

Noncommensurable Values of the Pecan Industry

Guide H-654

John G. Mexal, Professor, Dept. of Agronomy and Horticulture
Esteban A. Herrera, Professor, Dept. of Extension Plant Sciences
Theodore W. Sammis, Professor, Dept. of Agronomy and Horticulture
W.H. Zachritz, former Associate Director, Southwest Technology and Development Institute

Cooperative Extension Service
College of Agriculture and
Home Economics



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The pecan industry in New Mexico and West Texas has grown tremendously since pecans were first introduced to the Mesilla Valley by New Mexico State University in 1915. From that original 4-acre planting, the industry has grown to more than 42,000 acres (17,004 ha) with more than 2 million trees. Production in New Mexico in 1999 was 51 million lbs (23,181 Mg) worth \$48 million, while West Texas produced an additional 20 million lbs (9,090 Mg). New Mexico pecan yield decreased to 35 million pounds in 2000, but reached a record crop of 60 million pounds in 2001. The trend in increased production due to the relatively young age of many pecan trees indicates that production volume likely will continue to increase in the coming years.

While the value of the pecan industry can easily be measured from a nut production standpoint, there are other, less obvious, benefits to the community. Hartman et al. (2000) identified the following benefits of trees to a community:

- supply oxygen
- sequester carbon dioxide
- reduce noise pollution
- trap particulates
- alter microclimate
- improve aesthetics
- enhance outdoor urban spaces
- alter the community's character

Obviously, the opportunity to provide income was not included. These benefits are difficult to quantify, and it's even more difficult to define their dollar value. Hence, the values are noncommensurable, since they do not have a common unit of measure. This guide discusses the noncommensurable values of the pecan industry in New Mexico and West Texas in relation to commensurable values.

Assumptions

For ease of calculation, we will assume that the 2 million pecan trees in the NewMexico/West Texas region are mature (at least 15 years old) with characteristics (table 1) based on destructive harvest of four trees (Kraimer, unpubl).

Table 1. Estimated biomass partitioning of mature pecan trees (Kraimer, unpublished.).

Parameter	Trunk	Branches	Leave	Husks	Pecans	Roots	Total
Kg/tree	263	541	64	10	28	362	1268
Lb/tree	580	1193	141	22	62	798	2795
Kg/tree/yr	17	36	64	10	28	24	179
Lb/tree/yr	37	79	141	22	62	53	394

Thus, the model pecan orchard with 50 trees/acre (120 trees/ha) produces 20,000 lbs biomass/acre (22,378 kg/ha)/year with an annual nut production of 3,100 lbs/acre/year (3,400 kg/ha/yr). Furthermore, we will assume no biennial bearing. These estimates will be used for our "target" orchard when no other information is available or to estimate the production target.

COMMENSURABLE VALUES

Leaves and husks

In addition to shelled pecans, there are other potential sources of saleable products extracted from pecan orchards.

During the harvesting process, the pecans are separated from dry leaves and husks, which amounts to about 163 lbs/tree (74 kg) or about 8,000 lbs/acre/year (8,950 kg/ha/year). Conceivably, this biomass could

be harvested, mulched or composted and sold. However, this organic material has more potential value when left in the orchard and recycled in place.

Pecan shells

The New Mexico/West Texas pecan industry produced about 70 million lbs (31,818 Mg) of in-shell pecans in 1999. At an average shell-out percentage of 55%, about 31 million lbs (14,090 Mg) of shells are produced each year. The model orchard produces 1,400 lbs (1,636 kg) of shells from 3,100 lbs (1,409 kg) of pecans or about 59 million lbs (26,818 Mg) of shells/year. Thus, the region could produce 31 to 59 million lbs (14,090 to 26,818 Mg) of shells/year. This biomass could be used as a biofuel for a small power plant. The value would be about \$20/ton or \$280,000 to \$520,000 additional annual value. Alternatively, the material could be used in the horticultural industry as a mulch or potting medium. Generally, this use has a higher value than biofuel. At \$50 cubic yard (m³) for potting medium, pecan shells would have a value of \$1.4 to \$2.6 million assuming 1,000 lbs/cubic yard (500 kg/m³).

