Production and Marketing Report

Economic Comparison of Removing Pecan Trees and Planting Young Trees and Transplanting Established, Mature Trees

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Additional index words. orchard crowding, spacing, transplanting costs, *Carya illinoinensis*

Summary. Pecans [*Carya illinoinensis* Wangenh. K. (Koch)], grown in western Texas, New Mexico, Arizona, and California, are usually planted at a spacing of 9.1 × 9.1 m (30 × 30 ft). At this spacing, orchards begin to crowd in about 20 years. This crowding results in reduced yields and nut quality, Strategically removing trees over a period of years is the best alternative to avoid tree-crowding problems. Establishing a new orchard with transplanted mature trees can show a profit 3 years earlier than if using nursery-produced trees.

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This research was supported by the New Mexico Agricultural Experiment Station. Use of trade names does not imply endorsement of the products named nor criticism of similar ones not named. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked advertisement solely to indicate this fact.

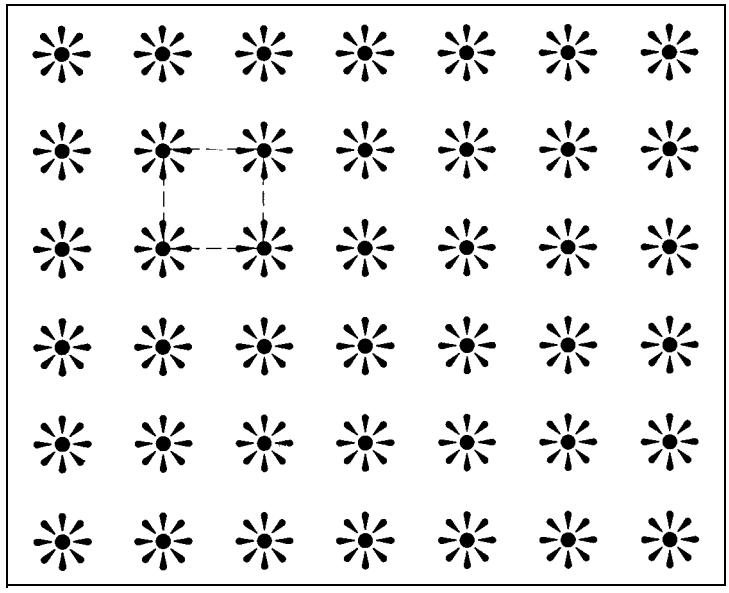


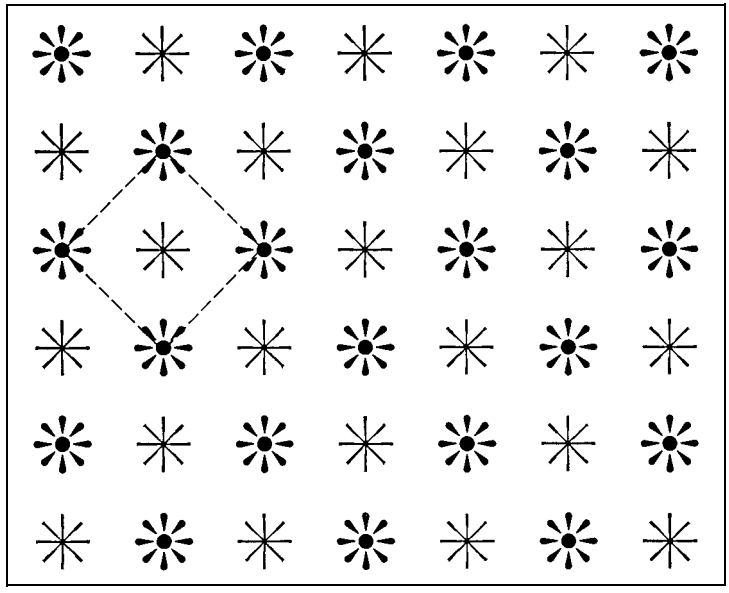
Fig. 1. *Tree spacing at planting: 9.1 × 9.1 m (30 × 30 ft). Square design, 120 trees/ha (48 trees/acre).*

Developing a productive, economical pecan orchard is a long and expensive process when nursery stock is used for establishment. In light of present-day spacing recommendations [9.1 × 9.1 m (30 × 30 ft) in the western region], it generally takes 8 years before an orchard achieves commercial production—when all expenses for producing a crop are paid by the value of the crop produced that year (German and Herrera, 1992).

