

AN ECONOMIC ANALYSIS OF PECAN ORCHARD ESTABLISHMENT AND MANAGEMENT

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The establishment and management of a pecan orchard requires considerable economic planning due to the magnitude and the long-term nature of the investment. The planning horizon must span 15 to 20 years. Few other enterprises require such long-range planning.

Production levels, costs and returns assumed for this analysis are estimates based upon past performance records and are not to be interpreted as projections. Actual production levels, costs and prices vary with management, locality, weather and economic conditions. Individuals considering investment in pecan orchards should be capable of high level management or willing to hire professional management. Management is the key to a successful pecan operation.

This study was specifically designed for the two areas shown in figure 1. The distinctions between the areas are based upon irrigation, insect control requirements and expected production. These areas require supplemental irrigation. Research has shown controlled daily flow irrigation systems (drip

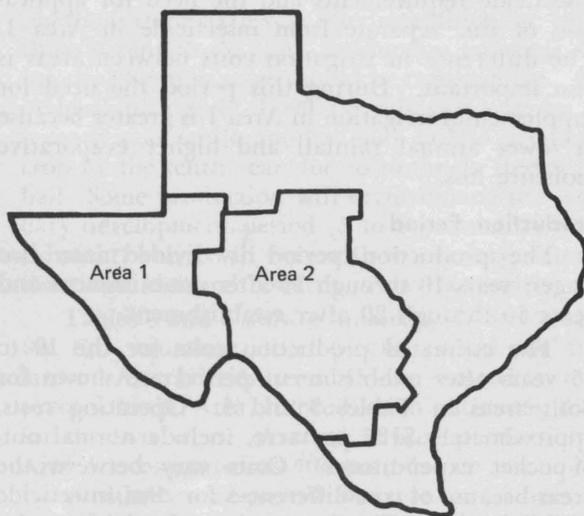


Fig. 1. Resource areas

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or trickle irrigation) to be an economical method of water application in areas where water for irrigation is limited. This analysis assumes the use of a controlled daily flow irrigation system.

Four distinct stages in the life of a planted pecan orchard are: (1) establishment, (2) initial development, (3) secondary development and (4) production. The investor must have sufficient capital to acquire land, trees, irrigation system and other requirements for establishment. Of particular importance is the time span from establishment to the point of economic production. During this period, costs are greater than returns from the sale of pecans, therefore, operating funds must be available from another source.

COSTS

Establishment Period

During the establishment period, in which land is prepared, the irrigation system is installed and trees are planted, costs required to operate and maintain the orchard vary depending upon land preparation required, source of irrigation water and density of planting.

The estimated cost per acre of a controlled daily flow irrigation system, based upon a design for a forty-acre orchard, is \$165 as shown in Table 1. Costs vary with selection of material types, water filtration equipment required, density of planting, automated equipment desired and labor costs.

Table 1. Estimated per acre costs of daily flow irrigation system

		Cost per acre
Lateral pipe 1/2"	1,254' @ \$.05	\$ 62.70
Tree loops 3/8"	108' @ \$.04	4.32
Emitters	36 @ \$.30	10.80
Supply line 1 1/2" PVC	66' @ \$.12	7.92
Supply line 3" PVC	25' @ \$.20	5.00
Filter	\$240 ÷ 40 ac.	6.00
Fertilizer injector	\$500 ÷ 40 ac.	12.50
Controls	\$120 ÷ 40 ac.	3.00
Miscellaneous connections	\$100 ÷ 40 ac.	2.50
Trenching		20.00
Labor		30.00
Estimated total per acre costs		\$164.74

The estimated establishment cost of \$300 per acre as shown in Table 2 is based on a planting density of 36 trees per acre. Operational costs for the two areas vary because of differences in insect control costs. Fixed costs reflect a return on the investment in land. Depreciation on well and pump varies due to initial cost differences of wells between the areas. Total estimated cost for a well and pump capable of serving 40 acres utilizing a daily controlled flow irrigation system is \$3,000 for Area 1 and \$1,600 for Area 2. This represents a cost per acre of \$75 for Area 1 and \$40 for Area 2. The systems were assigned twenty-year life expectancies for depreciation calculation.

