Economics of Eastern Black Walnut Agroforestry Systems

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Fifteen cents doesn't go far these days, unless it has lots of time. For instance, if you invested 15 cents at 8% interest compounded annually over 60 years you, or your grandchildren, would eventually collect more than $50. That's the power of money over time. At the same time, if you spent 15 cents today and had to wait 60 years to get a return on it, you must receive at least $50 to get your money's worth at 8%. So, who is going to spend 15 cents today and wait 60 years for a payoff? If you have planted a tree seedling with the intention of growing a fully mature timber tree, you already have made such a commitment. That seedling probably cost you 15 cents and perhaps more. If it was more, you must receive more than $50 in 60 years to cover your minimum expected return of 8%.

An easy way to visualize the power of money over time is to recall the old story of the blacksmith and the chintzy horse owner. The owner had the blacksmith shoe his horse. When he went to pay the bill, the smithy said he wanted $100 for the job. The owner thought that was totally outrageous and told the smithy so. The smithy, being a reasonable and clever man, offered an alternative.

"I'll tell you what I'll do. I put 32 nails in those horseshoes. You pay me a penny for the first one, two cents for the second, three cents for the third and so on until you have paid for the 32 nails and we'll call it even." The horseman didn't hesitate and jumped at the opportunity to pay only pennies per nail. Of course, when he learned that the constant doubling of the price would eventually add up to millions of dollars, he reneged and gladly paid the $100.

To offset the effects of time we can take two approaches to our tree plantation systems that will offer a higher return on our investment. We can reduce as far as possible the amount of money we invest in the early years. However, we must be careful not to cut costs to the point of reducing income from the trees later on. Some added costs in the beginning such as regular herbiciding and investment in quality seedlings definitely will pay off in later years.

The second alternative to offsetting long-term costs is to design a system that also has income as soon as possible. This early income offsets the early costs. Many agroforestry practices such as alleycropping and silvopastoral systems where livestock graze the alleys offer this early income opportunity.

What has become known as the "Missouri Basic System of Agroforestry" is typical of these multifaceted systems.

THE MISSOURI BASIC SYSTEM

Because every practitioner's system will be different in some way, it is necessary to create a baseline or model black walnut agroforestry system to compare with.

The "Missouri Basic System of Black Walnut Agroforestry" essentially is that system that was demonstrated by Gene Garrett, director of the University of Missouri Agroforestry Center, at the Sho-Neff Plantation at Stockton, Mo. and was adopted by HarperHill Farms and others around Missouri and Midwestern states. In its simplest form it is a forage/nut/timber system where the forage is harvested for hay. This basic system is used as a model because it is the one (with many slight modifications) that has been most widely accepted by landowners.

(See Black Walnut Agroforestry--Missouri Basic System for outline of practices and costs and returns.)

Profitability under the Missouri Basic System of agroforestry begins and ends with the walnut trees. In most cases, the sustained profitability of the enterprise will almost totally depend on nut production. Accepting that premise dictates that management priorities for the system be directed toward the tree crop, not to the supporting or alley crops.

It simply means that when a decision must be made that will favor one or the other, the walnut trees and the resultant nut crop will receive first consideration.

However, income from secondary enterprises such as hay, livestock, row crop or between-the-row or between-the-trees crops play a most important role of providing cash flow, especially during the first 10 to 15 years. From the standpoint of return on investment, these interplanted crops with their annual up-front incomes have a major effect on reducing the costs of accumulated interest on the first-year investment in seedlings, planting, grafting and other maintenance costs.

When an agroforestry system is analyzed for profits and return on investment over a 60-year period, it becomes obvious that high initial establishment costs severely reduce average annual percentage return on investment. The 60-year analysis is used because it is at that point that the 8 to 9-foot butt log is mature and can be cashed in for nearly full value. It is at this point in the life of the plantation that the landowner will be faced with a critical economic decision--Is the log market such that cutting and selling the logs and investing the income at current rates more financially attractive than the expected annual net income from continued nut harvest. The landowner also will have to take into consideration the increased risk of loss of the log value to natural disasters such as disease, fire and lightning.

But we have the luxury of postponing that decision for 60 years. Most likely our children or grandchildren will bear that burden. Our concern is more immediate. Will a black walnut agroforestry system make money now or within a reasonable time? The answer: An unequivocal "Yes."

DETERMINING COSTS AND YIELDS

In practice, black walnut agroforestry will have different profitability potential for every practitioner depending on their individual financial circumstances and how the agroforestry system fits into the overall farming operation.

Black walnut agroforestry farming systems are a relatively new concept. The oldest established systems now are only a quarter century old. Therefore, the economic information available for making profitability analysis is limited. In many cases it is necessary to project yields of nuts and log

values based on wild, native tree production in non-plantation settings. However, there is enough accumulated data from individual nut yields on trees of various ages, both wild and grafted, that conservative yield projections can be made with some confidence.

Costs associated with production practices are fairly well established. Records from the plantations established at Hammons Products Company's Sho-Neff Plantation at Stockton, Mo. for the last 25 years and from HarperHill Farms at Butler, Mo. for the past 13 years offer reliable and current information (see attached cost references). Future costs such as those for mechanical nut harvesting (see separate chapter) are taken from similar costs for pecan harvest and from experimental walnut harvesting trials.

To determine profitability of a farming system it is necessary to analyze the costs and income over the lifetime of the crop. For an annual crop such as corn or soybeans it is a rather simple process because there are only single-year costs and incomes to calculate. For a perennial crop such as black walnut and supporting crops such as forages in the alleys, the calculation is more complex because of the cumulative effects of costs and income, especially in the establishment years.