Orchard prunings

Every two to three years, the upper branches of mature orchards are pruned to reduce the height of trees and improve light penetration to the lower canopy. Generally, the orchards are pruned in the north-to-south direction only. The model orchard tree produces about 80 lbs (36 kg) of branch wood/tree/year. Thus, annual branch wood production totals more than 4,000 lbs/acre/year (4,490 kg/ha/year). The trees' upper canopy is pruned on two sides (east and west). Potentially, only half of the branch wood is pruned and, perhaps, less than one-quarter, since only the upper canopy is involved. Thus, perhaps 1,000 lbs/acre/year (1,122 kg/ha/year) would be pruned, or about 40 million lbs/year (18,182 Mg) in the region. At \$20/ton (Mg) biofuel, the value of the prunings would be more than \$300,000/year, providing fuel at the rate of 2 tons (Mg)/hour for power generation.

Converting pecan shells and orchard prunings into saleable products could increase the gross income of pecan growers by \$3 million/year.

NONCOMMENSURABLE VALUES

The eight noncommensurable values defined by Hartman et al. (2000) can be categorized into five general headings: carbon sequestration, oxygen release, pollution control, altered microclimate and beauty enhancement.

Carbon sequestration

Pecan orchards can serve as sinks for carbon dioxide, in spite of the fact that much of the fixed carbon is eventually consumed either as pecan kernels or biofuels. Plants remove carbon dioxide from the atmosphere and convert it to carbohydrates via the photosynthetic reaction simplified below (fig. 1).

Thus, for every unit of carbohydrate created by the pecan tree, almost 1.5 units of carbon dioxide (CO₂) are removed from the atmosphere (fig. 1). Much of the fixed carbon dioxide will be respired back into the atmosphere either as consumed pecans, decomposed litter in the orchard or burned biofuels. However, as much as 49% of the fixed CO₂ will remain in the tree. Using the model tree, approximately 180 lbs (82 kg) would remain fixed. This equals about 380 million lbs/year (172,000 Mg/yr) fixed by all the pecans in the region. Storing these carbohydrates as pecan wood removes 560 million lbs (255,000 Mg) of CO₂ in the process. The CO₂ fixed by pecans was generated from fuel combustion in automobiles. Roughly, an automobile generates 0.9 lb (0.41 kg) CO₂/mile (km) driven. Thus, the 560 million lbs (255,000 Mg) CO₂ is equivalent to 41,500 vehicles driving 15,000 miles (24,000 km)/year.

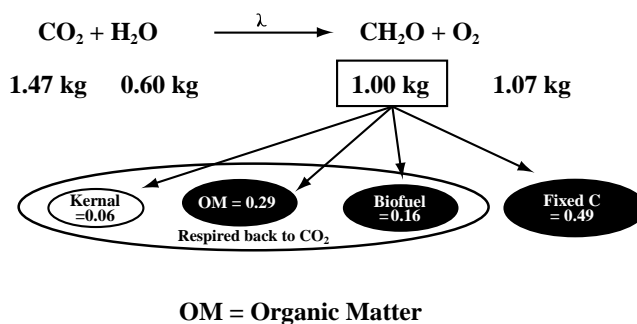


Figure 1. Basic photosynthetic reaction and relative partitioning of fixed carbon.

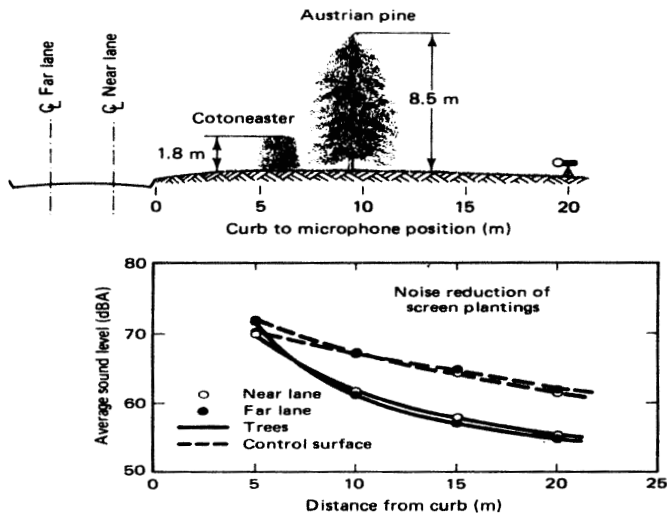


Figure 2. Noise reduction (dBA) by tree and shrub barrier near a highway compared to no barrier (Miller, 1988)

Oxygen release

In addition to removing CO₂ from the atmosphere, the photosynthetic process also generates more than 1 lb (kg) of oxygen (O₂) for every 1 lb (kg) CO₂ fixed. Consequently, storing 380 million lbs (172,000 Mg) of carbon in pecan wood releases more than 400 million lbs (182,000 Mg) of O₂. This oxygen is then used by humans in the air we breathe. Each human needs more than 400 lbs (182 kg) of O₂/year. The pecan orchards provide enough oxygen for nearly 1 million people in the New Mexico-Texas-Chihuahua region.

