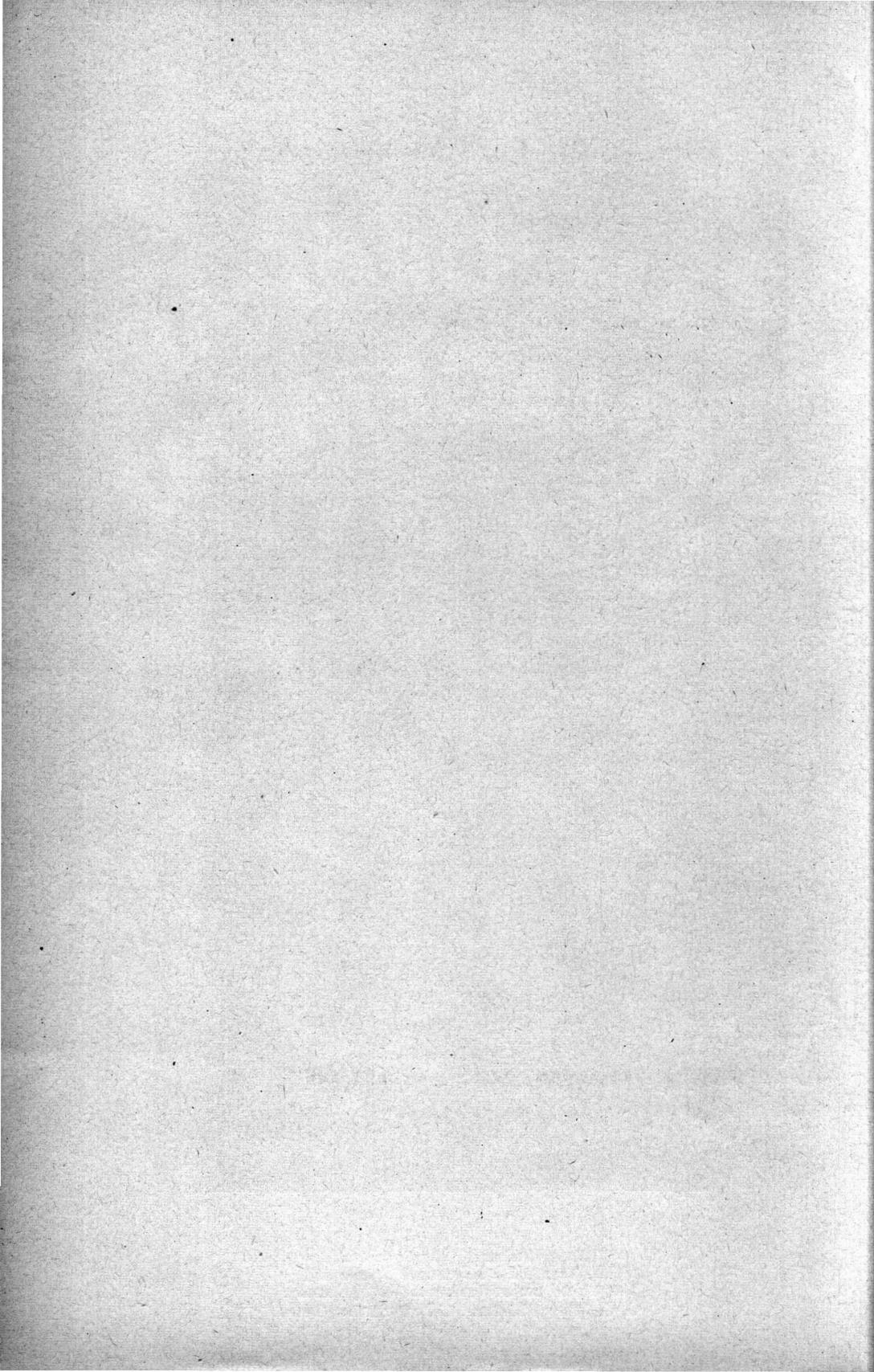


PECAN ORCHARD MANAGEMENT

Issued by
The Agricultural Extension Service
The Texas A. & M. College System and
The United States Department of Agriculture
G. G. Gibson, Director, College Station, Texas



Pecan Orchard Management

by

J. F. ROSBOROUGH, *Former Extension Horticulturist

F. R. BRISON, Professor of Horticulture
Texas A. & M. College

L. D. ROMBERG AND C. L. SMITH, U.S.D.A. Pecan Laboratory, Brownwood, Texas

SOIL AND MOISTURE FOR PECANS

The pecan is a deep rooted tree which needs plenty of moisture. It will not stand poorly drained or water-logged soil. Regardless of the depth of the tap root most of the lateral roots occur in the top three or four feet of soil.

