STARTING THE ORCHARD

T. J. Talbert

PRE-PLANTING SUGGESTIONS

Buying Good Trees

It is false economy to plant inferior or low grade fruit trees. The best which can be secured are, in the end, the most economical and profitable. Success or failure may depend upon their vigor and freedom from pests. Therefore, it is highly important to obtain the best, whether propagated at home or purchased from a commercial nursery. Well-matured healthy stock withstands transplanting better, is more resistant to dangerous pests and fungous diseases, comes into bearing earlier, and develops into more profitable fruit plants than small, stunted, and less hardy trees.

Setting at Proper Time

Apples and Pears.—Late fall and early winter planting of apple and pear trees is generally preferred in Missouri to spring planting. The results are not enough better, however, to justify a year's delay in setting.

Sour Cherries.—Sour cherries and other stone fruits have usually been planted in the spring. Cherries are believed to be the most difficult of the orchard fruits to transplant successfully. Often from one-third to two-thirds of the trees die when set in the spring. This high mortality necessitates frequent replanting before a full orchard stand is secured.

Occasional fall planting of sour cherry trees, at the Missouri Experiment Station, has uniformly resulted in a good stand. Those set in the fall have usually transplanted as successfully as apples or other fruits. For Missouri conditions therefore fall or early winter is the best season for setting.

Peaches.—In central and north Missouri, peach trees may usually be planted more safely in the spring than in the fall. This is true because a severe winter following autumn setting may
badly injure or kill the trees. Even in mild winters the wood is often injured enough to turn brown within. Thus damaged, the orchard frequently dies or at best makes poor growth and yields unprofitable fruit. Early spring setting therefore is preferred for the peach.

**Plums.**—The Japanese varieties and other slightly tender species of the plum are subject to winter injury in Missouri and so are more safely set in the spring. Hardy stock, however, benefits from fall and early winter planting about as much as apples and pears.

### Handling Fresh Stock

**Examination for Moisture.**—As soon as the trees are received, the roots should be examined for moisture. If none is present, they should be wet at once and kept damp until heeled in or transplanted. Should the stock be dried out much, burying it completely in damp, but not wet, earth and leaving it four to six days to be properly restored, may prove helpful. Trees should never be allowed to dry out or suffer exposure to the drying action of the wind and sun. When setting, the roots may be kept in a barrel partly filled with water, covered with damp packing material, or wrapped in damp gunny sacks.

**Heeling In.**—If the trees cannot be planted immediately upon arrival they should be heeled-in as soon as possible. This may be accomplished by digging a shallow trench and covering the roots, and a foot or more of the lower part of the stems or trunks, with moist earth. The ties of the tree bundle should be cut and the trees spread out in the trench to place the moist soil in close contact with the roots. This prevents the formation of air pockets and consequent drying. When thus spread out, the varieties may be distinguished by marked stakes driven between the different lots.

**Protection from Freezing and Drying.**—The roots of young, dormant fruit trees are easily killed by freezing. In fact, they cannot endure the low temperatures to which tops may be exposed without injury. They are also damaged by drying out in handling. The fact that they may be kept uncovered for a time in a moist packing shed, or in the field during a moist still day, should not encourage the belief that exposure to winds and a dry air is non-harmful. In setting large areas, trees are frequently distributed ahead of the planters and the roots left exposed too long to a drying sun or wind. Exposure of freshly dug trees for fifteen minutes
if the day is dry and windy, and for more than thirty minutes on an average sunny day, may be injurious.

Preparation of the Soil

Well-drained, typical fruit soils may be prepared for orchard setting by deep plowing and thorough harrowing or disk- ing as for potatoes, corn, or wheat. Thoroughly prepared, friable, and loose soil in good working condition, grows much better trees during the first few years than unplowed or poorly cultivated land. Planting truck or field crops without thorough preparation would be unthinkable; yet thorough preparation for planting of young fruit trees is often neglected.

Laying Out the Orchard

Pollination Factors.—Varieties should be selected and planted in such a manner as to facilitate inter-pollination. This means arrangement of trees in strips or blocks of two or four alternate rows containing three or more varieties. Such a plan should provide for cross-pollination at blooming time. In case one of the sorts tends to bear alternately, at least three varieties would be needed. If a poor pollen producer like the Winesap is selected, it
would be advisable to plant four varieties, alternating them in strips of two or four rows each across the orchard.