Pollution control

Trees are excellent screens that trap dust and other pollutants. One acre (0.4 hectares) of trees traps more than 500 lbs (277 kg) of pollutants, including more than 200 lbs (91 kg) of ozone and 150 lbs (68 kg) of particulates. According to a study in California, each acre (0.4 hectares) of trees is worth more than \$5,600 in emission reduction credits. Thus, the 42,000 acres (17,004 ha) of pecans in New Mexico/Texas trap about 21 million lbs (9,545 Mg) of pollutants, valued at nearly \$120 million.

Another, less obvious form of pollution is noise pollution. Trees and shrubs planted between homes and noise sources (highways) can reduce the noise

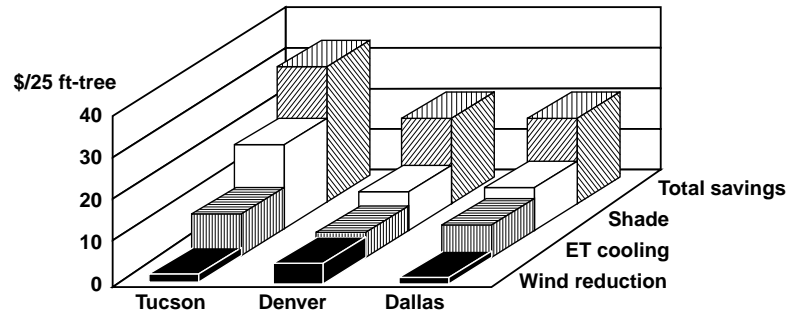


Figure 3. Energy savings accrued to a 24-ft tree planted near a home (McPherson and Rowntree, 1993)

level by nearly 10 decibels (fig. 2). A 10-decibel (dBA) reduction is a 10-fold reduction in noise, analogous to the Richter scale for earthquakes.

Altered microclimate

Trees are important components of a residential landscape, especially in a hot, dry climate like the Southwest. The pecan tree is suited ideally as a landscape tree in New Mexico. It is one of the last trees to break bud in the spring (early to mid-April) and one of the last to lose its leaves in the fall (late October). Thus, it provides shade for a residence from May through October and allows the sun to warm the home when air conditioning is not needed.

In addition to providing shade, trees can serve as both windbreaks and sound barriers for homeowners and livestock. A windbreak of trees and shrubs can decrease wind velocity on the leeward side by 40% to 80% compared to the windward side.

The benefits from shade-reduced wind and decreased cooling costs can be substantial. McPherson and Rowntree (1993) determined the benefit of landscape trees in different environments. Each 25-foot tall tree planted near a home decreased home cooling costs as much as \$30/year (fig. 3). Thus, four trees could reduce utility expenses by up to \$10/month.

Table 2. Summary of pecans' benefits to New Mexico and West Texas.

Commodity	Commensurable Value	Noncommensurable Value
Pecans	\$42 - \$48 million	
Shells	\$ 0.3 - \$ 2.6 million	
Prunings	\$ 0.3 million	
Leaves and shucks		Organic matter addition
Carbon sequestration		41,500 vehicles
Oxygen release		1 million people
Pollution control		Emission reduction credits (\$120 million)
Climate modification		\$30/tree
Beauty		1%/year/home
Total Benefit	\$42.6-\$50.9 million	Priceless

Enhanced beauty

The intrinsic beauty of trees in the landscape of a home or community is difficult to quantify. However, a reasonable estimate is that trees increase the value of a home by about 1% per year. Thus, a \$100,000 home that is 25 years old would have an additional worth of about \$25,000 because of the mature landscaping.

BOTTOM LINE

Pecans are extremely valuable not only to New Mexico and West Texas producers but also to the citizenry in general. The industry currently has an annual value approaching \$50 million. The value will only grow as young orchards mature. However, other products could further increase the value of the pecan industry an additional 5% to 10% through the development of new industries.

While the pecan industry is economically important to the region, the noncommensurable value of the trees is enormously greater (table 2). The trees provide oxygen, sequester carbon dioxide and buffer our personal environment against wind, rain and sun. Furthermore, the pecan orchards are a major attraction for visitors and residents alike.

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