The soil in which pecan trees grow best has the following characteristics: 1) well-drained, 2) fertile, 3) deep, and 4) pervious to water. These four qualities are essential, but may be found in different types of soil.

Alluvial soils along streams are generally good but sometimes unsuited because of poor drainage or lack of depth. Willow trees or crayfish holes are good indicators that the soil is unsuited. Coarse gravel deposits below the surface of the soil may cause excessive drainage making the soil unsuitable.

Some sandy upland soils are suitable for pecan production but the soil should be reasonably fertile and deep enough to hold large amounts of moisture. A porous clay subsoil underlying one and a half to three feet of sandy soil is preferred. Upland soils which are subject to erosion should be terraced before the trees are planted.

Check the soil before planting. Other kinds of soil may also be suitable but in all cases the soil should be carefully examined to a depth of six feet or more before setting out the trees.

Rainfall of 30 to 40 inches per year may be sufficient if properly distributed throughout the entire season. Trees with wide spacing and maintained by clean cultivation will grow and produce on less moisture. In areas of suitable soils, but with limited rainfall, moisture may be provided through irrigation. Adequate moisture throughout the growing season is important, as the pecan first develops size and then the meat develops during the latter part of the growing season. Mid season and late summer moisture tends to stimulate good development of the kernel.

ORCHARD DEVELOPMENT FROM NURSERY TREES

The planting distance between the trees should range from 50 to 70 feet. A wider spacing is necessary in alluvial soil where the trees are likely to grow to a larger size than on upland soil.

Factors to be considered in determining the proper space for planting pecan trees are 1) ultimate size of the trees, 2) rainfall, 3) possibility of fungus diseases, 4) air circulation and sunlight.

The root spread of a bearing pecan tree is about twice as great as the growth of the branches. These factors indicate that the individual who is setting a pecan orchard should provide ample space between trees for maximum growth and production. Another advantage of ample space between trees is that during the first seven to ten year period after the trees are set out, intercrops such as cotton, easily matur-

TABLE OF VARIETAL CHARACTERISTICS

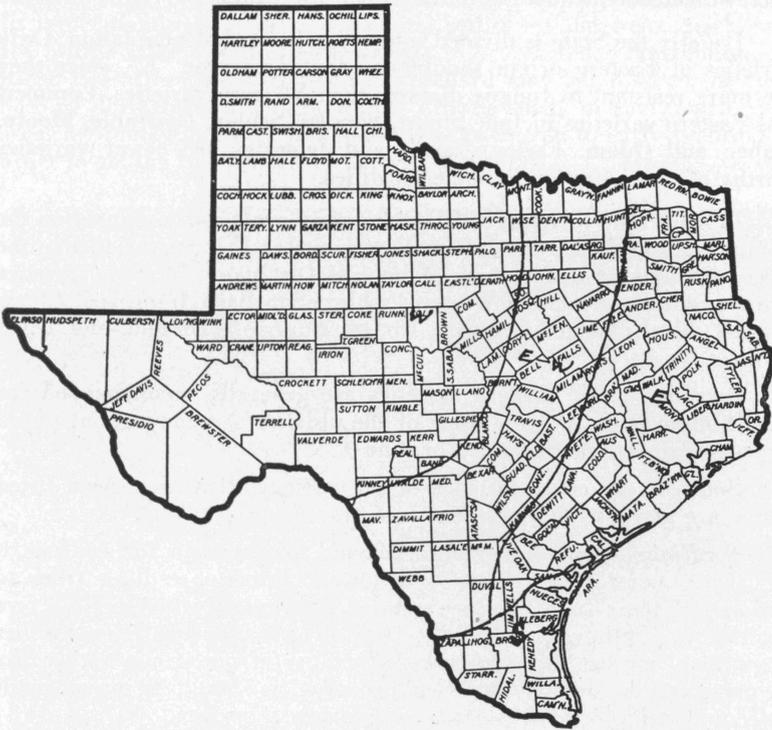
VARIETY	Kernel content of well filled nuts	Number of nuts per pound	Relative dates of		Relative time of season when nuts ripen
			Pollen Shedding	Stigma Receptivity	
WESTERN VARIETIES	Percent				
Burkett	54-58	40-60	Late	Early	Mid-season
Clark	53-56	60-80	Early	Late	Past mid-season
Halbert	57-60	60-80	Early	Late	Early
Ideal	54-58	55-75	Late	Early	Mid-season
Nugget	56-59	80-100	Late	Early	Mid-season
Onliwon	58-61	55-75	Early	Late	Mid-season
San Saba					
Improved	58-61	55-75	Early	Late	Early
Squirrel					
Delight	53-56	50-70	Early	Late	Early
Sovereign	52-55	50-70	Early	Late	Mid-season
Western Schley	56-59	55-75	Early	Late	Before mid-season
EASTERN VARIETIES					
Desirable	54-58	40-60	Early	Late	Mid-season
Mahan	53-57	40-60	Late	Early	Late
Moore	47-50	60-80	Early	Late	Early
Odom	54-57	40-60	Late	Early	Mid-season
Schley	57-60	50-70	Late	Early	Mid-season
Success	51-54	40-60	Early	Late	Mid-season
Stuart	48-50	45-60	Early	Late	Mid-season

