss of moisture, keep down weeds, and may make certain plant food elements more available.

### Maintaining Soil Fertility

The life of a raspberry planting may be greatly prolonged if steps for maintenance of soil fertility are taken at the time of planting. All plans may fail, however, if the planting is in an unfavorable location and in poor soil.

**Barnyard manure.** The annual application of barnyard manure is the best insurance against depletion of soil fertility. Applications of 10 to 20 or even 30 tons per acre may be made every year, or every 2 or 3 years. If poultry manure is used, the application should be somewhat lighter, probably 10 to 15 tons per acre. The manure may be applied in early autumn and disked in before a cover crop is sown. Manure may be applied also in spring. It should not be applied, however, in
the winter when the rains are frequent, as there would be considerable loss of plant nutrients from runoff.

**Cover crops.** Cover crops cannot be expected to increase the amount of organic matter in the soil, but their use may prevent the rapid decrease of organic matter content. Cover crops are used to some extent in red raspberry plantings in Oregon. Legumes such as vetches, Austrian winter peas, and crimson clover are often used, either alone or with some cereal such as winter oats, barley, or rye. These cover crops are usually drilled in during September so the early-fall rains will cause seeds to germinate quickly. Occasionally irrigation may be used if the season is very dry. Application of fertilizers, particularly those containing phosphorus and nitrogen, to increase the growth of cover crops may be advisable. Care must be taken in the spring to turn the cover crop under early to avoid its competing with the raspberry plants for moisture. Usually cover crops are combined with the soil by discing that need not be done deeply. A trashy surface is not objectionable unless it interferes with weed control.

**Commercial fertilizers.** Experimental evidence is somewhat inconclusive regarding the benefits of commercial fertilizers on red raspberries in Oregon. Most growers, however, feel that the application of fertilizers is a good insurance against possible soil deficiencies. Soil analyses should be relied upon in determining the fertilizers to use. Nitrogen is usually the element most likely to be lacking in western Oregon soils. Plants in most soils will give increased yields by application of 30 to 60 pounds of actual nitrogen per acre. Phosphorus also is often needed and sometimes soil is deficient in potash. Nitrogen fertilizers are best applied during late March or early April. There is a possibility of increasing the amount of winter injury if nitrogen is applied during late summer or autumn.

**Trellises**

It is always necessary to use some support for the red raspberry canes that are to bear fruit, since the weight of the fruit will cause the canes to bend over, making wind damage possible and harvesting difficult. Various kinds of supports are used, posts and wire being most common. Where the plants have been set farther apart than usual growers occasionally use stakes so that cultivation may be in two directions. These stakes or posts are usually about 7 feet long and are set 2 feet deep in the soil. Canes are then tied to the stakes with strong twine.

When a wire trellis is used, heavy end posts, 7 or 8 feet long set into the ground about 2½ or 3 feet deep, are generally used. Somewhat lighter posts may be used every 25 or 30 feet in the row. The posts are usually of wood treated with some preservative. Fir and other soft woods must be treated with a preservative or they will rot very quickly. Cedar or redwood may last longer than fir without treating, but even such wood should be treated. Some growers use posts of steel instead of wood. Fairly heavy wire (No. 10 or heavier) should be used. The wire is stretched from the end post and fastened in such a way that it can be tightened each year. The wire is fastened to the stakes in between in a
Canes tied to a single wire above the two sets of parallel wires in the 5-wire trellis system.

Canes of a single hill tied together to the central single wire.

Canes tied to the upper parallel wires when no single center wire is used.

Half of canes of one hill tied with half the canes of adjoining hill, all tied to center wire.

way so the wire can be passed through; large staples or nails bent over are often used or sometimes notches are cut in the posts. The number of wires varies from 3 to 5, according to the desires of the grower.

The 3-wire trellis consists of 2 wires spaced about 3½ to 4½ feet from the ground and parallel to each other about 12 inches apart. These wires are kept apart by attaching them to cross pieces fastened to the posts. A third wire is stretched about 6 or 8 inches above the 2 parallel wires midway between them. The canes are tied to this single wire, and the lower parallel wires are used to hold the new canes in the row.

The 5-wire trellis is very similar to the 3-wire system except that 2 sets of parallel wires are placed below the upper wire so more canes can be held in the row. Sometimes no central wire is used but 2 sets of parallel wires, as in the 5-wire trellis, to hold the canes in place. Sometimes the canes are tied to the upper parallel wires, and at other times they are left without tying. Strong binder twine is usually used in tying the canes to the wires.
Several canes are usually tied to the wire in a bundle, but not all the canes in a hill should be tied together. Sometimes the canes are bent so those from 2 hills are tied to the wires in the space between the hills, leaving the space above the hill open for the new canes to come up. This is advantageous from the picker’s standpoint. When all canes are tied to a single central wire, this wire should be heavy to hold the load.

**Training and Pruning**

**Fruit-bearing habits.** The canes of red raspberries are biennial; that is, they complete their growth in height the first season, bear the second season, and then die. The roots are perennial, living for many years and sending up new canes each year. Fruit-bud formation in red raspberries takes place after most of the cane growth has stopped. The period of fruit-bud formation begins in July and continues to the end of the growing season with single-crop varieties. In the spring, lateral shoots that bloom and set fruit grow rapidly. The buds on the upper portions of the canes develop into fruiting laterals first and those on the basal portions of the cane, last. The fruiting laterals from the upper buds are shorter and have fewer berries than those from the lower buds. There are wide ranges in lateral length and in number of berries per lateral of different varieties. The vigor of the plants also effects the length of laterals and the number of berries per lateral.