**Distance of Planting.**—The distance of setting varies with soils, varieties, pruning practices, habits of growth, and climatic conditions. Space between apple trees therefore may range from 33 by 33 feet for the more upright and less vigorous sorts on thinner soils to 40 by 40 feet for the spreading and strong growing varieties on richer and more productive soils. The mistake is often made of planting too close. A distance of about 36 feet for the less fertile soils and about 40 feet for the better soils is generally satisfactory. Pears should usually be set 30 feet apart each way; peaches, 20 to 24 feet; plums, 20 to 24 feet; cherries (sour), 24 to 30 feet; cherries (sweet), 28 to 32 feet; and quinces, 18 to 22 feet. The tendency should be to plant trees farther apart since experimental evidence has proved its value.

A greater distance between trees is desirable not only to prevent interlocking of the branches and interference with orchard operations when the bearing period is reached, but also to reduce competition between the root systems. As a rule the roots extend much farther in all directions than the branches. In fact, the roots often overlap and compete for moisture and nutrients long before the branches give trouble.

**The Square System.**—This method of laying off the ground for planting is usually used because it is easy and efficient. According to it, a base line is commonly established on one side of the field, fixed about 20 to 30 feet from the fence or road and marking the first row of trees. Stakes several feet in length should be driven into the ground at each end. If the row is long or the land uneven one or more stakes may be needed between them. They are placed by sighting over the two end stakes. The distance between the trees is then measured off and a small stake driven down to mark the place where each plant should be set.

Lines running at right angles to the base row are staked out in the same manner. Where the field is irregular in shape it may be most convenient to stake out a square or rectangular block after which irregular portions of remaining land can be marked out. Where the field is large it is usually advisable to use several stakes in locating the cross rows. Tall stakes should be provided at right angles to each other, over which to sight in aligning the trees as they are set.
The Furrow Method.—A less accurate method of laying out the orchard is by plowing furrows. Measurements are made and tall stakes driven in both directions at the ends of the lines and between the lines of stakes. Furrows are then plowed crosswise between the stakes.

PLANTING OPERATIONS

Preparing the Trees for Setting

In preparing the plants for setting, all portions of roots mutilated in digging or handling should be removed with pruning shears or a sharp knife. Where long slender roots appear, they should be cut off to about the length of that particular plant's general root system. The larger and more vigorous the root system, the better the tree, as a rule.

Making the Holes

Making the holes for planting is a simple matter if the land is well prepared. They should be large enough to receive the roots without bending them from their normal position and deep enough to let the trees stand about two inches deeper after planting than they stood in the nursery row. In using young trees as replants in the established orchard, it has been found that the roots of the older trees spread laterally to a much greater distance than do their branches. Often the roots permeate the soil prepared for the replant before the end of the first season. This emphasizes the need, for at least two or three years, of cutting back the roots of the surrounding trees while tilling about the replant.

The use of dynamite to shatter and loosen the soil has been investigated by many experiment stations. But in general, it has not resulted in any advantage to the trees. This has not only been true of tight, impervious subsoils known as hard-pan but of looser and more friable soils. In clays, a little wet when dynamited, distinct harm may be done by plastering it together and forming a cavity or pocket which may prevent good water drainage. In such instances trees are often killed for lack of proper drainage in wet weather. The soil and subsoil should always be dry enough to work properly before dynamiting. Tight, impervious soils requiring such treatment are usually unsuited for planting.

Setting the Roots

The roots should be set to stand in their normal position. Twisting or bending should be avoided as bending a main root greatly lessens its capacity to absorb water and prevents its nor-
mal growth. The roots may be kept in their proper position and the soil compacted about them by shaking the tree vigorously with one hand while the earth is being sifted from the shovel with the other. In this way the dirt falls lightly among the roots instead of bending them down and leaving air pockets as if it were scraped into the hole in masses.

**Compacting the Soil**

In setting, the soil should be tamped firmly about the roots as the hole is being filled. If about an inch of loose dirt is spread over the tamped surface, it tends to prevent the soil from baking and drying out. Much of the mortality of fruit trees is due to bending the roots and failure to compact the soil in planting. Lay-
er by layer, as the dirt is shaken in, it should be tamped firmly. It is impossible to pack the soil properly if the hole is entirely filled before tamping. The last two or three shovelsful are not tamped to prevent surface soil baking.