ing truck crops, or legume crops may be grown. The income from intercrops may be of much help in reducing the total cash sum needed to bring the orchard into paying production.

Planting to insure good pollination between varieties is important. Some pecan varieties produce pistillate flowers (nutlets) before pollen from the catkins is ripe. Others produce pistillate flowers (nutlets) after the pollen has been shed. Those who are making plantings of pecan trees should check the table to be sure that there is a combination of varieties that will provide pollen from early until late in the season.

CHOOSING VARIETIES FOR PLANTING

The purpose for which the pecan orchard is planted or budded should have a definite bearing on the varieties which will be used. If



Map of Texas showing zones of variety adaptation. Zone E represents areas of relatively high rainfall and therefore eastern varieties are generally planted because they are more resistant to scab than Western varieties.

In Zone E-W both Eastern and Western varieties may be used except in certain lowlands where the humidity is high and where scab would attack western varieties.

In Zone W Western varieties may be used since in this area scab has not occurred to any appreciable extent. Eastern varieties also may be used in this area.

In the extreme southern part of the state is Zone S where pecans apparently are not adapted. This may be due to the extremely mild and short winters.

the crop is to be sold largely for shelling purposes the consideration would be for medium sized pecans which have a high meat content and which have the ability to produce large and regular crops of nuts.

The experience of growers of improved pecans has generally been that the varieties planted are an important factor in determining the financial success of an orchard. Characteristics most desired in a commercial variety are 1) disease resistance 2) good production, and 3) a nut that meets market demands.

Owing to the great variation in climatic and in soil conditions within the State, even within short distances, it is very difficult to make general recommendations as to varieties to plant. It is best for any prospective planter to check the leading varieties in established groves of the locality where the orchard is to be planted, and in addition, obtain the recommendations of leading authorities.

Usually the State is divided into several zones of adaptation. Only varieties of Eastern origin should be planted in zone "E", since they are more resistant to fungus diseases than Western varieties. Commercial Eastern varieties include Stuart, Success, Schley, Desirable, Moore, Mahan and Odom. Farley, Candy and Jennings are newer varieties worthy of consideration in some localities.

In zone "W" varieties of Western origin are usually planted on the uplands and in the bottoms of small streams but Eastern varieties in the larger bottoms or in locations of poor air drainage. Western varieties being propagated include Western Schley, San Saba Improved, Clark, Burkett, Ideal, Nugget, Onliwon, No. 60, Squirrel's Delight, and Texas Prolific.

In zone "E-W" Eastern varieties are generally recommended for most bottom lands and for some of the uplands. No commercial planting of pecans is recommended in zone "S".

Some of the characteristics of the varieties that have been listed above are given in the table on page. 4.

Seedlings—Since the greatest demand for pecans is for shelling, it is usually considered unwise to top-work bearing seedling trees to varieties if these trees produce nuts of good quality for shelling, are healthy, and produce reasonably well. If a native seedling tree has exceptional merits in production and quality of nut it may be worthy of propagation locally, but such propagation should be on a small scale until the worth of the tree as a variety is proven.