Cane elongation of fall-bearing red raspberries ceases in mid-summer. Immediately after cane growth stops fruit buds differentiate rapidly in the terminal portions of the canes and soon develop into flowers and fruit. The first fruit-bud formation is at the top of the cane and moves downward at a progressively slower rate. The lower buds, therefore, do not flower and fruit until the following spring. The same process takes place in the single-crop raspberries, but cane growth continues late in the autumn so the time when the terminal buds differentiate into fruit buds is much later than with fall-bearing varieties.

**Pruning practices.** It must be remembered that any pruning reduces yield, since nearly all buds develop into flowers and fruit unless they are injured. Removal of canes or portions of canes, therefore, reduces the number of berries that can be produced. It is common knowledge, however, that if all canes are permitted to fruit, the berries are small and the vigor of current-season canes is reduced. Unpruned raspberry plantings, except those growing under very favorable conditions, usually deteriorate rapidly and soon become unprofitable.

The objective in pruning raspberries, therefore, is to obtain the highest yield of marketable fruit and at the same time maintain the future productiveness of the planting. Definite rules cannot be laid down for the degree of pruning to use. Each grower must determine the amount of pruning to be done from conditions in his own planting. Experiments have shown that canes of large diameter produce the greatest quantity of marketable fruit. It is, therefore, common practice to remove all canes of small diameter. The tip portions of long canes of small diameter are also removed. The grower, however, must determine for
Only canes of large diameter are left to fruit and the outer portion of these canes cut off at the point where the diameter begins to be small.

Tall canes of large diameter can be left longer in order to get larger yields. Bending down the canes and tying to the central wire makes picking easier.

himself, according to his local conditions, just which canes to leave and how much of the terminal portion to cut off.

**Time of pruning.** The pruning of red raspberries is done in late summer and winter or early spring. As soon as the crop is harvested, it is customary to remove the fruiting canes. At that time the weak or excess new canes are also cut out. It is not essential that old canes be removed at this time, but their removal does have the advantage of lessening the chances of insects or disease spreading from old to new canes. Late winter or early spring is the time for the main pruning operation. This is usually February and early March in western Oregon but may be later in eastern Oregon.

The first operation in spring pruning is the removal of short, weak canes of small diameter. Some thinning of the longer canes may also be necessary if the hill contains too many. It is usually best to leave up to 10 or 12 strong canes if that many are present. The terminal portion of the cane also is removed. The height at which to cut off the canes is determined by the length and diameter of the cane. Tall canes are usually of large diameter, and cutting off much of the cane greatly reduces the yield of good fruit. To obtain uniformity and ease in picking and handling his canes, the grower usually determines a height at which the field will give the best returns. The usual height ranges from 4 to 5½ or 6 feet. When red raspberry canes are
left longer than 5 1/2 feet, it is the practice to bend the cane down to the top wire and tie or weave the canes along the wire so that picking is easier.

Formerly, raspberry prunings were gathered together, removed from the planting, and burned. In recent years, with the advent of power machinery for cultivation, it has been possible to leave the canes in the row and break them up with the cultivating tools such as the roto-vator. Growers feel that the incorporation of the prunings into the soil is advantageous, since the broken and decaying pruning wood improves the physical properties of the soil.

Harvesting

The harvest season for red raspberries usually begins the latter part of June and continues to the end of July, and in some late seasons into August. Some varieties have a much shorter season than others, but the average is about 1 month. Picking crews should be engaged before the season begins. A crew large enough to get over the planting as fast as the berries ripen is important. Red raspberries must be picked every other day in warm weather or at most every 3 or 4 days in cooler weather. As a rule, about 5 pickers are needed per acre. Picking crews are usually made up of women and children from nearby towns and cities of Oregon.

It is important that the pickers be properly instructed on how to pick the berries. Only ripe berries that separate easily from the cores and are fully red should be picked. Care must be taken not to pick green berries since their presence makes a low-quality pack. On the other hand, failure to pick ripe berries leaves over-ripe berries for the next picking. Pickers should be instructed not to crush the berries and not to have more than 2 or 3 in the hand at one time. A responsible person should be in charge of all large crews to see that berries are properly picked.

It is the customary practice to place the berries in small boxes called "hallocks," each containing about 1 pound. These hallocks are set in trays or carriers holding 6 to 12. The carriers are usually on legs, making it easy for the picker to place the berries in the hallocks without dropping them. Red raspberries soften quickly in warm weather and should be removed from the field as soon as possible after picking. Assembly sheds should be located conveniently close to the planting so the berries can be taken to shade, where the hallocks can be removed to crates or lug boxes provided by the packing plants. Berries should go to market or packing plant without delay.

Diseases and Insect Pests

Red raspberries are susceptible to certain troublesome diseases and insect pests. Proper precautions for their control are necessary for success in growing red raspberries. Since recommended control measures change from time to time as more research is completed, growers should always obtain the most recent information from their local county extension agents.