**Placing Trees in Sod**

Where trees are set in sod as in a lawn, or where replanted between established trees in an uncultivated orchard, the newly set plants make much better growth if the holes are dug deep enough and broad enough to kill back the competing roots and the surrounding grass to a distance of several feet. It is difficult to make replants live in an established orchard unless proper care is taken. Holes should be dug about 14 to 18 inches deep and wide enough for insertion of the roots without bending. To destroy competing tree and grass roots a space extending 4 to 6 feet in all directions from the young tree should be spaded or hoed to a depth of about 10 or 12 inches. This gives opportunity for the replant to become established before the surrounding roots grow in and take away its moisture and nutrients.

To successfully grow trees in sod they must be given special care and attention until bearing age. Hoeing 4 to 6 feet in all directions around each tree is essential. From three to five such cultivations may be required during the growing season. Most young trees also need fertilizing. This may be accomplished by working 10 to 12 shovelsful of manure into the soil through early spring cultivation. Since the foliage of young trees is susceptible to disease and insect attack, it is well to spray them regularly when spraying the bearing orchard. Proper pruning should also be practiced each year.

In growing young orchards, mulching is sometimes helpful, especially if readily available fertilizers are used when needed for better growth. If the material such as straw, hay, etc. can be procured and applied in sufficient quantities to keep down grass and weeds around the plants and between the rows it is all the more valuable. This culture supplemented by fertilization should produce as vigorous trees as the use of cultivation and cover crops. Mulching has the disadvantage, however, of creating a fire hazard and in some instances, causing an increase in rodent damage.

**Removing Labels**

Trees frequently arrive from the nursery with wire name labels attached to one or more trunks in each bundle. It is very important that these be removed at time of planting as they may
girdle and kill the trees in a year or two. But if attached to one of the large limbs the wire does not do much damage even though removal is neglected.

**Keeping an Orchard Record**

An orchard record should be made for each plot of ground soon after the trees are planted. Since this is to be a permanent record the notes and entries should be kept in a book especially prepared for the purpose or at least in a well-adapted form.

The most important records will consist of kinds of trees, the varieties of each fruit planted, the dates of planting, age and condition of nursery stock, location by means of diagram or description, and name and address of nursery or individual supplying the trees, weather conditions at time of planting, and in some cases other information of value.

**PRUNING**

The newly set tree is pruned primarily to reduce its evaporating surface until new growth becomes well-established to supply moisture. Incidentally too, it may serve to start a proper framework or branching system. The degree of pruning differs with the species. Trees like the peach, which start new branches readily

---

*Fig. 3.—A two-year-old apple tree at time of transplanting, before and after pruning.*
from the central trunk but the twigs of which tend to dry out badly, should be cut back severely. Trees however, like the sour cherry which does not start growth readily from dormant buds on the older parts but which makes its new growth from the active terminal buds, should be pruned very little.

Methods of Pruning

Apple and Pear.—The apple and pear should be pruned to a medium degree. The side branches should be cut back to reduce them one-half to three-fourths and the central stem should be shortened but still left from 10 to 16 inches higher than any of the surrounding branches. At the end of the first season's growth the permanent framework may be established by removing all but three to five well-distributed, outward-spreading limbs, thus securing a modified leader tree. If the tree is large enough that permanent limbs may be chosen at transplanting, the permanent framework may be established then. The selected branches should be arranged up and down and around the main stem, if possible at a distance of 8 to 14 inches apart. If the tree is a one-year-old whip having no branches it should be shortened to a height of 2½ to 3 feet, to secure a good branching system below the point of cutting.

Peach, Nectarine, and Japanese Plum.—The peach should usually be pruned to a single stem either by removing the side branches entirely or shortening them to stubs 3 or 4 inches long and cutting the main trunk to 2 or 3 feet in height. The nectarine and Japanese plum should be treated similarly except that the latter may retain stubs a few inches long, or three to five main limbs if the branches are large, properly spaced, and well-established. These species start new growth most readily from the main trunk or the base of the limbs. Remaining branches or stubs should be spaced several inches apart and arranged up and down and around the trunk.

