



Fannin Central Appraisal District 2018 Agricultural Productivity Valuation

Example & Process

Forward

This document covers the process for calculating agricultural productivity values. It discusses the share lease, cash lease and owner operator arrangement and bee keeping valuation and provides a listing of the agricultural classes, minimum requirement and degree of intensity standards

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2018 Productivity Valuation Example & Process

Introduction

Agricultural appraisal of open-space land is based on the income approach to value. This approach considers the income derived and expenses incurred for a given agricultural endeavor based on the typical arrangement for a particular agricultural endeavor. The result of the calculations is the "Net-to-Land" which means "...the average annual net income derived from the use of open-space land that would have been earned from the land during the five-year period...by an owner using ordinary prudence..." (Sec. 23.51, Property Tax Code.)

The first step is to determine what the typical arrangement is for each classification of agricultural land. The typical arrangements are **share lease, cash lease and owner operator**. Each arrangement considers the income, variable and fixed expenses to determine the net-to-land for the agricultural endeavor. The difference between the arrangements is explained in the following examples.

Example of Income for Share Lease Arrangement

Under the share lease arrangement, the income and variable expense components are split by a factor of 1/3 or .33. The landowner (usually) pays a share of the production expenses and receives a prearranged share of the gross receipts rather than a fixed dollar amount. The crops under the classification of dry crop are wheat, sorghum, soybeans, oats, cotton and corn. Within this classification 25% is owner farmed, 25% is cash leased and 50% is share leased. The law requires the appraisal district to value the typical arrangement. The Share lease, as reported by United States Department of Agriculture (USDA), Farm Service Agency (FSA) is the typical arrangement for dry crop production. Irrigated crops and Orchards are typically owner farmed; therefore, we would look at the income and expenses as belonging to the owner. Pasture land, improved or native is typically operated on a cash lease basis. Under a cash lease, the owner receives a fixed lease payment for the use of the land. The owner bears no risk to the farming or ranching operation and does not share in any capital expense or profit. Cash lease and Owner Operator is discussed in greater detail later.

Next step is to determine what the prevailing crop is. There was a total of 70,919 acres planted and 55,403 acres harvested in the dry crop category. Corn made up 45%, wheat made up 29%, soybeans made up 11%, sorghum made up 7%, cotton made up 5% and oats made up 3% of the dry crop harvest for 2016. In previous years, wheat has clearly been the predominant crop but the data shows that corn has replaced it as the predominant crop for 2016. Rationale: 9,140 of the 28,000 acres planted for the wheat crop were grazed rather than harvested which significantly reduced its contribution to the dry crop category. Furthermore, only 16,000 acres of wheat were harvested as compared to the 25,100 acres of corn harvested. Therefore, corn was determined to be the predominant crop with (45%) of the 2016 dry crop harvest.

The key components for evaluating crop production are: Acres planted, acres harvested, yield and if applicable, government payments, secondary income (hunting, post-harvest grazing lease etc.). Variable expenses (necessary expenses such as seed, fertilizer, insecticide, herbicide, application, harvest haul and crop insurance. Fixed expenses include management and taxes. Fannin Central Appraisal District uses the share lease (typical arrangement) and wheat production (prevailing crop) to determine values for the dry crop category.

Yield / Planted Ratio

The yield / planted ratio is a calculation which compares the acres planted of a crop to the acres harvested. The result of the calculation is applied to the yield. The formula is $H/P \times Y$ where H is acres harvested, P is acres planted and Y is the yield per acre. Example, 20,000 acres was planted in crop X. The yield for the crop was 50 bushels per acre. 18,000 were actually harvested.

The yield / planted ratio for this crop is 45.

$$\begin{array}{r} \text{Harvested} \quad \underline{18,000} \\ \text{Planted} \quad 20,000 \end{array} \quad \times \quad \begin{array}{r} \text{Yield per Acre} \\ 50 \end{array} = \begin{array}{r} \text{Adjusted Yield} \\ 45 \end{array}$$

The result expresses the adjusted yield due to waste or loss of production. In this example, there was 10% loss from acres planted to acres harvested and that loss is accounted for by adjusting the yield. Let's apply this to actual production numbers for the 2016 corn crop for Fannin County.

