

# **WALNUT ECONOMICS**

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## **The Economics of When To Cut a Walnut Tree**

If you are thinking of selling a mature walnut, you need to answer two questions: 1) What is my tree worth? And 2) How fast is it increasing in value?

This article discusses several of the forces that determine the price of a tree. But your tree is unique and a printed article can not assess the unique features of your tree.

### **What is My Tree Worth?**

The first thing you need to know is the market price of walnut timber. The best source of prices for walnuts and other hardwoods is the Indiana Forest Products Price Report published annually by Purdue University and edited by Prof William L. Hoover.

<http://www.ces.purdue.edu/extmedia/FNR/FNR-177-W.pdf>

To convert the Indiana prices into a rough value for your tree requires several steps.

#### **1 How big is your tree?**

Trees are easiest to measure at chest height, which is 4.5 ft above the ground. A tape around the tree will measure its circumference, which is 3.1416 times as large as its diameter.

When marketing the tree, its diameter will be measured at the small end of the log, inside the bark. To estimate this, you must estimate the taper (i.e. provide a rough estimate of how much smaller your tree is at the height of its log) and subtract two inches for the bark.

And, of course, you must estimate the length of the log. There are many ways to do this but a rough, quick way is to put a piece of tape on the tree about 4 ft above the ground.

Then back up and estimate if you have a clear log that is 2, 3 or 4 times as high as the tape. While this method is very rough, it is quick and requires no skill.

2 How many board feet of lumber are there in your tree?

In most of America, logs are converted into board feet using the Doyle scale. In Wisconsin, they are often converted using the Scribner scale. While Scribner offers more board feet per log for most commonly sized logs, I believe there is no difference in what a savvy buyer will offer for a particular log. You can't fool an experienced buyer by selling in feet instead of meters.

A Doyle table is available at. <http://www.penn-sylvan.com/HTML/doyle-scale.html>

Also, a convenient web site will estimate the number of board feet in your log using the Doyle scale if you enter the diameter and log length into its blanks.

[http://www.sizes.com/units/doyles\\_rule.htm](http://www.sizes.com/units/doyles_rule.htm)

For example, an 8 ft. log of a tree that is 18" in diameter will have 98 board feet according to the Doyle scale.

**How good is your tree?** The biggest variation in price comes from tree quality.

The Indiana Price Report estimates that prime walnut sawlogs were worth \$1.25 per board ft. in 2008, while prime walnut veneer logs averaged \$7.50 per board ft for a log of 18-20 inches in diameter. Smaller logs not only have fewer board feet, but their wood is less valuable per board foot when turned into veneer. With so much at stake, you need help to estimate the quality of your unique tree.

If your tree is a veneer tree that is 18" in diameter, the log will be worth \$735. Often a second or third, or even fourth, log can be cut from the same tree. The values of these upper logs are typically far less than the value of the first 8' log. The diameters of these upper logs are hard to determine while standing on the ground, but they will add value to the tree.

**How Much Will my Tree Increase in Value if I don't Cut it This Year?**

Three factors will increase the value of a tree. 1) How quickly the price of walnut lumber is increasing. 2) How fast your tree is growing. And 3) How much more the market values lumber from a large tree than from a small tree.

1) The Indiana Price Reports analyze long term trends. They conclude that over the long haul, the price of walnut lumber has increased at a rate that is one percent greater than the increase in the Consumer Price Index. This is a good standard to use if uncertain about current price trends.

2) It is easy to determine how fast your tree grows in a year. Measure its circumference two years in a row. Divide each by Pi (3.1416) to compute how much the diameter increased. If your tree is on good soil, has little competition for sunlight from nearby trees, and has little competition for water from vegetation in its ground cover, it can grow a ring of 1/4" each year. This converts to an increase in diameter of 1/2" per year which means that every other year you gain an inch in diameter which increases the number of board feet in your tree. In the example above, an increase from 18" to 19" in diameter will increase the number of board feet from 98 to 112 on the Doyle scale. This is an increase of 14% in two years or 7% per year. Bigger, older trees may grow a bit slower.

If your tree suffers from poor soil, a small crown to absorb sunlight, or competing ground cover, it could grow a ring of 1/8" per year, which would convert to an increase in board feet of 3-1/2% per year. Again, you can measure this easily yourself.

3) The quality of veneer varies significantly with the diameter of the log. The Indiana Price Report gives seven different prices for prime veneer from logs of different diameter. These vary from \$2.39 per board ft for a log of 12-13" in diameter to \$9.50 per board foot from a log greater than 28" in diameter.