At the recommended spacing, trees eventually become crowded after about 20 years, resulting in reduced per-acre yield and nut quality (Brandt, 1991; Wheeler, 1983). In addition, tree stress caused by the lack of sunlight can induce alternate bearing (Wood, 1992). Lower-limb dieback, dead wood, and decreased nut production are symptoms of tree crowding (Brandt, 1991; Malstrom et al., 1982; Wheeler, 1983). Lower-limb dieback and a decrease to <40% of sunlight reception on the orchard ground at midday maybe the best indicator to start tree removal on a crowded pecan orchard (Malstrom et al., 1982; McEachern and Zajicek 1990).

There are many ways to approach this problem so that an orchard can maintain profitability (White et al., 1988). Each method has positive and negative aspects that must be considered in the overall development of the orchard or expansion

Fig. 2. *Tree spacing at second thinning: 13.6 × 13.6 m changed from square to diamond design Fifty percent of original trees remain in the orchard, 60 trees/ha (24 trees/acre).*



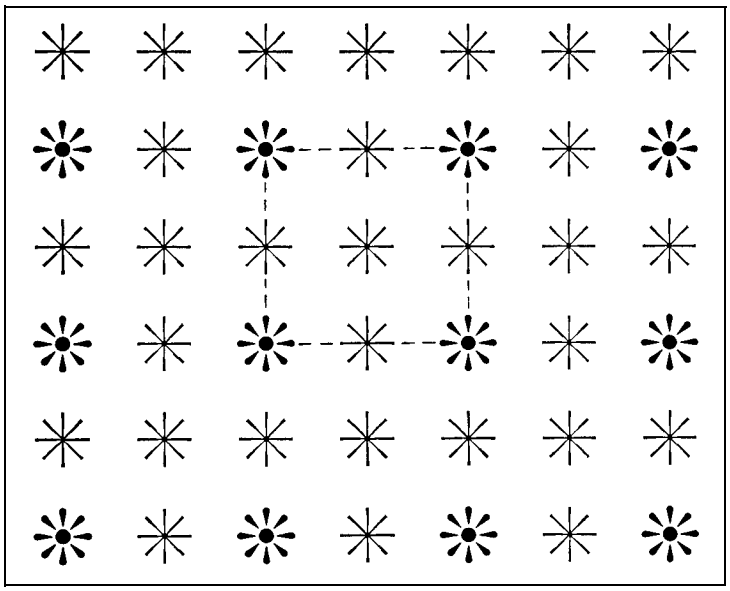


Fig. 3 *Tree spacing at fourth thinning: 18.2 x 18.2 m changed from square to diamond and back to square design. Twenty-five percent of original trees remain in the orchard, 30 trees/ha (12 trees/acre).*

Table 1. *Pecan pruning and transplanting costs in Las Cruces, N.M.*

Item	Cost/tree ($)
Pruning	3.60[z]
Branch removal	3.50
Water tank	2.73
Paint	1.34
Transplanter	33.00[y]
Total	44.17

[z]Average pruning costs fluctuate according to free size.
[y]This rate is charged for trees transplanted within a mile radius. Rate will go up as the transportation distance increases; it can go up to $50.00 for a 5-mile distance. Available tree spades can transplant trees from 12.7cm (5 inches)to 45.7cm (18inches) in diameter; actual cost may be higher for large trees and lower for small trees.

into new orchards. Unfortunately, most growers ignore overcrowding rather than minimize its detrimental effects (Herrera, 1990). Others administer severe pruning practices that can drastically reduce yields for several years (Herrera, 1990; McEachern, 1990).

Probably the best recommendation for solving orchard crowding is to remove trees strategically, This should occur about 20 years after planting depending on soil type and orchard management. Once that decision is made, it becomes equally important to remove trees in a design or pattern to maintain optimum orchard production (Herrera, 1987). The pattern to be followed in tree removal depends on the orchard design and tree spacing used at planting time (McEachern and Zajicek, 1990), In the western United States, most orchards are planted on a square design [9.1 x 9.1 m (30 x 30 ft)] (Fig. 1); therefore, the recommended pattern is to remove trees in such away that the orchard design will change from a square to a diamond and back to a square. It is preferable to remove trees in an orchard in four stages. The first two stages should take place within 3 years. The other two stages should take place at later dates depending on sunlight penetration, nut yield, and nut quality. This scheme will avoid a large yield reduction, as the optimum spacing is achieved over time, rather than all at once.