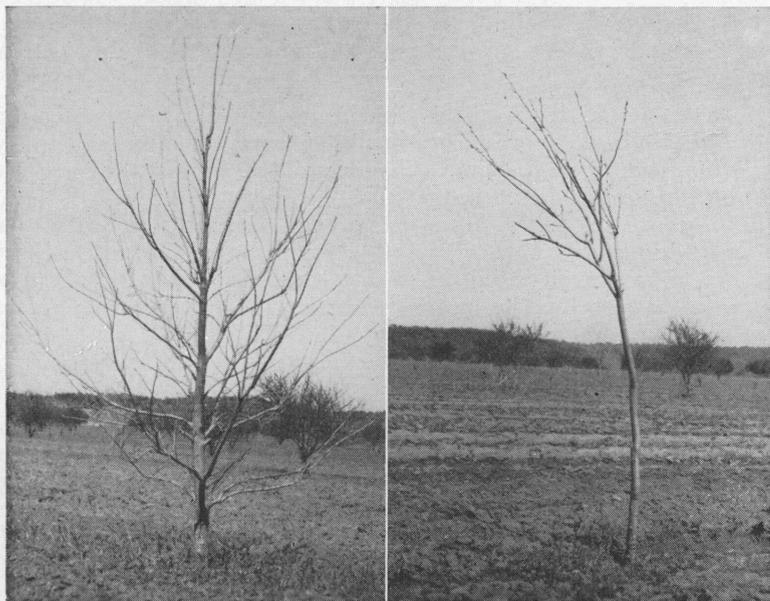
TRANSPLANTING

Pecan trees which are 3-4 feet or 4-5 feet in height are a suitable size for planting. Stocky nursery trees are considered to be more vigorous than those which are spindly. Trees which are unusually large require extra care when transplanted. Most nursery trees that are

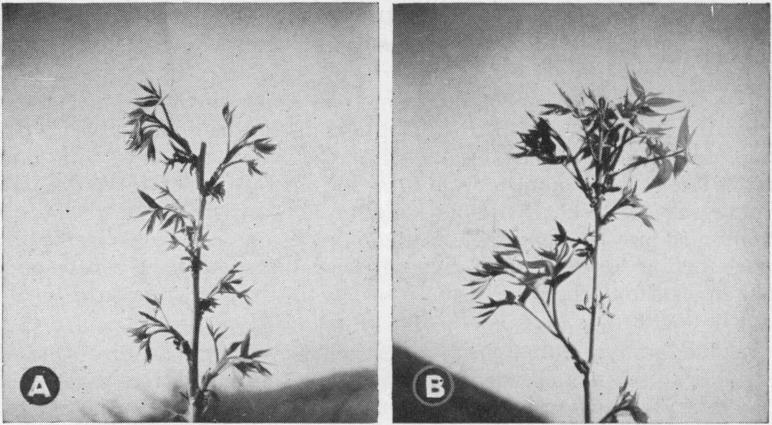
planted in commercial orchards are from rootstocks which are two to four years old and with one or two years of growth of bud or graft to form the top. Little is to be gained in bringing about earlier production by using large trees.

For large plantings use a farm level or surveyor's transit in laying off the rows. Stakes of sufficient heights that may be seen for a considerable distance should mark each tree location. In heavy soils holes about three feet in diameter and three to four feet in depth are prepared for setting the trees. In lighter soils the hole in which the trees are to be planted may be dug with a posthole digger or with mechanized equipment such as is used in the digging of postholes in fence construction. The holes should be dug 12 to 15 inches in diameter and three to four feet in depth.

A suitable planting chart indicating the planting arrangement and varieties to be planted should be prepared before the trees are set out. In large plantings, prior to the actual setting of the trees, mark each row with a stake to indicate the variety to be planted. Transplanting of pecan trees from the nursery to the orchard may begin when the trees become dormant and continue until growth starts in early spring. In areas of limited moisture late planting is preferred to early planting in order to get the full benefit of the winter rainfall.



The effect of removing all the lower limbs of a young pecan tree. A, no lower limbs were removed. Note the sturdiness of the tree and that it is not bent by winds. B, tree pruned to a high head. Note slender trunk and tree leaning from wind. Trees are the same age and growing in the same orchard.



The right way, A, and the wrong way, B, to start young pecan trees.

