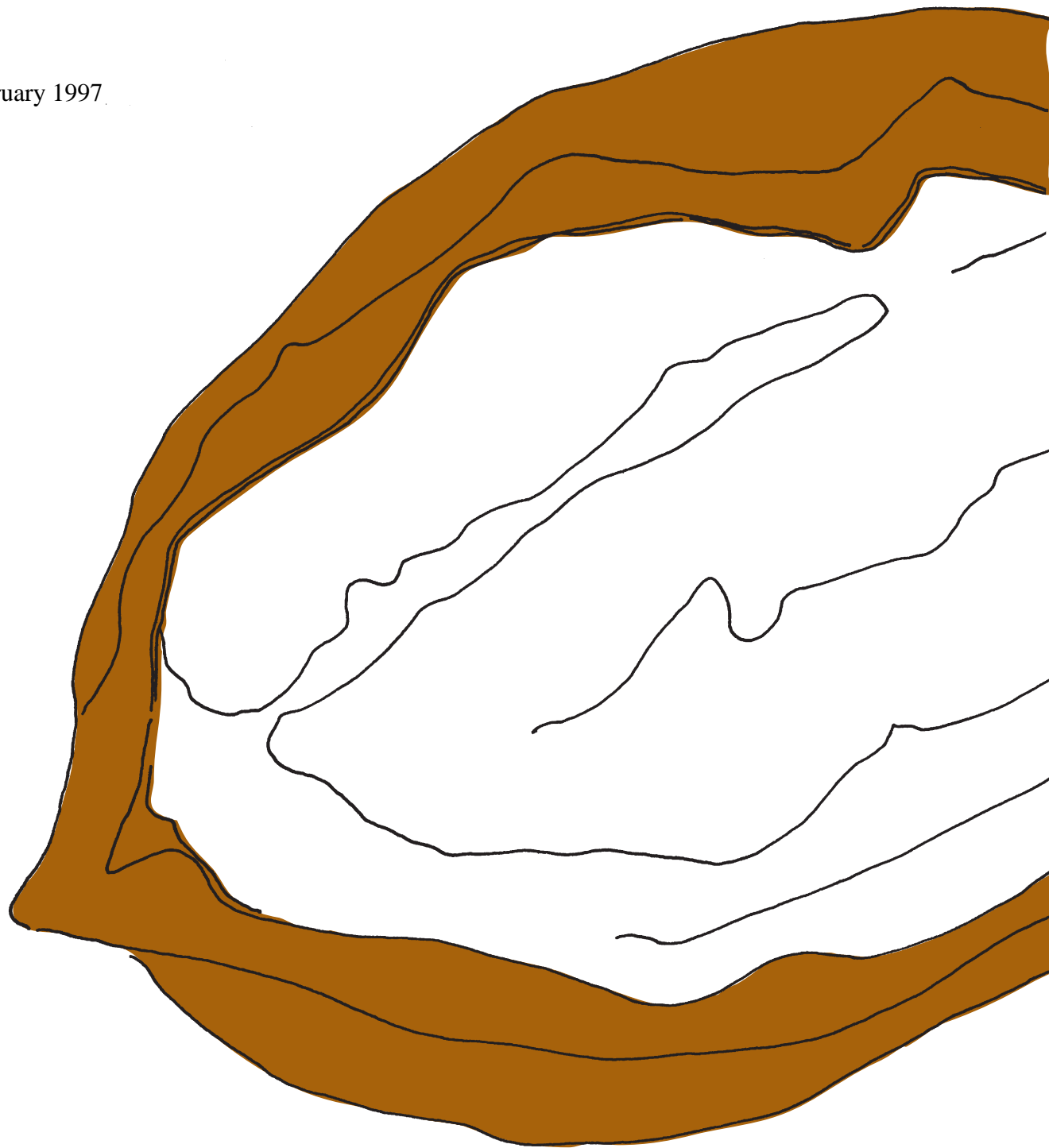


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Development Guide for New Pecan Orchards

CLEMSON
E X T E N S I O N

Development Guide for New Pecan Orchards

Establishing a new pecan orchard requires many decisions before planting the trees, such as the length of time before the orchard starts bearing, the yield and returns that can be expected for a projected period, and the ease of operation.