American Plum.—The American plum should be cut back somewhat less severely than the apple. If the tree is well-branched, three or four main limbs may be left intact to form a permanent head and the remaining stem and branches may be removed. The side branches left may be shortened one-third to one-half their length.

Sour Cherry.—The sour cherry should not have its permanent branches cut back, as it starts new growth most readily from the
larger, active buds at the terminals. Three to five main limbs should be chosen for the permanent framework and the remaining ones removed. The limbs which are left should keep their terminal buds intact. Instead of cutting back twigs, they should be merely thinned to four or five well-placed branches arranged up and down and around the main stem at distances of 6 to 10 inches. Under Missouri conditions cutting back the branches is likely to kill or seriously injure the trees.

Time of Pruning

The principal work should be done some time after the leaves drop in the fall and before they appear in the spring. Any time during this dormant season, whenever men may work comfortably out-of-doors, is satisfactory. With large orchards one of the chief difficulties, is that of getting the pruning done. Labor however, may usually be secured more easily during the fall and winter than during the rush work period of early spring just as growth starts.

Effects of Pruning

While the discussion which follows applies more especially to apples and pears, the same principles and practices hold for pruning peaches, plums, and cherries.

With the peach it is important that the trees be headed low and that the fruiting wood be kept near the ground. Bearing trees are cut back somewhat more severely than others because the fruit is borne on one-year-old wood. It is important that the trees be headed low and that the fruiting wood be kept near the ground. The fruiting wood should be maintained near the main trunk and not too far out on the scaffold branches. If the young trees are properly pruned at planting time they do not usually require severe pruning the first two or three years.

So-called corrective pruning during the first few years in the orchard, is done largely to thin out interfering or competing branches; and since such cutting need not be severe it does not delay bearing or reduce the size of the trees. Severe or heavy pruning however, does delay the time of bearing. The leaf area is reduced and later, as a result, the root area also decreases to maintain the balance. Trees not pruned or lightly pruned are larger at bearing age than those which have been pruned heavily.

Pruning is necessary to correct the shape or form of the tree and thereby to develop strong branches for carrying a heavy load of good colored fruit. Beyond this, however, severe cutting should
be avoided. Light cutting each year keeps the branches properly spaced and in balance, but even this should be reduced to a minimum as the trees come into bearing.

**CARE OF YOUNG ORCHARD**

**Soil Management**

Regardless of soil types, the particular fruit section, or the kind of fruit grown, the adoption of fundamental practices is necessary for a permanent soil management program. These consist of the maintenance of an adequate supply of organic matter, the presence of nitrogen in sufficient quantities, and the control of run-off water to check erosion and conserve the moisture supply.

**Tillage Practices.**—The organic matter of the soil acts as a storehouse for nitrogenous compounds. With its gradual depletion, the nitrogen disappears and growth is reduced. Constant tillage tends to reduce or “burn out” the humus supply. The cultural practices therefore, that make nitrogen most rapidly available, at the same time most rapidly deplete the total supply. To maintain the soil organic matter, manures or cover crops must be used.

Much argument pro and con has prevailed regarding the clean cultivation question and in the opinion of many, the problem has not been settled. Nearly all agree however, that the pendulum is now swinging toward less frequent and shallow cultivation. Tillage practices are changing and the reasons are believed to be good.

The experience of several years ago showed that clean tillage without cover crops hastened the liberation of plant food and the plants made good growth at first and produced abundantly. But this distinct improvement for clean cultivated trees was in most instances short-lived. Tillage was given too much emphasis; so to place the orchard industry upon a profitable basis it has been necessary to substitute the use of tillage and cover crop systems.

**Clean Cultivation and Cover Crops.**—Clean cultivation with cover crops usually means the planting of some crop in the orchard, following early spring and summer tillage, which when plowed under the following spring will add organic matter to the land. Thus both nitrogen and humus may be added, and by keeping the land covered during the fall and winter the soil moisture supply is conserved and erosion largely prevented. In the young orchard this system is quite important as the soil organic matter should be built up while the trees are young.
The seeding is usually done in the summer or early fall in order to secure a fairly good growth before winter weather prevails. The practice is to turn under the cover crop early in the spring. An interval then of about four to six weeks occurs in most sections during which the soil is bare or free of a cover crop. After this period it is usually seeded to another crop.