2016 Dry Crop Income

Income is the sum of production, government payments and any secondary income generated from using the property (hunting leases or recreational leases).

In 2016, 27,700 acres were planted in corn according to the USDA/NASS survey report. The reported yield was 82.1 bushels per acre. The Yield/Planted ratio for this crop is 74.4 as shown below.

$$\begin{array}{r} \text{Harvested} \quad \underline{25,100} \\ \text{Planted} \quad 27,700 \end{array} \quad \times \quad \begin{array}{r} \text{Yield per Acre} \\ 82.1 \end{array} = \begin{array}{r} \text{Adjusted Yield} \\ 74.4 \end{array}$$

The market rate was \$3.75 per bushel. The adjusted per-acre dry crop production calculation is:

$$P (\$ \text{ value of Production}) = R (\text{Rate per bushel}) \times AY (\text{Adjusted Yield}).$$

$$\$3.75 \times 74.4 = \$279.00$$

2016 dry crop production showed a slight increase as corn replaced wheat as the prevailing crop. No Government payments apply to this category.

There was no Secondary income reported for this category for hunting leases. The income component is calculated as follows:

2016 Dry Crop Production:	\$279.00 per acre
Government Payments:	\$ 0.00 per acre
Secondary Income:	<u>\$ 0.00 per acre</u> (hunting lease)
Total Income:	\$279.00 per acre Income

Share lease uses a factor of 1/3 or .33 to determine the owners' share of the income.

$$\$279.00 \times .33 = \$92.07$$

Expenses (Variable and Fixed)

Example of Variable Costs as determined by the Agricultural Advisory Board, FSA Reporting and Comptroller reports

Seed Costs:	\$ 60.00 per acre
Fertilizer, Herbicide, Insecticide & Application:	\$ 80.00 per acre
Haul &Harvest:	\$ 34.88 per acre
Crop Insurance:	<u>\$ 12.00 per acre</u>
Total Variable Costs:	\$186.88 per acre

Share lease uses a factor of .33 to determine owners' share of this expense.
 $\$186.88 \times .33 = \61.67 (Rounded)

Owners Share of Variable: \$61.67 per acre **Variable Expenses**

Example of Fixed Costs as determined by the Agricultural Advisory Board, FSA Reporting and Comptroller reports

This value relates to those costs only responsible or assigned to the property owner in the computation.

Management: @7% of income	\$ 6.44 per acre
Water	\$ 0.00 per acre
Previous Year Property Taxes:	\$ 4.19 per acre
Fence/and Fence Maintenance:	<u>\$ 0.00 per acre</u>
Total Fixed Expenses	\$ 10.63 per acre

100% of the fixed expenses go to the owner.

Summary and Productivity Value for this use

Income minus variable, minus fixed costs equal current Net to Land.

Income	\$ 92.07
Var. Exp.	- \$ 61.67
Fixed Exp.	<u>- \$ 10.63</u>
	\$ 19.77 Net-to-Land per acre for 2016.

The 2016 net-to-land is then added to the previous four years' net-to-land computations and averaged as explained in detail below:

The law requires the appraiser to determine the net income the land would have generated under an average owner of ordinary prudence during each year of a five-year period. The law specifies the appraiser **must** base the annual income estimate on the five-year period that precedes the year before the year of appraisal. For example, an appraisal in 2018 would be based on income from 2016 (two years prior to the appraisal), 2015, 2014, 2013 & 2012. This five-year averaging serves as a buffer for an otherwise volatile market. The appraiser then averages the annual income for each of these years. The resulting average or "net-to-land" is the amount to be capitalized in the appraisal for 2018. Capitalizing is the process of converting income into value.

2012	\$65.68
2013	\$51.05
2014	\$15.12
2015	(\$45.99)
2016	\$19.77
2017	Omit

2018	\$21.13
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AVG: \$105.63 divided by 5 equals \$21.13

For agricultural or open-space land, Tax Code Section 23.53 requires appraisal districts to use a cap rate that is the greater of 10 percent or the interest rate specified on the previous Dec. 31 by the Farm Credit Bank of Texas plus 2.5 percent. The bank's interest rate on Dec. 31, 2017, was 3.96 percent. With the 2.5 percent added, that rate became 6.46 percent. Since 10 percent is the greater rate, the 2018 cap rate is 10 percent. The cap rate for the past 10 years has been 10 percent, the last time it was not 10 percent was 2007, when it was 10.13 percent. <https://comptroller.texas.gov/taxes/property-tax/caprates.php>

Once the net-to-land average is determined, it is divided by the Cap Rate and the result is the productivity value for the crop for the year.