Anyone considering going into pecan production for total income must realize the large capital outlay needed initially and the long period before returns become profitable. It has been estimated that a minimum of 50 to 200 acres is required to justify the cost of the equipment necessary for pecan production at an intensive level. However, many people who are interested in planting pecans do not plan to rely solely on pecan production for their total income and may already have some of the needed equipment.

ORCHARD LOCATION

Pecans grow best on deep, fertile, sandy loam or loam soils with a clay subsoil. Any soil with adequate water-holding capacity will do, provided it is deep enough. The type of soil, whether a sand or loam, will determine in many respects the spacing and type of management program. Sandy soils will definitely require some type of irrigation to maintain soil moisture levels needed for best plant growth. Pecans should not be planted on poorly drained soil, hardpan or stiff clays, or thin sands with a high water table.

Air drainage is not as important for pecans as for apples and peaches. Avoid planting on badly eroded hills, bottom lands, or pockets with no free air movement where drying of foliage will be slow and humidity high. These conditions increase chance of disease infections. Directions of exposure is not so important with pecans.

TREE SPACING

When the site and soil type are adequate for pecan production, tree spacing and variety selection are the two most important factors to consider in planting a new orchard.

Before ordering trees make a planting plan so that you can get the correct number of each variety. The plan should ensure adequate, but not surplus, space for the pecan trees at various ages for a long span of years. Several factors to consider in developing this plan are economical use of the land, time required to obtain substantial yields, soil type, variety, and whether irrigation is intended. Considering these factors, the following basic planting plans exist: (1) conventional spacing with intercropping, (2) conventional spacing with filler trees, and (3) high-density spacing.

Typical conventional spacings are 80 x 80, 60 x 60, 50 x 50 feet and variations of these. Such spacings usually eliminate the need for thinning trees in later years, but land is wasted. This “wasted” land can be used in several ways.

Intercropping is the practice of growing another crop between the rows of young pecan trees while they are small. This practice may make wider spacing more feasible, but no crop should be planted closer than 6 feet from the drip line of the pecan trees. Care should be taken not to plant crops that may contribute to increased disease or insect population in the pecan trees. Some growers have interplanted peaches and pecans and have been quite successful.

With the proper layout, the grower can use “filler” trees between trees in the basic layout, such as

60 x 60 spacing. Filler trees should be the more prolific and precocious varieties such as Cape Fear or Shoshoni. These varieties produce a nut crop in 4 to 5 years, providing some return before the standard varieties, such as Stuart, Desirable, Elliott, or Gloria Grande start production.

High-density planting using spacing of 40 x 40, 50 x 30, 35 x 35, and 40 x 20 feet is a new concept in pecan production. The 40 x 20 spacing would use the “filler” tree concept. Varieties used for this type of planting should be adaptable to pruning or hedging to limit tree size and prevent overcrowding. High-density plantings cost more per acre both to establish and to manage. Nut production will be greater until the trees become overcrowded and must be thinned to maintain production.

Cape Fear, Pawnee, Sumner, Melrose, and other varieties show promise for high-density plantings. The management of this type of planting must be more intensive than for conventional plantings, but the returns are generally great enough to justify such a system (Tables 1 and 2). Because of the greater number of trees per acre, the grower should definitely consider some type of irrigation system. Irrigation systems are discussed briefly on pages 6 and 7.

Pecans are wind-pollinated and do not depend upon insect-pollination. Once the planting system has been selected, be sure to arrange the varieties to ensure adequate pollination throughout the orchard. Pollination types will be discussed with varieties. Generally not more than five rows of a variety should be planted before planting a variety to pollinate the first variety. Varieties should also be arranged with some consideration given to disease control and nut maturity. Each row should contain only one variety to facilitate spraying, harvesting, and irrigation scheduling.

Table 1. Number of trees and production potential per tree at various tree spacings.

Spacing	Trees/ acre	Pounds production per tree per year at age				
		4	5	6	7	8-10 (Avg.)
35 x 35	35.6	10	20	25	30	40
40 x 30	36.3	10	20	25	30	40
40 x 40	27.2	10	20	25	30	40
60 x 60	12.1	10	20	25	30	40
80 x 80	6.8	10	20	25	30	40

Source: Meadows and Young, *Pecan Quart.*, Feb. 1973.