Unfortunately, seven prices are not enough for a statistician to estimate with confidence a mathematical relationship between log diameter and lumber value. Nevertheless, I provide an estimate below that is derived from a common statistical procedure called least squares. Because of the small number of data points, think of it as a rough estimate of the percent increase in value for each increased inch of diameter. The estimate of values for each diameter is based on the curved line in the attached diagram, which is derived from the seven price points in the diagram. The price points are actual prices taken from the Indiana Report. Where the Indiana Report publishes one price for logs of 18" - 20" in diameter, I have used the mid-point, 19", in my statistical estimation of the price of walnut lumber.

My results are summarized in Table 1.

The table is computed net of inflation. A standard forecast for inflation these days is two percent per year. This means you should add two percent to the percentages reported in the last two columns of the table to compute a rate of return that can be compared to published market interest rates. If you wish to earn ten percent or more per year including this inflationary adjustment, Columns 10 and 11 suggest that if you have slowly growing tree, you should consider cutting it at 18" in diameter, while a rapidly growing tree should be cut when it is 25" in diameter. If you are less aggressive and will accept a seven percent rate of return, a slowly growing tree should be cut when it is 23" in diameter, while a rapidly growing tree should be left alone to grow into its 30s.

Remember also that in the example, I suggested that a three inch margin should be deducted from your chest high measurement of the tree to compute its economic diameter. The diameters in the table are measured inside the bark and are about three inches shy of what you would measure with a tape. So when the table suggests a 25"

tree, you should think 28" using your tape. And remember that you have probably arranged to have your timber sale treated as a capital gain for tax purpose, and it is the after tax return that should be used when comparing alternative investments..

Table 2 provides two examples that could be helpful in using table 1. These examples include the adjustments mentioned above. The example makes assumptions about inflation, about the size of your tree and about how fast it is growing. In table two, it is assumed you have measured two trees, one with a circumference of 63 inches and one with a circumference of 94 inches. It is assumed that the diameters of both are growing at one third of an inch per year. Table 2 also assumes that the ongoing inflation rate averages two percent per year.

TABLE 1

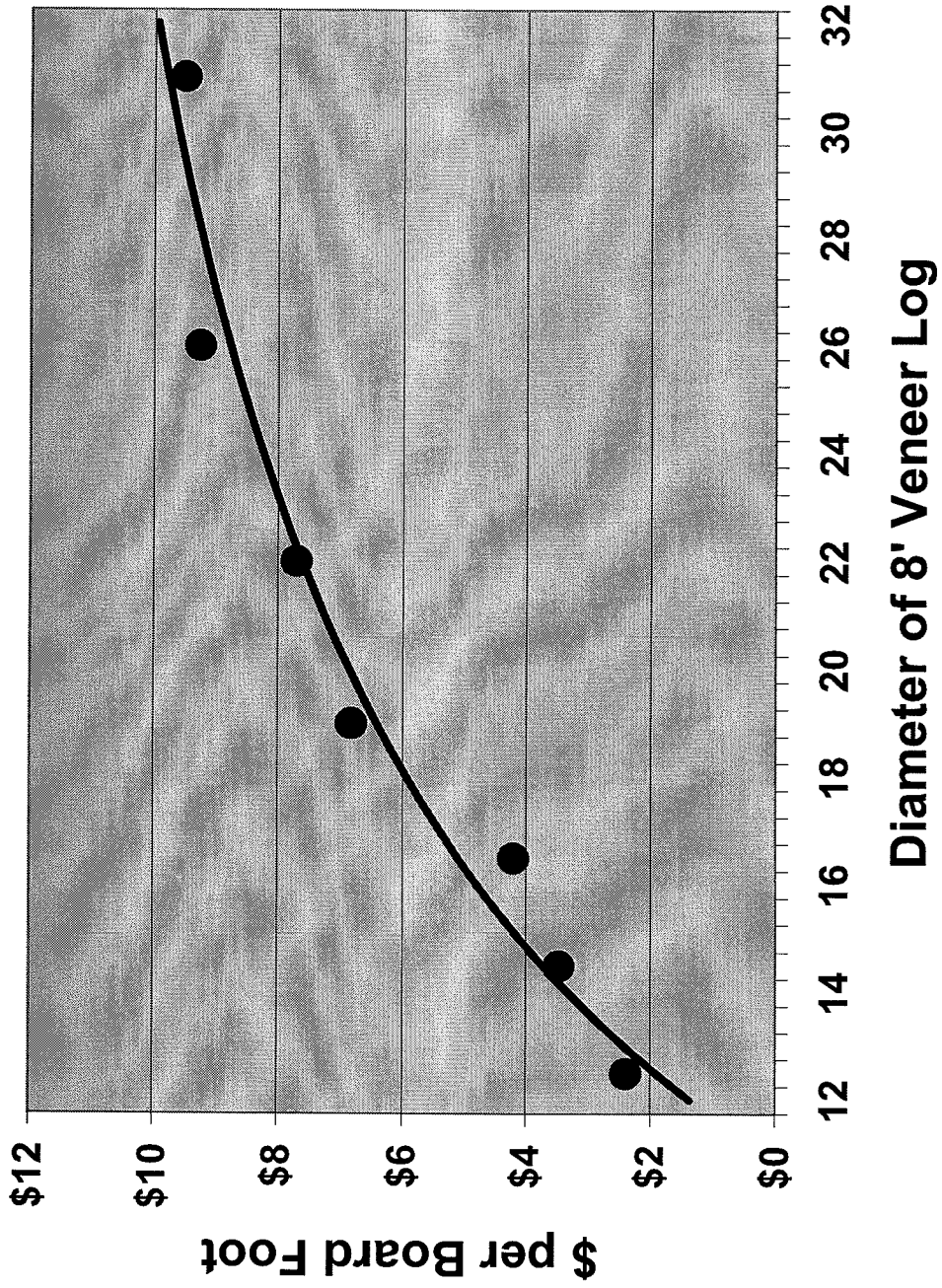
How to Estimate the Rate of Return of a Standing Veneer Quality Log Based on its Diameter and Rate of Growth