Net to Land	<u>\$21.13</u>	
Cap Rate	.10	= \$211.30 per acre, (Assessed Productivity Value).

Once the net-to-land is determined it is applied as productivity value as outlined in the "Manual for Appraisal of Agricultural Lands, January 2017" produced by the office of the State Comptroller.

Example of Cash Lease Arrangement

A cash lease (cash rent) is an agreement between the landowner and the tenant to lease the land for a fixed cash payment. It is usually in terms of dollars per acre for a period of one year. The owner bears no risk to the farming or ranching operation and does not share in any capital expense or profit. Typically, the owner has no labor or capital expenses and the cash lease payment is equivalent to the return to the land. Pasture land, improved or native is typically operated on a cash lease basis.

Cash Lease Income

In 2016, the FSA reported 167,333 acres of improved and native grasses. Of that, 23,245 acres were in hay production. Improved grasses made up 34% and native grasses made up 66% of the overall hay production. Approximately 144,088 acres of these grasses were left for grazing and not for hay production. The reported yield for this hay was 2.58 tons per acre at a market rate of \$103.84 per ton. $\$103.84 \times 2.58 = \267.91 the Yield/Planted ratio for this crop is 100%. This is a calculation to determine any loss of yield or waste. There was no reported waste of the grasses used for hay production for 2016 and there were multiple cuttings reported for that year as well.

Although the adjusted crop production grossed \$267.91 to the farmer, the owner simply leased the property out for a fixed payment to the farmer. The rest of this example will focus on improved pasture lease rates and expenses. Improved pastures typically leased for \$20.00 per

acre to the farmer. The farmer takes on all the risk of production and receives the profit of the operation. The owner may also lease the land for hunting for additional income. Although some of these lands (less than 7%) have hunting leases, The vast majority of these lands do not and therefore no secondary income is applied. The income component is calculated as follows:

2016 Improved Pasture/ land lease:	\$20.00 per acre
Government Payments:	\$ 0.00 per acre
Secondary Income:	<u>\$ 0.00 per acre</u> (hunting lease)
Total Income:	\$20.00 per acre Income

100% of the income under a cash lease goes to the owner.

Cash Lease Expenses

Since the owner bears none of the risk with the operation, no variable expenses are taken.

Example of Fixed Costs as determined by the Agricultural Advisory Board, FSA Reporting and Comptroller reports

This value relates to those costs only responsible or assigned to the property owner in the computation. **100% of the fixed expenses go to the owner.**

Management @ 7% of income:	\$1.40 per acre
Water	\$0.19 per acre
Previous Year Property Taxes:	\$2.64 per acre
Fence/and Fence Maintenance:	<u>\$4.15 per acre</u>
Total Fixed Expenses	\$8.38 per acre

Summary and Productivity Value for this use

Income minus variable, minus fixed costs equal current net-to-land or

Income	\$ 20.00
Expenses	- <u>\$ 8.38</u>
	= \$11.62 net-to-land per acre for this use.

The 2016 net-to-land is added to the previous four years' net-to-land computations and averaged as explained previously.

2012	\$16.25
2013	\$15.76
2014	\$13.29
2015	\$13.38
2016	\$11.62
2017	Omit

2018	\$14.06
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AVG: \$70.30 divided by 5 equals \$14.06

Once the net-to-land average is determined, it is divided by the Cap Rate for the value. In this example \$14.06 net-to-land is divided by 10%.

Net to Land	<u>\$14.06</u>	
Cap Rate	.10	= \$140.60 per acre, which is the assessed Productivity Value.