**Use of Cover Crops**

**Value as Soil Builders.**—It is true that growing cover crops may compete with the fruit trees during the late summer and early fall for soil moisture and nutrients. But this effect is usually desired as it tends to slow up or check growth and thus cause wood tissues to harden for winter protection. Annual cover crops are not usually deep-rooted and so may not influence deep-rooted tree fruits. Therefore both the nitrogen and the organic matter supply may be maintained.

A cover crop checks the flow of water arising from rain and snow, increases soil moisture absorption, and materially lessens surface washing. Also if a leguminous cover crop is plowed under and the soil is cultivated early in the spring, the maximum quantity of nitrates are available during the early growth period. For land where the organic matter supply and nitrogen seems insufficient for a thrifty, healthy growth, this system of soil improvement and management has great merit.

**Over-Winter Legumes.**—Leguminous cover crops that overwinter usually include winter vetch, crimson clover, red clover, mammoth clover, and sweet clover. Of these, vetch is considered the best winter cover, particularly in the young orchard. It is always preferred for localities subject to cold winters.

With legumes which have the ability to take free nitrogen from the air and fix it through organisms in the root nodules, the total nitrogen supply in some soils may be actually increased. It is frequently found that the amount added through the legumes is greater than that used by the trees or lost through other sources. Thus land deficient in nitrogen as well as humus usually benefits from leguminous cover crops such as those mentioned. Expense is also less than the addition of nitrogen through any other method.

**Over-Wintering Non-Legumes.**—Over-wintering non-leguminous crops commonly used in orchards are rye, wheat, and winter oats. Like legumes, these have many advantages such as hold-
ing the snow, preventing erosion, conserving moisture when plowed under, and increasing the soil aeration and organic matter supply. They lack however, the important ability to store nitrogen and thus increase the supply.

**Non-Overwintering Cover Crops.**—Some of the cover or green manure crops killed by frost in autumn and early winter are valuable for growing in the late summer and early fall after cultivation ceases and, when killed by frost, to cover the soil, prevent erosion and deep soil freezing, and hold the snow. Also when plowed under they add large quantities of nutrients and thus materially increase the organic matter supply. Legumes most suited for this purpose are cowpeas and soybeans, and non-legumes are rape (Dwarf Essex), turnips, and weeds allowed to grow in late summer and fall.

**Intercropping the Orchard**

In planting intercrops, a certain portion of land should always be reserved for the trees. This should be a strip not less than six to eight feet wide along each row and should be widened with each year’s growth to allow sufficient room for unobstructed root extension. The space reserved should be given thorough and timely cultivation at the same time the intercrop is tended. Many vegetables and truck crops such as beans and peas, tomatoes, early and late cabbage, potatoes, sweet potatoes, melons, squashes, pumpkins, carrots, and turnips may be used as orchard intercrops. If properly handled they should not injure the fruit plants and in many cases may actually benefit them. In fact young trees often do not receive cultivation and fertilization unless garden and truck crops are grown. The latter demand care and cultivation and therefore may cause the orchard to receive better treatment. If the fertility of the soil is also maintained, the land may be made to pay a fair to good return before the trees come into active bearing.

**Fertilizing**

**Manure.**—All factors considered, no nitrogen-carrying fertilizer is believed to be better than manure. Manure not only acts as a fertilizer to supply fruit trees with readily available nitrogen but it improves the aeration and tilth of the soil. The mechanical or working condition is improved. Also through the humus supply, the water-holding capacity is improved and danger of washing and injury from drought in dry seasons, are reduced.

**Commercial Nitrogen.**—The chief substitutes for manure are nitrate of soda, sulphate of ammonia, and cyanamid. These com-
mercial products contain much larger percentages of nitrogen than manure. They are also far less bulky, and easier to transport and handle. Sodium nitrate contains 15 or 16 per cent nitrogen, depending upon methods of preparation, while ammonium sulphate contains about 20 per cent nitrogen and cyanamid 21 per cent. From these percentages, the grower finds that only about three-fourths as much sulphate of ammonia and cyanamid are needed as nitrate of soda for the same amount of nitrogen.

While manure is all important in orchard fertilization, it is believed that even were it obtainable in sufficient quantities, most good growers would supplement it with a commercial nitrogen fertilizer. For instance, spring applications of chemical fertilizers is much more effective in increasing growth than manure applied at the same time. This is because most chemical fertilizers are more readily and quickly available to the tree roots.