The 60-year analysis also is useful for making comparisons of profitability between agroforestry systems. A simple change such as switching from planting bareroot seedlings and field grafting in the third year to planting nursery-grafted seedlings can have a major effect on the landowner's rate of return on investment over the long term.

IS IT PROFITABLE?

Black walnut agroforestry is a commitment--a long-term commitment. Most likely, as in the example of the Missouri Basic System, from 10 to 15 years will be required before a net profit is realized when interest on the investment to establish the plantation is figured in. However, when the return on investment over a long period (60 years) is considered, the investment can be highly profitable. When compared to a similar investment in a mutual fund over many years the rate of return on the agroforestry system of 10 to 20% or more is very competitive.

When the Missouri Basic System was analyzed for long-term profitability, it was determined that it had an Internal Rate of Return, or an annual return on investment in the case of a mutual fund, of 17%. That's projected over 60 years. The analysis also indicated that if you expected an 8% return on your investment you could pay $620 an acre for the land used in the system. Remember, the Missouri Basic System is based on rather conservative yield and income estimates. And, it includes a $7 an hour labor charge for all production practices.

As a comparison, the profitability of the Missouri Basic System without a nut crop was made. While the Internal Rate of Return was still a respectable 12%, the amount a landowner could invest in land at an expected return on investment of 8% was only $75 an acre. In short, this system would not pay for itself. However, some landowners would find this quite acceptable since they already own the land and might find an agroforestry practice suited their needs and fit their overall farming plans.

A third comparison was made where the trees were grown for timber only and neither nuts nor hay was harvested. In this case the Internal Rate of Return dropped to less than 3% and the land investment at an expected 8% return dropped to a negative $245 per acre.

To illustrate that every agroforestry operation will express unique profit potential because of varying input costs and selection of differing production practices, an analysis of the Missouri Basic System was made with the assumption that the operator owned the harvesting machinery and was using it to harvest 300,000 pounds or more of nuts each year. This level of nut harvesting reduces the harvest equipment ownership costs to a minimum. In this case the Internal Rate of Return was increased to 20% a year and the landowner could have invested $943 an acre in his land at an expected 8% return.

RATE OF 32% NITROGEN PER ACRE IN OUNCES										
Radius (ft.)	**Area (sq.ft.)**	**30 lbs.**	**40 lbs.**	**50 lbs.**	**60 lbs.**	**70 lbs.**	**80 lbs.**	**90 lbs.**	**100 lbs.**	**150 lbs.**
2	13	0.48	0.64	0.8	0.8	0.96	1.12	1.28	1.44	2.08
3	28	0.96	1.28	1.6	1.92	2.24	2.4	2.72	3.04	4.64
4	50	1.6	2.24	2.72	3.36	3.84	4.48	4.96	5.44	8.32
5	79	2.56	3.52	4.32	5.28	6.08	7.04	7.84	8.64	13.12
6	113	3.68	4.96	6.24	7.52	8.8	9.92	11.2	12.48	19.2
7	154	5.12	6.72	8.48	10.24	11.84	13.6	15.36	17.6	25.6
8	201	6.72	8.8	11.04	13.28	15.52	17.6	20.8	22.4	33.6
9	255	8.48	11.2	14.08	17.6	19.2	22.4	25.6	28.8	41.4
10	314	10.4	10.4	17.6	20.8	24	27.2	32	35.2	51.2
11	380	12.64	17.6	20.8	25.6	28.8	33.6	38.4	41.6	62.4
12	452	14.88	20.8	25.6	30.4	35.2	40	44.8	49.6	75.2
13	531	17.6	24	28.8	35.2	41.6	46.4	49.6	59.2	88
14	616	20.8	27.2	33.6	41.6	48	54.4	60.8	67.2	102.4
15	707	24	32	38.4	46.4	54.4	62.4	70.4	78.4	116.8
16	804	27.2	35.2	44.8	52.8	62.4	70.4	80	88	132.8
17	908	30.4	40	49.6	60.8	70.4	80	89.6	100.8	150.4
18	1018	33.6	44.8	56	67.2	78.4	89.6	100.8	112	168
19	1134	36.8	49.6	62.4	75.2	88	100.8	112	124.8	187.2
20	1257	41.6	56	68.8	83.2	97.6	110.4	124.8	139.2	208

MEASURING HERBICIDE SPRAYED AREA
(Acres/100 feet sprayed on both sides of tree row)

(Formula: 2 times spray width times 100 divided by 43,560 equals acre per 100 feet of row)

(Spray width)
1-foot width = .0046 acre/100 feet of tree row
2-foot width = .0092 acre/100 feet of tree row
3-foot width = .0138 acre/100 feet of tree row
4-foot width = .0184 acre/100 feet of tree row
5-foot width = .0230 acre/100 feet of tree row
6-foot width = .0276 acre/100 feet of tree row

Calculating actual sprayed area per acre based on 40-acre field with rows 40 by 20 feet: 1 quarter-mile row=1,320 feet minus turn rows (area at ends of field to turn equipment from 20 to 40 feet without trees planted) times 2 (two ends)=40 to 80 feet=1,240 feet (80 feet of turn row area) times 3-foot spray strip=.0138 (from table above) times 1,240 feet of sprayed length of row divided by 100 feet=1.24 times .0138=.017 acres (almost 1/5 acre sprayed per quarter mile of row). There are 33 rows in a 40-acre field a quarter mile long laid out on 40 by 20 spacing. So, 33 rows=.017 (acre/row)=5.6 actual acres sprayed or only 14% of the total field.