Example of Owner Operator Arrangement

Income

In 2016, NASS reported 500 acres of Orchard were planted and harvested with 100 percent of the Orchards being in pecans. The reported yield for the pecan crop according to Texas A&M University and adjusted for Fannin County was 2115 pounds per acre. However, the Agricultural Advisory Board recommended an adjusted yield that factors the orchard (Improved) and non-orchard (Native) setting and the boom/bust cycle of this crop. The Adjusted Yield was calculated by averaging the Improved and Native Crops and resulted in 1058 lbs. per acre. The Boom/Bust cycle is shown in the acres planted to acres harvested ratio and considers the yield. Improved per acre yield 1485 lb. + Native per acre yield = 630 lbs./2 = 1058 lbs. The lowest market rate, as reported by NASS was \$1.82 per pound and used in these calculations. $\$1.82 \times 1058 = \1926 income per acre for this crop.

The yield / planted ratio for this crop is 1926.

Harvested	<u>500</u>	Adjusted Yield per Acre		Adjusted Yield
Planted	500	X	1058 =	1926

No government payments were indicated for this crop and no secondary income was reported. The income component is calculated as follows:

2016 Pecan Production:	\$ 1926.00 per acre
Government Payments:	\$ 0.00 per acre
Secondary Income:	<u>\$ 0.00 per acre</u> (hunting lease)
Total Income:	\$ 1926.00 per acre Income

Owner operators retain 100 percent of the income.

Expenses

Example of Variable Costs as determined by the Agricultural Advisory Board, FSA Reporting and Comptroller reports

Fertilizer, Herbicide, Insecticide & Application:	\$ 254.67 per acre
Harvest, Haul & Clean-up:	\$ 1294.33 per acre
Crop Insurance:	<u>\$ 118.00 per acre was reported</u>
Total Variable Costs:	\$ 1667.00 per acre

Owner operators bear 100 percent of the variable expenses.

Example of Fixed Costs as determined by the Agricultural Advisory Board, FSA Reporting, Owner reporting and Comptroller reports

This value relates to those costs only responsible or assigned to the property owner in the computation.

Management: @7% of income	\$ 134.82 per acre
Water	\$ 0.00 per acre
Previous Year Property Taxes:	\$ 8.92 per acre
Fence/and Fence Maintenance:	<u>\$ 0.00 per acre</u>
Total Fixed Expenses	\$ 143.74 per acre

100% of the fixed expenses go to the owner.

Summary and Productivity Value for this use

Income minus variable, minus fixed costs equal current Net to Land.

Income	\$ 1926.00
Var. Exp.	- \$ 1667.00
Fixed Exp.	- \$ 143.74
	<u>\$ 115.26</u> Net-to-Land per acre for this use.

The 2016 Net-to-Land is added to the previous four years Net-to-Land computations and averaged as explained in detail below:

The law requires the appraiser to determine the net income the land would have generated under an average owner of ordinary prudence during each year of a five-year period. The law specifies the appraiser must base the annual income estimate on the five-year period that precedes the year before the year of appraisal. For example, an appraisal in 2018 would be based on income from 2016 (two years prior to the appraisal), 2015, 2014, 2013 & 2012. This five year averaging serves as a buffer for an otherwise volatile market. The appraiser then averages the annual income for each of these years. The resulting average, or "Net-to-Land" is the amount to be capitalized in the appraisal.

2012	\$ 62.04
2013	\$ 51.98
2014	\$ 58.36
2015	\$ 47.55
2016	\$115.26
2017	Omit

2018	\$ 67.04
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AVG: \$335.19 divided by 5 equals \$67.04

The Cap Rate as discussed previously is 10%.

Once the net-to-land average is determined, it is divided by the Cap Rate for the value. In this example, the \$67.04 Net-to-Land divided by 10%.

Net to Land \$67.04

Cap Rate .10 = \$670.40 per acre, which is the assessed Productivity Value.

Once the net-to-land is determined it is applied as productivity value as outlined in the "Manual for Appraisal of Agricultural Lands, January 2017" produced by the office of the State Comptroller.

Bees

Beekeeping is an agricultural use and shall qualify for agricultural use productivity valuation if used for pollination or for the production of human food or other tangible products having a commercial value. Sec. 23.51 (2) Property Tax Code

Acreage Requirements

The State of Texas has set a minimum of 5 acres and a maximum of 20 acres to qualify beekeeping as an agricultural use.