It is best to plant the trees as soon as possible after arrival from the nursery. Where a delay in planting is necessary, take the trees out of the packing material in which they were shipped and cover the roots with moist soil. As each tree is being planted all bruised ends of roots should be cut off smooth and in the case of trees planted in holes dug with a posthole digger the roots may be trimmed to fit the dimensions of the hole.

In setting the trees in their permanent locations it is suggested that they be planted about two inches deeper than they stood in the nursery. Only the loose top soil should be used in filling around the trees. The soil should be firmly packed around the roots as the hole is being filled. In case the soil is not well supplied with moisture, add water around each tree at time of planting. In areas of limited moisture, leave a basin around each tree so that it may be watered as often as necessary to keep the tree in good condition. This is especially important for those trees which are set early in the winter and where drying out of the roots may occur before the normal season of growth begins in the spring.

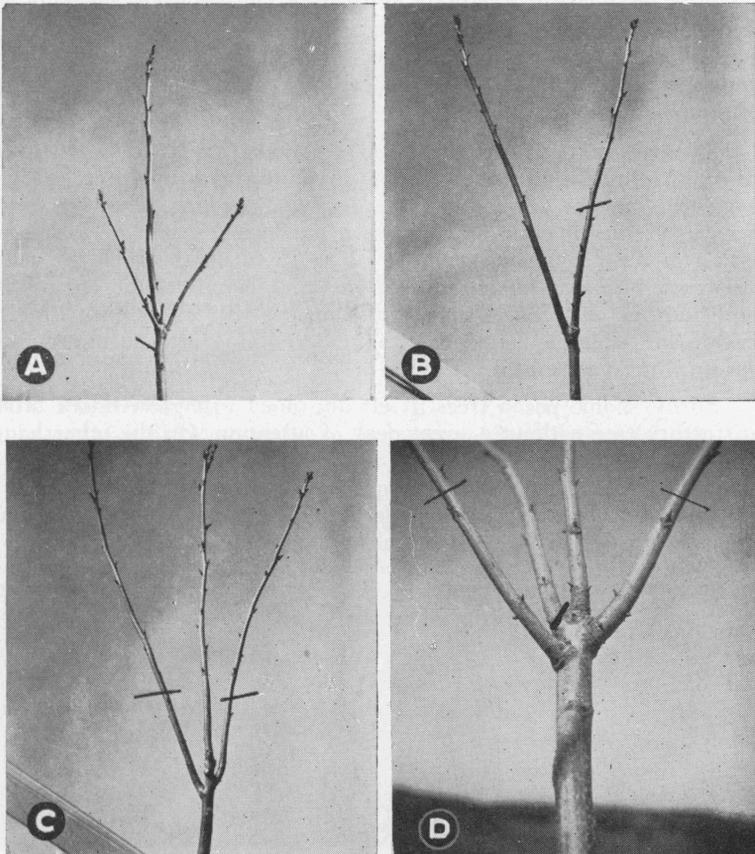
As the trees are planted the tops are cut approximately one-third to one-half of the total length of the body above the ground. In the case of large trees the body should be wrapped with several thicknesses of wrapping paper to prevent sun scald or damage from the flat headed apple tree borer.

CARE OF YOUNG TREES

During the first summer adequate moisture is vital. In a dry season the ground around each tree should be soaked thoroughly to the full depth of the root system at least once every two weeks.

Sunscald—If the bodies of the young trees are not wrapped at time of planting it is important that all twigs and leaves be allowed to grow on the entire length of the body during the first season to bring about a better flow of sap and to provide foliage for shade.

Winter injury may result from low temperatures damaging young trees which have not become thoroughly established. Bursting of the bark near the ground line and up the body of the tree indicates cold damage. Trees which have had winter damage should be encouraged into growth the following spring through fertilizing, cultivation, and watering. Where trees have been damaged to the extent that the bark has cracked from the ground line to the top of the tree it is best to allow sprouting to occur near the ground line in the early spring and,