Table 2. ***Pecan tree yield comparisons of nursery frees and transplanted (removed) mature trees in New Mexico and Texas.***

	Lb/acre		
Years after transplanting	New Mexico	Texas	Nursery tree (1 inch in diam)
2	NR	NR	0
3	NR	96	10
4	NR	480	30
5	620	720	50
6	1147[y]	1080[y]	250
7	737[x]	1440	400
8	2055	1800	900
9	799[x]	1920	1200[y]
10	1733	2200[x]	1500
11	2357	2350[x]	1800
12	789[w]	2000	

[z]NR = production was not recorded.
[y]Designates year in which establishment costs have been paid off.
[x]Partial crop lost due to late freezes.
[w]Partial crop lost due to hailstorms in June and July.

Thinning procedures and schedule

Step 1. Remove every other tree in every other row the first year, removing 25% of the trees (Fig. 2).

Step 2. After 1 or 2 years, remove every other tree in those rows where trees were not removed the previous year.

Steps 1 and 2 remove 50% of the orchard trees with a resulting diamond configuration. Tree rows will be lined on a diagonal basis and tree spacing will be 13.6 x 13.6 m (42 x 42 ft).

Step 3. Whenever trees begin crowding again, thin every other tree in every other row.

Step 4. Within 3 years, remove remaining trees in those rows where trees have been removed, At the end, 75% of all trees that were originally planted are removed and trees are spaced 18.2 x 18.2 m (60 x 60 ft) (Fig. 3).

Tree removal in an orchard can be expensive in terms of cutting and removing the wood from the orchard. There is a cost involved in cutting trees and killing the stumps However, trees removed can be sold for firewood to offset the cost.

The most efficient use of these trees would be to develop a new block or orchard by transplanting them if land is available. Otherwise, trees can be sold or given away. Spacings of transplanted trees have ranged from 9.1 x 9.1 to 13.6 x 13.6 m (30 x 30 to 45 x 45ft)depending on land availability and equipment accessibility for future transplanting.

In comparing the cost of tree transplanting to planting nursery stock, the cost of pruning must be included. Considerable pruning is required and needs to be done in an orderly way to prevent damage to permanent trees. A recent study conducted at New Mexico State Univ. determined the cost of transplanting a large pecan tree during the thinning process (Table 1). This cost ($44.17) is more than three times the cost of establishing a 1-inch nursery tree. The cost of transplanting also involves using a machine(tree spade), which is the most variable cost and will vary with the distance trees have to be transported; large trees may also increase the price somewhat, but charges for small trees are lower.

Manufacturers' recommendations for equipment to remove pecan trees consider a maximum of 30.5 cm (12 inches) in diameter for transplanting. However, growers have successfully used this equipment to transplant pecan trees almost 45.7

cm in diameter. The best time for transplanting is during the winter. Trees should be pruned back the same winter. Good water management after transplanting is essential.

Surveys conducted among pecan growers resulted in a yield analysis of trees that had been transplanted in New Mexico and Texas compared to nut production obtained when an orchard is established with 1-inch nursery trees (German and Herrera, 1992) (Table 2). These data indicate that a profitable production level is reached in 6 years after transplanting for mature trees and 9 years for nursery trees—a gain of 3 years in economic return for transplanting trees that otherwise would be destroyed.

In the last 10 years, many trees have been transplanted in New Mexico. The last pecan acreage summary, compiled in 1992 by the New Mexico Dept. of Agricultural in cooperation with the New Mexico Agricultural Statistics Service (US. Dept. of Agriculture), showed that about 600 ha (1 485 acres) of pecans have been transplanted as mature trees from 1985 to 1992, This is a clear indication of growers' recognizing the advantages of transplanting trees from crowded orchards, However, research is needed to understand the best way to prune trees back before transplanting and the optimum management practices after transplanting, including pruning, nitrogen applications, and irrigation scheduling.

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