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Diameter of log	Bd ft per log (Doyle Scale)	% Increase in Doyle bd ft per additional inch of diameter	Value per bd ft as interpolated from Indiana prices for logs of various diameters	% Increase in Value of a bd ft from an increase of one inch in diameter	% Increase in Value of a Walnut log from each inch increase in diameter. (Cols 3 and 5 Compounded)	% Increase in Value of Tree per year if free grows one half inch in diameter per year	% Increase in Value of Tree per year if free grows one qtr inch in diameter per year	Percent Increase in Walnut Prices per year (In Excess of CPI) per Indiana Report	% Increase in Value of Tree per yr. (In Excess of CPI) per Indiana Report	% Increase in Real Value of Tree per yr. (In Excess of CPI) per Indiana Report
12	32		\$1.36							
13	40	25%	\$2.42	78%	122%	49.0%	22.1%	1.0%	50.5%	23.3%
14	50	25%	\$3.33	37%	72%	31.1%	14.5%	1.0%	32.4%	15.6%
15	60	20%	\$4.11	24%	48%	21.8%	10.4%	1.0%	23.0%	11.5%
16	72	20%	\$4.80	17%	40%	18.3%	8.8%	1.0%	19.5%	9.9%
17	84	17%	\$5.41	13%	31%	14.6%	7.1%	1.0%	15.8%	8.1%
18	98	17%	\$5.94	10%	28%	13.3%	6.4%	1.0%	14.4%	7.5%
19	112	14%	\$6.43	8%	24%	11.2%	5.4%	1.0%	12.3%	6.5%
20	128	14%	\$6.86	7%	22%	10.5%	5.1%	1.0%	11.6%	6.1%
21	144	13%	\$7.25	6%	19%	9.1%	4.4%	1.0%	10.2%	5.5%
22	162	13%	\$7.61	5%	18%	8.6%	4.2%	1.0%	9.7%	5.3%
23	180	11%	\$7.94	4%	16%	7.6%	3.8%	1.0%	8.7%	4.8%
24	200	11%	\$8.24	4%	15%	7.4%	3.6%	1.0%	8.4%	4.7%
25	220	10%	\$8.51	3%	14%	6.6%	3.3%	1.0%	7.7%	4.3%
26	242	10%	\$8.76	3%	13%	6.4%	3.2%	1.0%	7.5%	4.2%
27	264	9%	\$9.00	3%	12%	5.8%	2.9%	1.0%	6.9%	3.9%
28	288	9%	\$9.22	2%	12%	5.7%	2.8%	1.0%	6.8%	3.8%
29	312	8%	\$9.42	2%	11%	5.2%	2.6%	1.0%	6.3%	3.6%
30	338	8%	\$9.61	2%	11%	5.1%	2.5%	1.0%	6.2%	3.6%
31	364	8%	\$9.79	2%	10%	4.7%	2.3%	1.0%	5.8%	3.4%
32	392	8%	\$9.95	2%	10%	4.7%	2.3%	1.0%	5.7%	3.3%
33	420	7%	\$10.11	2%	9%	4.3%	2.1%	1.0%	5.4%	3.2%

NOTE: Uses 7 Observations



# Approximation of Indiana Data



● Actual Data  
— Math. Approx.