The degree of intensity standard is set at a minimum of six colonies and 5 acres. The minimum degree of intensity was established using Section 131.001 Texas Agriculture Code's definition of an apiary, which is a place where six or more colonies of bees or nuclei of bees are kept. A colony is the hive and its equipment and appurtenances including bees, comb, honey, pollen and brood.

For each additional 2.5 acres one additional hive is required. If additional acreage is less than 2.5 acres, no additional hive is required. For example, if a property owner has 17 acres of land used for bee keeping ten hives would be needed to qualify.

First 5 acres	6 hives
Additional 10 acres	4 hives
<u>Remaining 2 acres</u>	<u>0 hives</u>
Total hives required	10 hives

Qualification

When property owners initially qualify for agricultural appraisal they must show proof of history for agricultural use/beekeeping for any of the five preceding seven years. One way to do this is to ask for export, import or intra-state permits, which are required by the Texas Apiary Inspection Service to transport hives. The typical arrangement for bee keeping is where a property owner has an agreement with a local commercial beekeeper to place hives on their land for a period of time. After pollination, the hives are removed, the honey harvested and the hives sent to the next pollinating area. Land owners will be required to provide this agreement on application.

Valuation

Under Open-Space productivity valuation, values are calculated using a modified income approach to determine the per acre value. This is done using cash lease rates that are collected each year through surveys mailed to lessees. The challenge with determining a productivity value for beekeeping using the cash lease method is usually beekeepers do not lease the land on which the hives are located. In most instances, a property owner who has hives located on his/her land already has an open-space valuation on their property.

Using the basic Income/Rate/Value (IRV) formula for developing an income approach to value, we developed a productivity value in beekeeping.

In Texas, it is estimated that a hive will produce an average of 70 pounds of honey per year. There was no data reported that indicate Fannin County to be any different. With assistance of local beekeepers, we estimated \$63.62 per hive of total expenses for 2016. Other expenses related to processing are not considered as the machinery and equipment are exempt from taxation as implements of husbandry.

The average wholesale price for honey in 2016 was \$1.96 per pound as reported by the National Honey Board. The following is Fannin Central Appraisal District's 2016 calculation.

Total income per hive	70 lbs. X \$1.96 = \$137.20
Total expenses per hive per year	\$63.62
Net Operating Income (NOI)	\$137.20 - \$63.62 = \$73.58
Productivity Value per hive	\$73.58/.10 cap rate = \$735.80

The following is a breakdown of the total expenses per hive:

Variable Expenses:	\$40.00 per hive
Fixed Expenses:	
Management @ 7% of income:	\$ 9.60 per hive
Previous Year Property Taxes:	\$14.02 per hive
<hr/>	
Total Expenses	\$63.62 per hive

Converting Per Hive Value to Acres

Fannin Central Appraisal District's degree of intensity is 6 hives on the first 5 acres with 1 hive for every 2.5 acres up to a maximum of 20 acres. This would give you a range of 6-12 hives minimum requirement. The productivity value is applied on a per acre basis; therefore, the following formula is used.

FCAD's minimum requirement on 20 acres is 12 hives. Therefore, the average hives per acre is $12/20 = .60$ hives.

Productivity Value per acre	$\$735.80 \times .6$ (minimum hives) = \$441.48
	\$441.48 Per-Acre for 2016

Productivity Value for this use

The 2016 Per Acre value is added to the previous four years per acre value computations and averaged as explained previously with one exception. Because the NOI was already capitalized we average the per-acre values rather than the net-to-land.

2012	\$770.67
2013	\$835.29
2014	\$907.92
2015	\$444.62
2016	\$441.48
2017	Omit

2017	\$680.00
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AVG: \$3399.98 divided by 5 equals \$680.00

\$680.00 Per-Acre is the assessed Productivity Value.