Table 2. Theoretical production: Pounds per acre at various spacings and tree ages.

Spacing	Year				
	4	5	6	7	8-10 (Avg.)
35 x 35	356	712	890	1,068	1,424
40 x 30	363	726	907	1,089	1,452
40 x 40	272	544	680	816	1,088
60 x 60	121	242	302	363	484
80 x 80	68	136	170	204	272

Source: Meadows and Young, *Pecan Quart.*, Feb. 1973.

VARIETY REVIEW

Selecting the varieties is one of the most important decisions for a pecan grower. The long-range performance of an orchard and the management system depend to a great extent upon the varieties selected.

In selecting the proper varieties for an orchard, consider these factors:

- Annual production capacity
- Age the tree begins production (precocity)
- Tree strength and branching characteristics
- Nut size
- Kernel percentage and quality
- Pollination type
- Disease and insect resistance
- Date of ripening or maturity

The summer climate of the southeastern United States consists mainly of high temperatures and high humidity with many cloudy days throughout the long growing season. These factors create conditions conducive to a buildup of both disease and insect populations. In most situations, a sound spray program will be needed even with the new varieties that show some disease tolerance.

Pecans have both male flowers (catkins) and female flowers on the same tree, but not as complete flowers. In most varieties the pollen maturity and female flower maturity or receptivity do not occur at the same time; therefore, one variety will be pollinated by another. This is called cross-pollination, and it must be considered in orchard planning to provide for adequate pollen sources.

Pecan varieties are divided into two bloom types: Bloom Type I or protandrous varieties (pollen matures first), and Bloom Type II or protogynous varieties (female flowers mature first). Every orchard should include both bloom types for adequate fruit set and nut production. At least two varieties of each bloom type are recommended.

Table 3. Comparative data of stigma receptivity and pollen shedding of pecan varieties.

Variety	Type	A P R I L				M A Y			
		20	25	30	5	10	15	20	
Caddo	I		xxxxxxxx			_____			
Cape Fear	I			xxxxx		_____			
Desirable	I		xxxxxxxx			_____			
Owens	I			xxxxx		_____			
Pawnee	I		xxxxxxx			_____			
Elliott	II		_____			xxxxxxxx			
Forkert	II					xxxxxx			
Glorio Grande	II					xxxxxxxxxxx			
Melrose	II					xxxxxx			
Shoshoni	II		_____		xxxxxxx				
Stuart	II					xxxxxxx			
Sumner	II		_____			xxxxxxxxxxx			

xxxx = Pollen shedding

_____ = Stigma receptivity

I = Protandry or pollen shed prior to stigma receptivity

II = Protogyny or stigma receptive prior to pollen shedding

I. Protandrous Varieties (pollen first)

Caddo — Originated in Philema, Georgia, from a Brooks X Alley cross. Nut has a dark shell and football shape, rather small with 60 to 75 nuts per pound and kernel percentage of 58. Tree is moderately precocious, has excellent vigor, bears well, and is rather scab-resistant. Nut matures in late September. Recommended for trial only.

Cape Fear — Originated at the Coastal Plain Branch Station of the North Carolina Experiment Station, Willard, North Carolina, as an open-pollinated seedling of Schley. Nut is rounded with 40 nuts per pound and kernel percentage of 52. The tree bears well and is quite precocious. This variety is fairly disease-resistant but may scorch in late season. The nut is slightly smaller than Stuart. Limb distribution and angle of branching have been excellent. Nut matures in mid October.

Desirable — Originated in Ocean Springs, Mississippi, as a chance seedling of Success. A leading commercial variety in the Southeast, it has a fairly large nut with 43 nuts per pound and 51 to 53% kernel. Poor scab resistance and regular bearer but does not come into production until about 8 years. Young trees under rapid growth tend to break under heavy rain or high winds. May suffer winter injury in piedmont and midland sections of South Carolina. Overall, a good variety under a disease-control program. Matures in late October.