Table 2. Estimated establishment costs per acre

Item	Area 1	Area 2
Land preparation	\$ 10.00	\$ 10.00
Trees (36 @ \$4.00)	144.00	144.00
Staking and holes	20.00	20.00
Irrigation	10.75	10.75
Weed control	7.50	7.50
Insecticide and application	—	7.50
Labor	40.00	40.00
Maintenance and repair	8.97	8.39
Interest on operating capital	9.65	9.93
Total operational costs	\$250.87	\$258.07
Fixed costs		
Depreciation:		
Well and pump	\$ 3.75	\$ 2.00
Daily flow system	8.13	8.13
Land cost (\$400 x .08)	32.00	32.00
Total fixed cost	\$ 43.88	\$ 42.13
Estimated total establishment costs	\$294.75	\$300.20

Initial Development Period

The initial development period is the time span from the establishment year to the year production is expected to begin. Tables 3 and 4 show estimated total annual costs for each area during the initial development period to be approximately \$110 per acre. The budgets presented are based on varieties capable of bearing crops by the fifth season after transplanting. Average annual costs for 4 years following establishment include operational costs required to maintain tree growth and annual fixed costs.

The largest cost differences between the areas reflect different requirements for zinc and insecticide. In Area 1, insecticide requirements are not as great as in Area 2. The zinc cost for Area 1 includes the cost of two applications of zinc separate from the application of insecticide. In Area 2 it was assumed that zinc is applied with insecticide applications; therefore, the cost of applying zinc is included in the cost of applying insecticide.

Secondary Development Period

During the secondary development period, the fifth through the ninth year, production is expected to begin and increase as the trees approach maturity. Secondary development costs are estimated at approximately \$140 per acre (Tables 3 and 4). Included in the secondary development costs are

Table 3. Estimated per acre development and production costs, Area 1

Item	Initial development Years 1-4	Secondary development Years 5-9	Production costs Years 10-15	Production costs Years 16-20
Fertilizer	\$ 2.16	\$ 6.00	\$ 12.00	\$ 15.00
Zinc	11.23	17.22	23.96	35.94
Insecticide & application	7.40	14.34	19.13	26.53
Weed control	21.00	21.00	21.00	21.00
Pruning	3.60	8.00	10.00	10.00
Irrigation	10.75	22.00	26.50	26.50
Additional labor	5.00	5.00	5.00	5.00
Maintenance	8.97	8.97	8.97	8.97
Interest on oper. capital	2.80	4.10	5.06	5.96
Total operating costs	\$ 72.91	\$106.63	\$131.62	\$154.90
Fixed costs	\$ 43.88	\$ 43.88	\$ 43.88	\$ 43.88
Estimated total annual costs	\$116.79	\$150.51	\$175.50	\$198.78

Table 4. Estimated per acre development and production costs, Area 2

Item	Initial development Years 1-4	Secondary development Years 5-9	Production costs Years 10-15	Production costs Years 16-20
Fertilizer	\$ 2.16	\$ 6.00	\$ 12.00	\$ 15.00
Zinc	.75	1.50	3.00	4.50
Insecticide & application	12.50	25.00	40.00	50.00
Weed control	21.00	21.00	21.00	21.00
Pruning	3.60	8.00	10.00	10.00
Irrigation	10.75	16.00	19.00	22.00
Additional labor	5.00	5.00	5.00	5.00
Maintenance	8.37	8.39	8.39	8.39
Interest on oper. capital	2.57	3.64	5.10	5.44
Total operating costs	\$ 66.70	\$ 94.53	\$123.49	\$141.33
Fixed costs	\$ 42.13	\$ 42.13	\$ 42.13	\$ 42.13
Estimated total annual costs	\$108.83	\$136.66	\$165.62	\$183.46

operational costs required to maintain tree growth and production and annual fixed costs. Harvest costs are not included due to the variation of production.