The amount to use per tree depends upon the size and age of the trees and the cultural practices used. For sod orchards, about one-fourth pound for each year of age, is customary while in cultivated orchards only about a half that amount is needed.

**Spraying**

The foliage of young trees, sometimes suffers seriously from attacks of disease and insects. Therefore it should be carefully watched during the first two or three years after planting as well as later and at the first indication of injury steps should be taken promptly to prevent it. Only peach foliage may not need spraying.

**Summer Sprays.**—Where both diseases and insects are to be controlled, a combination spray such as is employed in bearing apple orchards may serve the double purpose. This may consist of lime-sulphur solution at the rate of 2.5 gallons to 100 gallons of water to which two pounds of arsenate of lead is added, or bordeaux 4-6-100 may be used with two pounds of arsenate of lead.

The fungicides, lime-sulphur and bordeaux, control such diseases as scab, black rot, leaf spot on the apple, and leaf spot on cherries and plums. Arsenate of lead or poison is used to check biting and chewing insects like canker worm, several species of foliage eating caterpillars, etc.

When aphids become very numerous on young trees nicotine sulphate, 3/4 pint to 100 gallons of water may be used. Nicotine at the same dilution may also be added to the combination sprays
mentioned. Frequently oil emulsion, \( \frac{3}{4} \) gallon to 100 gallons is added to the bordeaux combination spray, as it has been found effective against aphids and is also inexpensive. In spraying, the work must be done very thoroughly. Suckling insects must be hit and wet by the solution to secure good results.

**Dormant Sprays.**—All young trees may soon become infested by San Jose scale. To keep this insect under control it is necessary to spray almost annually. The dormant season which occurs between the dropping of the leaves in the fall and their appearance in the spring is the proper time. Lime-sulphur solution at the rate of 1 to 7, or oil emulsion at the dilution recommended by the manufacturer is an effective control. Where peach leaf curl, a fungous disease of peach foliage, is also present, the lime-sulphur if applied before growth starts, will control both curl and scale. Oil emulsion too if added to bordeaux 4-6-100 makes the spray effective against both. The spray to be effective against the leaf curl disease must be applied before the buds begin to swell or the beginning of growth in the early spring.

**PROTECTION AGAINST RODENTS**

**Use of Wrappers.**—The only safe way to prevent rabbits from gnawing the bark off the trunks of young fruit trees is to wrap the base of the trunks from the ground to a height of about 18 to 20 inches. Where the branches are less than 18 inches above the soil the wrappers should include both trunk and branches to a height of about 18 to 20 inches. Various kinds of wrapping material may be used. Some of the most common are one-inch mesh poultry wire, galvanized window screen wire, galvanized wire netting having 3 or 4 meshes to the inch, hardware cloth, old newspapers, gunny sacks torn in strips 6 to 8 inches wide, and cornstalks. Other suitable types are wood-veneer wrappers, patented wire wrappers, tarred paper, and building paper.

**Time of Wrapping and Unwrapping.**—The wrappers should be placed around the tree trunks about the time the leaves drop in the fall. All those except wire should be removed early in the spring as growth starts. Those like newspapers, gunny sacks, cornstalks, building paper, wood veneer, etc., wrapped around the tree trunks and left during the spring and summer, may form a harbor for insects and diseases. Also the bark of the tree trunks when thus enclosed will not develop normally.
Soil Cultivation and Removal of Rubbish.—Good cultivation of both young and old orchards, from early spring until about the middle of July or first of August, not only tends to prevent serious injury by field mice but usually does much toward making the trees more vigorous and healthy and consequently more profitable. Trash, litter, and dead grass and weeds which may form a harbor for the meadow mouse should be kept away from the tree trunks. Where cultivation cannot be practiced on account of soil washing or for the other reasons, damage may be largely prevented by hoeing in the fall a strip a few feet wide around the tree trunks to keep the space cleared of weeds, litter, and mulch.

Use of Mechanical Protectors.—Galvanized window screen wire and other types of wire screen having meshes of about one-fourth inch, may be cut into strips, placed around the tree trunks and pushed into the soil a few inches (as previously described to prevent injury by rabbits) to protect against mice injury. Wire protectors, therefore, serve a double purpose.