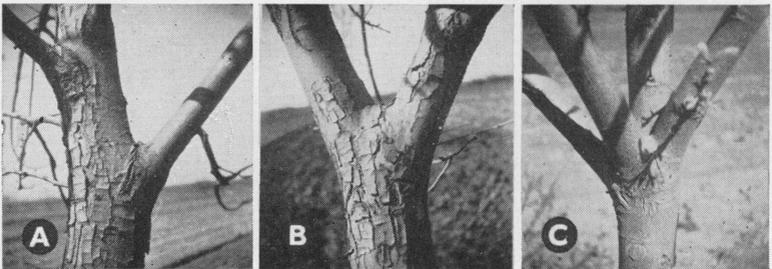
Illustrations showing how to correct bad forks in young pecan trees. A, a strong fork that requires no pruning; B, cut back one prong as shown; C, cut back two prongs; D, remove one prong and cut back two.

after the sprouts have made good growth, the damaged part of the tree may be removed. Care should be exercised in cutting so that sprouts coming from the bud or graft will be used for re-establishing the tree instead of sprouts coming from near the ground line which may be seedling growth.

Heading young trees is most important. Young planted trees should be allowed to develop temporary branches at a height of two or three feet from the ground. Numerous lateral branches are important in the building of a vigorous root system in young trees. It should be borne in mind, however, that these young branches which are allowed to develop during the first two or three seasons of growth will be removed to give the trees a permanent head of branches at a height of five to six feet. The ultimate high heading of the trees during the third to fifth year of growth is necessary to facilitate cultivation and to allow adequate air circulation and sunlight in the pecan orchard. In the case of trees planted on lands which are subject to overflow the trees should be headed at least six feet in height so that trash and debris will not accumulate among the branches.

Framework—The framework of a pecan tree (trunk and main branches) must be able to withstand great strains brought about by a heavy crop of nuts. The modified leader type in which four to six main branches are arranged in spirals about the central leader is considered best. It is desirable that there be 12 to 18 inches between the main framework branches in the alternation which should occur around the main body of the tree. Such an arrangement will allow each limb to develop into a large diameter without developing into an undesirable fork or crotch in the tree.

Forks—Some pecan trees if left unpruned will grow into a fairly satisfactory tree without a great deal of attention. On the other hand, with some pruning each year during the first five or six growing seasons, a strong framework and symmetrical tree may be developed which will reward each pecan grove owner for his efforts. There are various types of limb formations which tend to produce weak trees.



Types of forks: A, strong fork formed by two prongs of unequal size, and with relatively wide angle between the prongs; B, strong fork formed by two prongs of equal size and with wide angle crotch; C, four prong "crow foot" fork.

Correct the bad forks in young trees—as the trees grow older mistakes become conspicuous.

DEVELOPMENT FROM SEED

For developing an orchard with little cash outlay, pecans may be planted where the permanent trees are to stand, or in a small nursery for transplanting at the end of the first growing season. It is known that the pecans from some trees produce superior seedlings which will grow more rapidly and develop into more desirable understock. It is therefore suggested that only pecans taken from trees of known merit should be planted. Some of the varieties which are being used for rootstock by Texas nurserymen are Riverside, Burkett, and Mahan.

In planting the pecans in permanent tree locations, plant three to six nuts and cover approximately three inches deep. It is suggested that the orchard be staked out and that the pecans be planted around each stake. At the end of the first or second year of growth the best seedlings are selected and the others are removed by cutting them off below the ground line.

If a young nursery is to be grown the pecans are planted three to four per foot during early January. Plant the rows at least six feet apart to allow for easy cultivation with ordinary farm equipment.

The seedling pecan trees may be budded during the second or third growing season. Budding should be done in early spring so that the buds may be forced and encouraged into a full season of vigorous growth. Nursery trees so handled may be dug out and transplanted during the following winter months.

SOIL MANAGEMENT

For best results young planted pecan trees should be cultivated regularly. Cultivation should be shallow, not exceeding three or four inches at any time.

Pecan trees require a soil that is high in nitrogen. Therefore, the use of winter cover crops, such as vetch and austrian winter peas, should be used to build the soil so that maximum tree growth may be obtained.

As the trees reach fifteen to twenty years of age the summer cultivation may be less intensive and a program of stirring the soil by disking or shallow plowing once at the beginning of the growing season and once or twice more during the growing season will be sufficient. An early disking followed in late spring by mowing of weeds may be sufficient. In no case should a solid turf of bermuda grass or other turf-like grasses be allowed to develop in the cultivated orchard.

Remember: Weeds and grass are the greatest competitors for moisture. Moisture is essential for the normal growth and development of the pecan crop.