2018 Agricultural Classes and Requirements

Category	Definition	Minimum Acreage	Other requirements
Irrigated Crop	Lands which are cultivated on a regular basis for the production of adapted cultivated and close growing crops for harvest. The moisture needs are met by artificially watering on a systematic basis.	10 Acres	Consisting of: Wheat, Corn, Soybeans, Sorghum, or other standing grains.
Dry Crop	Lands which are cultivated on a regular basis for the production of adapted cultivated and close growing crops for harvest, but which are not artificially watered.	10 Acres	Consisting of: Wheat, Corn, Soybeans, Sorghum, or other standing grains.
Improved Pasture	Lands which have increased forage production or carrying capacities above the native surroundings due to the improvement of the land through the use of seeding, fertilizing, tending, cut, bailed, and other methods of improvement. These lands may or may not be artificially watered.	10 Acres	Consist of: Common Bermuda grass, hybrid Bermuda grass, Johnson grass, Old World Bluestems, Crabgrass, Fescue, Dallisgrass, and Bahia Grass.
Native Pasture	Lands used for grazing by <u>qualifying</u> livestock and wildlife on which the majority of the grasses and plants are native to the land. Native and natural vegetation, unmanaged <u>except for weed control, cutting and bailing.</u>	10 Acres	Consist of: Meadow Dropseed, Annual Threeland, Longspike Tridens, Little Bluestem, Switchgrass, Indian Grass, Big Bluestems, Sideoats gama, Buffalo Grass, Texas Wintergrass, Paspalams, Panciums, and White Tridens
Hay Production	Using both improved and native grasses.	10 Acres	Degree of intensity: Requires a minimum of 2,000 lbs. of hay production per acre per year for Native grasses and 4,000 lbs. per year for Improved.
Irrigated Orchards	Water supplied by direct delivery system.	3 Acres	14 Native (non-orchard setting) or 70 Improved (traditional orchard) productive fruit bearing trees with a 25-ft. spacing or 27 Improved (traditional orchard) productive fruit bearing trees with a 40-ft. spacing = 1 acre of orchard, See Diagram on back
Non-Irrigated Orchards	Water supplied by natural rainfall and runoff.	3 Acres	14 Native (non-orchard setting) or 70 Improved (traditional orchard) productive fruit bearing trees with a 25-ft. spacing or 27 Improved (traditional orchard) productive fruit bearing trees with a 40-ft. spacing = 1 acre of orchard, See Diagram on back
Bees	Texas Property Tax Code Section 23.51: The use of land to raise or keep bees for pollination or for the production of human food or other tangible products having a commercial value.	5 Acres	Minimum of 6 colonies (hives) on first 5 acres. For each additional 2.5 acres one additional hive is required. Submit agreement with beekeeper if hives are not owned by land owner
Vineyards	A plantation of grapevines, typically producing grapes used in winemaking	3 Acres	Minimum of 454 vines in a setting of 8ft spacing per vine with 12 ft. row spacing is required to equal one acre of vineyard

Wildlife Management

Wildlife Management	- Must have been in 1-d-1 ag - Must meet min acreage set by Texas Parks and Wildlife Department for our region unless property is under certain deed restrictions, easements, threatened or endangered species	12.5 Acres individual or 16.6 Acres for Co-op	Can only be applied to land currently receiving agricultural appraisal. Approved wildlife plan prepared and signed by owner is required at time of conversion to wildlife management Value remains fixed to the value at the time of conversion and remains fixed.
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Animal Unit and Soil Type

Animal Unit	<table> <tr> <td>Cow, 1000 lb., dry</td> <td>.92</td> <td>Sheep, mature</td> <td>.20</td> </tr> <tr> <td>Cow, 1000 lb., with calf</td> <td>1.00</td> <td>Lamb, 1 year old</td> <td>.15</td> </tr> <tr> <td>Bull, mature</td> <td>1.35</td> <td>Goat, mature</td> <td>.15</td> </tr> <tr> <td>Cattle, 1 year old</td> <td>.60</td> <td>Kid, 1 year old</td> <td>.10</td> </tr> <tr> <td>Cattle, 2-year-old</td> <td>.80</td> <td>Mature Horse</td> <td>1.25</td> </tr> <tr> <td>Colt</td> <td>.20</td> <td></td> <td></td> </tr> </table>	Cow, 1000 lb., dry	.92	Sheep, mature	.20	Cow, 1000 lb., with calf	1.00	Lamb, 1 year old	.15	Bull, mature	1.35	Goat, mature	.15	Cattle, 1 year old	.60	Kid, 1 year old	.10	Cattle, 2-year-old	.80	Mature Horse	1.25	Colt	.20				Acres Requirements: Native Pasture, Sand 12.0 Acres per Animal Unit Native Pasture, Black 10.0 Acres per Animal Unit Improved Pasture, Sand 10.0 Acres per Animal Unit Improved Pasture, Black 8.0 Acres per Animal Unit
Cow, 1000 lb., dry	.92	Sheep, mature	.20																								
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Cattle, 2-year-old	.80	Mature Horse	1.25																								
Colt	.20																										