Costs for the two areas differ because of different insecticide requirements and the need for application of zinc separate from insecticide in Area 1. The difference in irrigation costs between areas is also important. During this period the need for supplemental irrigation in Area 1 is greater because of lower annual rainfall and higher evaporative moisture loss.

Production Period

The production period is divided into two stages; years 10 through 15 after establishment and years 16 through 20 after establishment.

The estimated production costs for the 10 to 15 years after establishment period are shown for both areas in Tables 3 and 4. Operating costs, approximately \$125 per acre, include normal out-of-pocket expenditures. Costs vary between the areas because of cost differences for zinc, insecticide and irrigation. Total annual production cost for the period is estimated at about \$170 per acre.

Tables 3 and 4 also show estimates of production costs during the 16 to 20 years after establishment period. Annual operational costs are approximately \$150 per acre and total costs are approximately \$190 per acre with some cost variation between the areas.

RETURNS

Secondary Development Period

There are precocious (earlier maturing) pecan varieties with the potential of production levels which provide returns exceeding annual costs during the fifth or sixth year after establishment. While these potentials do exist, production estimates during the planning stage should be conservative. One orchard may yield 1,000 pounds per acre by the seventh year while another may fail to produce a crop by the tenth year due to untimely freezes and hail. Some production will occur during the secondary development period (5 to 9 years after establishment) but it will vary with the variety, management and external conditions such as weather.

Tables 5 and 6 show estimated costs and returns for the secondary development period for both areas. As varieties tend to be somewhat more precocious in Area 1, production estimates differ for the two areas. Average annual production in Area 1 is estimated as 408 pounds per acre. This is equivalent to 12 pounds per tree for 34 trees per acre (2 tree death loss from original 36). Estimates for Area 2 are 8 pounds per tree or 272 pounds average annual production over the period. Pecan prices are assumed to be 40 cents per pound return after harvest costs are paid. Using the secondary development costs shown earlier, net returns average \$12.70 per acre annually over the period for

Area 1 and a net loss of \$27.85 per acre for Area 2. Production will be zero or low early in the period and will increase toward the end of the period.

Production Period, Years 10-15

For the years 10 through 15 after establishment, average annual production for both areas is estimated at 1,280 pounds per acre or 40 pounds per tree for 32 trees (4 tree death loss). The assumed price of 40 cents per pound after harvesting costs results in gross returns of \$512 per acre annually (Tables 5 and 6). Subtraction of all production costs results in a net return per acre of \$336 for Area 1 and \$346 for Area 2.

Table 5. Estimated annual per acre costs and returns, Area 1

	Secondary development Years 5-9	Production periods	
		Years 10-15	Years 16-20
Estimated total production	408 lb.	1280 lb.	1800 lb.
Estimated returns after harvesting costs	\$163.20	\$512.00	\$720.00
Operating costs	\$106.63	\$131.62	\$154.90
Income above operating costs	\$ 56.57	\$380.38	\$565.10
Total fixed costs	\$ 43.88	\$ 43.88	\$ 43.88
Net returns	\$ 12.69	\$336.50	\$521.22

Table 6. Estimated annual per acre costs and returns, Area 2

	Secondary development Years 5-9	Production periods	
		Years 10-15	Years 16-20
Estimated total production	272 lb.	1280 lb.	1800 lb.
Estimated returns after harvesting costs	\$108.80	\$512.00	\$720.00
Operating costs	\$ 94.53	\$123.49	\$141.33
Income above operating costs	\$ 14.27	\$388.51	\$578.67
Total fixed costs	\$ 42.13	\$ 42.13	\$ 42.13
Net returns	-\$ 27.84	\$346.38	\$536.54

Production Period, Years 16-20

During this period, average annual production is estimated at 1,800 pounds per acre (Tables 5 and 6) or 60 pounds per tree for 30 trees (6 tree death loss). Net returns after all costs are \$521 for Area 1 and \$536 for Area 2.