CARE OF NATIVE GROVES

In native pecan groves the surface of the soil is usually covered with leaves or other organic matter. This ground covering serves to reduce the loss of soil moisture and also encourages the growth of feeder roots near the surface of the soil. When native groves are plowed for the first time rosetting may result by having the surface roots cut by the plow. It is therefore important that shallow cultivation be used in plowing or disking among native pecan trees.

With proper care in the change-over, native groves can be brought into cultivation without too much danger of damaging the trees. Once the change is made and carried on for several years, the native grove may be handled in the same manner as the planted orchard.

Where native groves are subject to overflow or severe erosion, the growing of some type of soil cover may be necessary. Pecan trees that are grown under limited cultivation are more vigorous than those which are grown in a heavy sod. On extreme low land which is subjected to frequent overflow and strong currents, it may be necessary to allow the sod to remain over the surface of the soil to prevent washing. Pecan groves which must be handled in this manner should be mowed as often as necessary during the growing season or grazed heavily with livestock, to prevent excessive growth of weeds.

Grasses: As pecan trees do not grow satisfactorily in heavy sod, less vigorous perennial grasses are preferable. On heavy soils johnson grass or sweetclover as well as low growing soil covers such as bur-clover may be encouraged. In addition early maturing non-legume grasses such as winter ryegrass may be grown for a soil cover and for grazing purposes during the early spring season. Most grasses which will mature before mid-June may be used as a soil covering in the pecan orchard. During mid and late summer, grasses which compete with the trees for soil moisture may prove detrimental.

Intercrops: At least six feet on each side of the grove of young trees should be left for continuous summer cultivation. If the young trees are spaced sixty feet apart and a cultivated strip on each side of the tree row is left, there will be a space of approximately forty-five feet for the growing of intercrops. Approximately fifteen rows of cotton or early maturing truck crops, such as irish potatoes, beans, or tomatoes, may be grown between each two rows of trees during the first few years. Late maturing crops which require large quantities of soil moisture would not be desirable. Such crops as watermelons, sweet potatoes, or field corn, are not considered desirable for planting in young pecan orchards. As the young pecan trees increase in age, an additional space for cultivating trees should be provided. At the end of the tenth to twelfth year, at which time the trees should be in fair production, the growing of intercrops during the summer season should be omitted.

The planting of winter cover crops in early fall is usually beneficial to both young and old pecan orchards.

Below is given the rate of seeding for some winter cover crops:

	Seed per Acre
Rye	1½ to 2 bushels
Wheat	1½ to 2 bushels
Barley	1½ to 2 bushels
Hairy vetch (<i>Vicia villosa</i>)	20 to 30 pounds
Sweet Clover (<i>Melilotus indica</i>)	15 to 20 pounds
Hubam clover (<i>Melilotus annua</i>)	15 to 20 pounds
Giant Southern bur-clover	15 to 20 pounds

Fall plowing tends to open up the soil so that winter rain will penetrate into the subsoil thereby storing up adequate moisture. By plowing 4-6 inches deep and turning under the leaves as soon as they have shed, certain leaf diseases, such as vein-spot, liver-spot, scab, and other troubles common to pecan foliage are greatly reduced.

Fertilizers: Most planted pecan groves that are grown on upland soil in the eastern part of Texas must be fertilized with commercial fertilizer to maintain normal tree growth. As the trees reach bearing age large quantities of commercial fertilizer supplemented by winter crops should be used.

In the areas where pecan orchards are planted on alluvial soils the use of commercial fertilizers to stimulate tree growth is not usually necessary.

In the sandy upland areas of central West Texas benefits from using commercial fertilizer do not appear to be in evidence.

Conditions vary according to the orchard but the general fertilizer formula recommended for pecan trees is a 5-10-5 or 8-8-8 mixture. In addition ammonium nitrate should be added as a supplementary plant food to stimulate tree growth. The amount of 5-10-5 or 8-8-8 per tree should be one to two pounds to each inch of diameter of the trunk of the tree. For older bearing trees two to three pounds for each inch of trunk diameter is recommended. The fertilizer should be broadcast in early spring over the ground area from near the body of the tree to the end of the branches. The heaviest application should be made toward the end of the branches because it is in this area that most of the feeder roots are located.

In the case of young trees, ammonium nitrate may be added in early spring at the rate of one pound per year of age of the tree. In bearing orchards which have a heavy setting of nuts, five to ten pounds of ammonium nitrate per tree may be added in May or early June. The

fertilizer will assist the trees in making extra growth for the development of fruit buds while carrying a full crop.