Owens — Chance seedling. This cultivar has large, well-filled nuts and moderate production. The nuts are thick-shelled with 50 nuts per pound and 48% kernel. The tree is scab-resistant and moderately precocious.

Pawnee — USDA release of a Mohawk X Starking Hardy cross. It is an early maturing, large nut with a high percent kernel. It is moderately precocious and has strong crotches. Moderately scab-resistant, and has been found to be less susceptible to aphids than most cultivars.

II. Protogynous Varieties (nutlets first)

Elliott — Originated in Santa Rosa County, Florida, from unknown parentage. A small nut having about 62 nuts per pound with a kernel percentage of about 53. The tree is highly scab-resistant and is fairly prolific but does not come into production for 9 or 10 years. A good pollinator for the Desirable variety. Nuts mature in early October.

Forkert — A Success and Schley cross. A high-quality nut averaging 55 nuts per pound and 62 percent kernel. The nut is of adequate size and yield is good. The thin shells may crack if mechanically harvested. May have some slight scab susceptibility. The tree has a strong branch structure.

Gloria Grande — Originated in Orangeburg, South Carolina, from a chance seedling. Very similar to Stuart in many respects. The tree branches profusely and has excellent crotches. **Gloria Grande** averages about 44 nuts per pound with 48% kernel. Scab resistance is apparently very good. It does not come into production at an early age but is still a favorite among many commercial growers.

Melrose — A selected native released by Louisiana Agricultural Experiment Station. Moderate size nut with 55 nuts per pound and 53% kernel. Excellent scab resistance and is reported to be more tolerant to zinc deficiency than many other cultivars.

Shoshoni — Originated from Odom X Evers cross by Romberg in Brownwood, Texas. Nuts mature in mid October, are medium-sized (40 to 60 per pound), and have 50 to 58% kernel. Trees are very vigorous and have extremely upright growth with very strong crotch angles. **Shoshoni** is very precocious and prolific. Suggested for high-density planting as a “filler” tree. May need a fungicide program for scab control in some years.

Stuart — Originated as a chance seedling transplanted from Mobile, Alabama, to Pascagoula, Mississippi, in 1874. Commercial standard in current production. **Stuart** has fair to good scab resistance but is susceptible to downy spot. It is late coming into production (10 to 12 years, if not irrigated) with 45-50 nuts per pound and 48 to 50% kernel.

Sumner — Begins to produce well from 6th year and has been consistent in production. Kernel shellout is 55%, nut size is 44 to 48 nuts per pound, and kernel color is very good. Trees are somewhat difficult to train to a central leader; however, branches are strongly attached. Scab resistance has generally been good.

A grower should be aware that some of the newer varieties are not scab-resistant and will require a fungicide spray program. However, for maximum production of any variety, a spray program will be advantageous. Susceptibility to disease may be offset by other factors.

Growers should contact nurseries directly when ordering pecan trees, as availability will vary from nursery to nursery and changes almost daily. Trees should be ordered in the early fall to ensure delivery of good quality trees in January and February. A list of pecan nurseries may be obtained from the Clemson Extension office in each county. Recommended tree size is 5 to 6 feet (5/8 inch caliper). Larger trees can successfully be planted but are more expensive and more difficult to handle.

LAND PREPARATION

Once the decision has been made to plant pecan trees and the orchard design has been completed, the next important step before transplanting the trees is preparing the land.

Disc thoroughly to loosen the topsoil as well as to level the land. A soil test should be made to determine the pH and the levels of potassium, magnesium, phosphorous, and calcium. Soil pH should be adjusted to 6.5 with dolomitic limestone. Dolomitic limestone rather than calcitic limestone should be used because of the magnesium content. The use of calcitic limestone will gradually reduce the content of magnesium in the soil and leaf tissue.

After liming, subsoil to a depth of about 30 inches to increase the rooting zone and thus provide a greater soil volume for absorption of nutrients and water and to increase the pH in the rooting zone to a level more favorable for root growth and development. If the level of soil potassium is low, make an application of a high-analysis potassium and low-analysis nitrogen fertilizer before planting to build up the potassium content.