Orchard Spacing Diagram

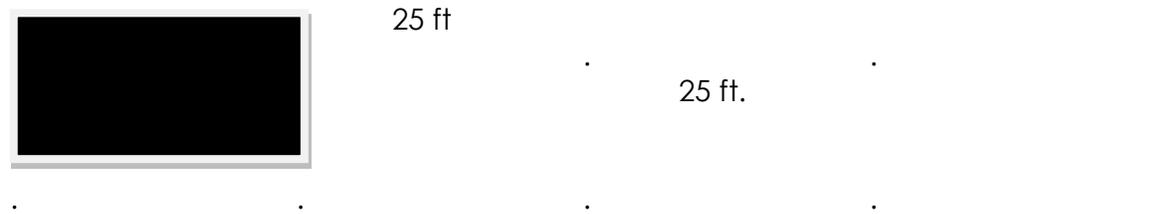
Raising livestock requires fences, proper management of land for long run forage, enough animal units to match land's carrying capacity, and a herd management procedure to get the animals to market.

******* It is recommended that you double up on the number of trees planted additional to come to the number of trees listed above due to tree loss as one establishes the orchard *******

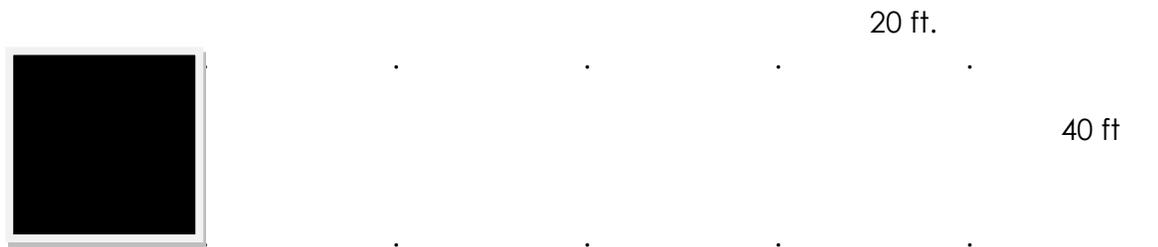
Figure 1 Pecan orchard design systems spacing diagram



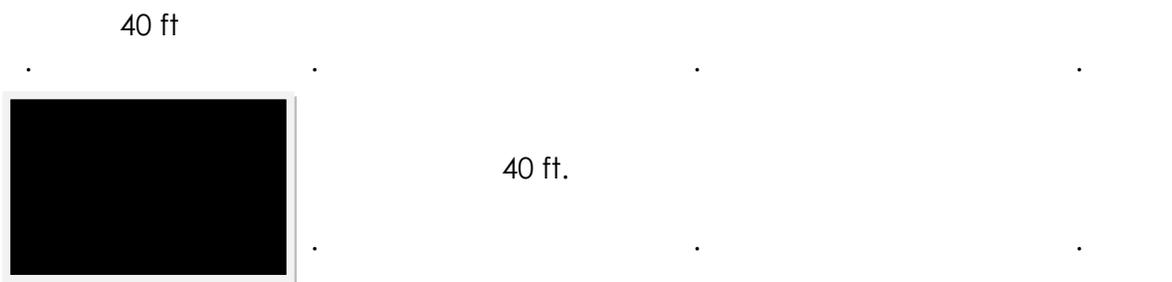
Initial planting a minimum of 140 trees with 12.5 x 25 ft. spacing for an ultra-density non-irrigated orchard setup



A minimum of 70 trees with 25 ft. x 25 ft. spacing for a standard non-irrigated orchard setup



Initial planting a minimum of 55 trees with 20 ft. x 40 ft. spacing for a ultra-density irrigated orchard



A minimum of 27 trees with 40 ft. x 40 ft. spacing for a ultra-density irrigated orchard