Farm manure may be used in fertilizing pecan orchards but this form of plant food should be thoroughly decayed before it is applied. The application of fresh manure may be toxic to the trees causing them to turn yellow and lose a part of their foliage. Farm manures may be applied over the surface of the soil and allowed to decompose for a period of thirty to sixty days before being incorporated into the soil.

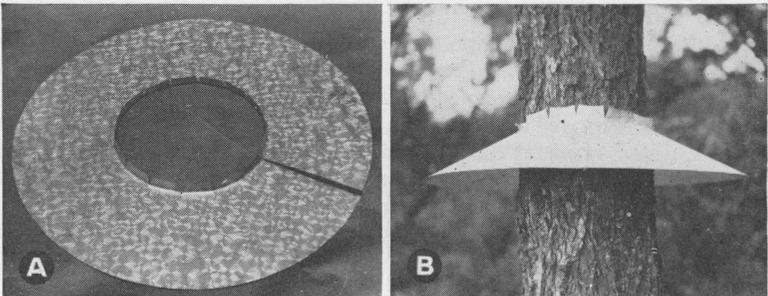
HARVESTING, CURING, AND STORING PECANS

Pecans are harvested as soon as the nuts will separate readily from the green husks. It is desirable to harvest the pecan crop as soon as it has reached maturity to prevent losses from depredators such as squirrels and crows; or on alluvial land to prevent possible losses from overflows.

Pecans are harvested by thrashing the branches with cane or cedar poles and picked by hand. Where cane poles are used the end of the pole may be wrapped with friction tape for a distance of two feet to prevent the pole from splitting.

If a large number of pecan trees are to be harvested a pecan shaker may be used. This is a mechanical device that may be attached to an ordinary farm tractor for shaking the limbs and causing the pecans to fall. This simple equipment may be made in almost any machine or blacksmith shop. It has been instrumental in reducing harvest costs by more than fifty percent. By writing to the Extension Service Mailing Room, College Station, Texas, a blueprint describing the construction of a pecan shaker may be obtained.

The harvesting of the nut crop may be further facilitated by the use of sheets spread on the ground under the trees and outward toward the spread of the branches. Sheets for this purpose are usually made from heavy cotton sheeting in rectangular pieces about five by ten yards in area. Two of these will cover an area under a pecan tree



Squirrel guard: A, sheet metal cut ready to put on tree; B, shows guard in place on tree. The metal should extend 8 to 10 inches from the body of the tree.

approximately ten yards square. For larger trees more than two sheets may be necessary. The sheets should be stored between seasons in rat-proof containers.

Curing: Pecans stored in tight bags or bins will mold if they have not been sufficiently cured. With clear, dry weather during the harvest season and by placing the sacked pecans in locations of ample ventilation, there is little danger of the pecans molding or sprouting. In seasons of considerable rainfall at time of harvest it is necessary to allow the pecans to dry thoroughly before going into storage. Nuts may be cured in trays made of 1" x 4" boards to form the sides and with $\frac{1}{4}$ " or $\frac{1}{2}$ " hardware cloth bottoms. The tray should be placed across supports so that the air can circulate freely among the pecans. Pecans may also be cured in 50 pound or 100 pound burlap or cloth bags which have been so arranged that the air circulates freely among them. It is well to turn the bags upside down every second or third day so that the nuts may cure uniformly.

Storing: The size of the pecan crop varies widely from year to year and in years when the crop is large and the price is low it is often an advantage to the grower to hold his pecans and market them later; or he may desire to hold them for other reasons. The nuts may be kept for two years without appreciable deterioration when stored at a temperature of 32° to 38° F. They should be stored as soon as curing is completed since their quality is impaired at ordinary temperatures long before rancidity is perceptible. Most commercial cold storage plants have suitable facilities for storage of pecans, and the cost of storage is relatively low. Pecan nuts should not be stored where free ammonia comes in contact with them as very small amounts of ammonia cause the kernels to turn dark, impairing the quality. Furthermore, the storage room should be free from all odors since the oil in the kernels readily absorbs them causing the nuts to have objectionable flavors.

For additional information, refer to

B-166, Propagation of Pecans.

C-261, Pecan Insects and Their Control

Your County Extension Agents have these
publications.