CARE OF NURSERY STOCK AND TRANSPLANTING

Most pecan trees will have to be shipped some distance from the nursery to the grower; therefore, delivery should be arranged when you are ready to plant. However, when this is not possible, remove trees from the package as soon as they arrive, heel them in, and water freely. Never allow the roots of pecan trees to become dry. When some delay in planting is expected or cold weather is anticipated, be sure to cover the roots deeply enough to prevent drying and cold injury.

Pecan trees can be transplanted any time during the dormant season. In well-drained land, plant the trees from December to March, but in heavy, wet land delay planting until March or early April. Dig a hole large enough to accommodate the root system of the trees. Before planting, examine the roots of the tree and remove or cut back all broken or injured roots. Backfill the hole with topsoil until the tree is slightly deeper than it grew in the nursery. Do not plant too deep.

Two methods may be used for filling holes: (1) fill the holes about one-third full of soil and saturate the soil with water to settle, repeating this operation until the hole is almost full, or (2) pack the soil as the hole is filled. Lateral roots should be carefully spread throughout the soil and not compressed against the taproot. Water thoroughly, especially if soil is dry. With either method, a basin should be constructed around the tree 3 to 4 feet in diameter and 6 to 8 inches deep. Water the trees at 10-day intervals during the first season if rainfall is not sufficient (1 inch or more per 2 weeks.). This basin may not be necessary if an irrigation system has been or will be installed soon after planting.

As soon as the trees are set, remove one-fourth or one-third of the top to balance the top with the roots since a large portion of the roots was lost by digging.

Tree care after planting is not discussed in this bulletin, but can be found in various publications on pecan production.

IRRIGATION

During the first year in the orchard the root system develops slowly and a constant availability of moisture is necessary if the tree is to survive and grow. Irrigation will not only help to ensure a greater tree survival the first year but also will greatly increase tree growth in subsequent years. In most cases irrigated trees will produce earlier than non-irrigated trees. If trees are spaced closer than 50 x 50 feet, consideration of some type of permanent irrigation system is imperative.

Three types of permanent irrigation systems are available for orchards: (1) sprinklers or solid set, (2) low-volume sprinkler or emitter, and (3) trickle or drip irrigation. All three types are presently in use in pecan plantings and are quite successful. General characteristics of each type follow, but no specific design criteria are included.

Sprinkler or solid set irrigation systems apply large amounts of water over a short period of time to large areas under the tree. Generally almost all of the area under the tree canopy is wetted. Each sprinkler requires 2 to 5 gallons of water per minute (gpm) and pressure of 20 to 60 psi thus necessitating a large pumping and delivery system. Water quality is generally not critical as the water is emitted through large orifices in the sprinkler. Energy cost will be highest in this type of system compared to the other two types.

Low-volume sprinklers or emitters are designed to apply water over an area 10 to 16 feet in diameter under the tree. Application rates will vary from 8 to 48 gallons per hour (gph) per tree at a pressure of 15 to 25 psi. This system requires a lower pumping capacity and a smaller distribution system than that for sprinkler, but larger than for drip. Water is applied to a large portion of the root system in an economical way.

Trickle or drip irrigation systems apply small amounts of water (0.5 to 2 gallons per hour per emitter) with several emitters per tree over a period of up to 12 hours per day depending upon need. Low pressures of 15 to 25 psi are used. Each of the three types of permanent irrigation systems requires a different management program. Management will vary even with the same type of irrigation at different locations. Permanent systems offer the grower a means of reducing labor cost, improving production efficiency, by using automation in the system itself.

Before deciding on which method of irrigation is best for you, contact Clemson Extension personnel and equipment suppliers for more information and assistance.

SUMMARY

The necessary steps in making decisions and carrying them out are listed as follows:

1. Determine level of interest and intent.
2. Evaluate site and soil characteristics.
3. Determine tree spacing system desired.
4. Select varieties to match spacing system and provide good pollination.
5. Draw actual orchard layout to ensure correct number of trees needed of each variety.
6. Order trees from a reputable nursery, and order early.
7. Prepare land for planting, including an analysis of soil nutrients and pH, correcting pH level and low potassium, if necessary.
8. Set a delivery date for trees. Plant when they arrive or heel trees properly.
9. Plant trees properly.
10. Provide some type of water delivery system.

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