ANALYSIS OF THE INVESTMENT

Orchard investments are analyzed by two methods. The first is to trace flows of the expenses and returns of the orchard to determine the number of years required to recover cost. The second is to determine the discounted rate of return over the 20-year period.

Table 7 analyzes cost recovery for both areas by showing the net cash outlay or the net cash returns for each year. Investment requirements in the establishment year include capital outlays for the purchase of land valued at \$400 per acre, the per acre investment in well, pump and distribution system and the per acre operational cost during the establishment year. Entries in subsequent years are operating costs or income above operating costs.

These costs reflect the net cash flows of each year. The costs are summed and are reduced each time annual returns exceed annual operating costs. Once the column, **Summation of Annual Cash Flows**, becomes positive, all original costs are recovered, and the positive total represents the sum of the net cash flows through that specific year. The analysis reveals that cost recovery occurs during the twelfth year of operation for both areas based on estimated costs, production and prices used.

The second method of analysis discounts the cash flows shown to determine the discounted return to the investment over the 20-year period. Based upon this method, investments in pecans indicate a discounted rate of return in excess of 11 percent, Table 7. However, the prospective investor must realize that no return on investment is earned until the twelfth year. Thereafter, net income generated will result in a positive return on the investment which has a discounted rate of return of approximately 11 percent by the twentieth year. In addition, the orchard has value and income potential beyond the 20-year period discussed in this analysis. Because of the variability of these factors, they were omitted from this analysis.

Market outlook for quality nuts is good with potential for supplying specialty markets. In addition, the value of the pecan orchard increases during its productive life in excess of development cost.

Although long-run returns on the investment in pecans appear promising, funds are not available for debt repayment in early years. Additional limitations include risks and high management requirements.

Risks are difficult to quantify and include in the analysis. Risks include variation in prices, yields, technology and economic conditions. Institutional changes related to government programs, taxes and financing are additional sources of risk. The prospective investor should be aware of all factors which affect his potential returns. The effects of disease, insects and severe weather conditions should be considered in projections of yields. The potential loss of trees, their replacement and extended time lags before production should also be considered. Since changes in the cost of production and price levels are impossible to predict, it is suggested that the investor analyze the pecan investment based upon his estimates of production costs and several levels of projected yields and prices.

Table 7. Analysis of the investment

Year ¹	Area 1		Area 2	
	Column 1 Net annual cash flows*	Column 2 Summation of annual cash flows*	Column 1 Net annual cash flows*	Column 2 Summation of annual cash flows*
Establishment	-\$890.61	-\$890.61	-\$862.81	-\$862.81
1	- 72.91	- 963.52	- 66.70	- 929.51
2	- 72.91	- 1036.43	- 66.70	- 996.21
3	- 72.91	- 1109.34	- 66.70	- 1062.91
4	- 72.91	- 1182.25	- 66.70	- 1129.61
5	56.57	- 1125.68	14.27	- 1115.34
6	56.57	- 1069.11	14.27	- 1101.07
7	56.57	- 1012.54	14.27	- 1086.80
8	56.57	- 955.97	14.27	- 1072.53
9	56.57	- 899.40	14.27	- 1058.26
10	380.38	- 519.02	388.51	- 669.75
11	380.38	- 138.64	388.51	- 281.24
12	380.38	241.74	388.51	107.27
13	380.38	622.12	388.51	495.78
14	380.38	1002.50	388.51	884.29
15	380.38	1382.88	388.51	1272.80
16	565.10	1947.98	578.67	1851.47
17	565.10	2513.08	578.67	2430.14
18	565.10	3078.18	578.67	3008.81
19	565.10	3643.28	578.67	3587.48
20	565.10	4208.38	578.67	4166.15

Discounted rate of return, end of 20th year
Area I 11.6% Area II 11.4%

*Outflow —

¹Establishment outlays include per acre costs for land, pump and well, daily control system and establishment operational costs. Subsequent yearly totals are net operational costs or net returns above operational costs. These totals represent net cash flows over the twenty year period.

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