Table 3. Prices paid for delivered veneer logs by Indiana mills, May 2007 and May 2008

Species/Grade/ Log Dia.	2008 Range	No. Responses		Mean (s.e.) <sup>1</sup>		Median		Change (%)	
		2007	2008	2007	2008	2007	2008	Mean	Median
<b>Black Walnut</b>	(\$/MBF)			(\$/MBF)		(\$/MBF)			
<b>Prime</b>									
12-13	1000-3500	3	11	2500 (500.00)	2391 (235.66)	2000	2500	-4.4	25.0
14-15	1500-5000	4	11	3625 (375.00)	3473 (359.06)	3500	3500	-4.2	0.0
16-17	2000-7000	5	11	3840 (624.98)	4209 (553.58)	4500	3500	9.6	-22.2
18-20	3000-13000	3	10	5333 (1201.85)	6820 (1085.85)	6000	7500	27.9	25.0
21-23	3600-1700	3	8	6333 (1201.85)	7700 (1562.05)	7000	7500	21.6	7.1
24-28	4500-20000	2	6	9500 (500.00)	9250 (2308.50)	9500	8000	-2.6	-15.8
>28	5000-20000	1	6	10000 (NA)	9500 (2217.36)	10000	8000	-5	-20
<b>Select</b>									
12-13	800-3000	2	6	2750 (250.00)	1900 (318.33)	2750	1800	-30.9	-34.5
14-15	1000-4000	1	6	4000 (NA)	2417 (454.91)	4000	2000	-39.6	-50.0
16-17	1200-4000	1	7	4000 (NA)	2529 (448.13)	4000	2500	-36.8	-37.5
18-20	2000-6000	1	5	4000 (NA)	4000 (707.11)	4000	4000	0.0	0.0
21-23	3000-12000	1	5	4000 (NA)	5440 (1677.38)	4000	4000	36.0	0.0
24-28	3000-14000	1	5	5000 (NA)	6000 (2024.38)	5000	4000	20.0	-20.0
>28	3000-14000	1	5	5000 (NA)	6200 (1984.94)	5000	5000	24.0	0.0
<b>White Oak</b>									
<b>Prime</b>									
13-14	600-2200	3	9	2067 (233.33)	1583 (178.34)	2000	1500	-23.4	-25.0
15-17	1000-3000	5	10	1800 (254.95)	2195 (209.29)	2000	2150	21.0	7.5
18-20	1200-3500	5	9	2000 (221.36)	2622 (230.02)	2000	3000	31.1	50.0
21-23	1750-4000	5	7	2500 (285.04)	3064 (262.02)	2500	3000	22.6	20.0
24-28	3000-4500	2	5	2250 (250.00)	3700 (300.00)	2250	4000	64.4	77.8
>28	3000-5000	2	5	2250 (250.00)	3800 (374.17)	2250	4000	68.9	77.8
<b>Select</b>									
13-14	600-1600	1	5	1200 (NA)	1220 (190.79)	1200	1300	1.7	8.3
15-17	1300-2000	1	5	1500 (NA)	1660 (143.53)	1500	1500	10.7	0.0
18-20	1500-2500	1	4	1700 (NA)	2000 (204.12)	1700	2000	17.6	17.6
21-23	1500-3000	1	5	2000 (NA)	2360 (273.13)	2000	2500	18.0	25.0
24-28	1500-3500	1	4	2000 (NA)	2625 (515.39)	2000	2750	31.3	37.5
>28	1500-4000	1	4	2000 (NA)	2750 (595.12)	2000	2750	37.5	37.5
<b>Black Cherry</b>									
<b>Prime</b>									
12-13	800-3000	0	7	NA	1729 (276.64)	NA	2000	NA	NA
14-15	1500-5000	2	9	3500 (500.00)	2478 (367.72)	3500	2000	-29.2	-42.9
16-17	1500-7000	4	8	2750 (838.15)	3375 (580.56)	2400	3250	22.7	35.4
18-20	3000-9000	2	6	4500 (1500.00)	4433 (922.56)	4500	3550	-1.5	-21.1
21-23	3500-10000	2	6	5000 (2000.00)	5000 (1024.70)	5000	4000	0.0	-20.0
24-28	3500-10000	2	5	6000 (3000.00)	5400 (1197.91)	6000	5000	-10.0	-16.7
>28	3500-10000	1	5	3000 (NA)	5400 (1197.91)	3000	5000	80.0	66.7
<b>Select</b>									
12-13	800-2000	0	4	NA	1500 (300.00)	NA	1600	NA	NA
14-15	800-2500	0	4	NA	1700 (362.86)	NA	1750	NA	NA
16-17	1350-2500	0	4	NA	1963 (311.83)	NA	2000	NA	NA
18-20	2500-3000	1	3	1750 (NA)	2833 (166.67)	1750	3000	61.9	71.4
21-23	2500-4000	1	3	1750 (NA)	3333 (440.96)	1750	3500	90.5	100.0
24-28	2500-4000	1	3	1750 (NA)	3500 (500.00)	1750	4000	100.0	128.6
>28	2500-4000	1	3	1750 (NA)	3500 (500.00)	1750	4000	1000.0	128.6

(Continued)