Beyond the Wild Nut: Moving Toward Profitable Black Walnut Nut Crops

Brian Hammons, Felix Ponder, Jr., and John Rickman[1]

ABSTRACT—Currently, about 2 million pounds of black walnut nutmeats are consumed annually, requiring about 26 million pounds of wild in-shell nuts (hulled, wet weight). Walnuts from wild trees are variable in quality, yield, and moisture, reducing the amount of good, salable nutmeats produced. Consequently, the price that can be paid to the harvester/producer is limited. Improved varieties of black walnut trees differ from wild trees in that they are typically planted in orchards, produce nuts more consistently and the nuts have higher percent kernel yield and quality. Thus, the price on such improved nuts can be higher. The black walnut industry (Hammons Products Company) has developed quality guidelines whereby growers of improved varieties can receive more for nuts with higher nutmeat yields and desirable characteristics. High yield of good quality nutmeats is the key to profitable nut crops.

There is an increasing need for a greater, more stable supply of black walnuts to support long-term consumption growth. One way to help increase the supply is through the use of more nuts from trees of improved varieties. Virtually all the available supply of black walnuts for the commercial market is now harvested from wild trees in a few states. The wild nuts are variable in quality, yield, and moisture, which reduces the amount of good, salable nutmeats produced. The average yield, based on wet drying weight, is only about 7.5% (Hammons 2001). This low yield, plus increasing hauling costs and freight costs, keeps the purchase price low at the buying stations. Also, because yields on nuts from eastern states are much less than nuts from the central states, the purchase price there is even lower.

The price for black walnuts must be higher in order to encourage growers to invest in orchards and harvest more nuts. In addition to volume, production of high quality black walnut nuts also will require a much higher price. The following sections review evaluations of "Quality" and then discuss one mechanism for determining a higher price based upon high quality.

QUALITY

Over the years, many hours of work have gone into evaluating black walnut nutmeat quality. In 1977, the Nebraska Nut Growers Association decided to hold a contest to find the largest black walnut nut (Bish 1999). However, soon, it was decided that big was not always better. In that test, the largest nut, Rowher variety, weighed 24.3 g, but yielded only 27.3% nutmeat compared to nuts of the Emma K variety, which weighed 17.2 g and had a yield of 35.9% nutmeat (Table 1). By comparison, kernel percent from wild trees averaged only 23%. Nut quality evaluation of the species must be an ongoing process to select high-producing, quality varieties that require fewer resources to produce.

There is evidence to suggest that the performance of nut varieties may be affected by climate or geographic area (Hanson 1999, Rink and others 1994). Earlier, Bey (1973) demonstrated that the growth performance of black walnut was affected by geographic origin in provenance tests. In test plantings, black walnut trees originating well to the south consistently outgrew those of local origin. The geographic region for nut varieties may be even narrower than for timber trees (Hanson 1999).

[1]President (BH), Hammons Products Company, P.O. Box 140, Stockton, MO 65758; Research Soil Scientist (FPJr), USDA Forest Service, North Central Research Station 208 Foster Hall, Lincoln University, Jefferson City, MO 65102; and Plant Manager (JR), Hammons Products Company, P.O. Box 140, Stockton, MO 65758; FPJr is the corresponding author: to contact, call 573-681-5575 or 573-875-5341, ext. 234 or e-mail at fponder@fs.fed.us.

Citation for proceedings: Michler, C.H.; Pijut, P.M.; Van Sambeek, J.W.; Coggeshall, M.V.; Seifert, J.; Woeste, K.; Overton, R.; Ponder, F., Jr., eds. 2004. Black walnut in a new century, proceedings of the 6th Walnut Council research symposium; 2004 July 25-28; Lafayette, IN. Gen. Tech. Rep. NC-243. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 188 p.

Table 1.—Black walnut nut characteristics for variety and plantation grown wild trees.

Tree Type	Nut Weight	Kernel Weight	Percent Kernel
Variety[1]	*g*	*g*	
Emma K	17.181	6.17	35.91
McGinnis	17.83	5.66	31.24
Surprise	20.22	6.61	32.71
Sauber	14.70	4.93	33.55
Hay #1	20.90	6.77	32.10
Sparks 147	16.90	5.77	33.42
Rowher	24.26	6.37	27.34
Sparks 127	15.01	5.11	33.69
Myers	15.52	5.03	32.89
Krause	18.36	4.77	28.00
Wild[2]			
Area 17	12.44	2.86	22.14
Area 22	14.14	2.66	23.95

[1]*Data for variety trees adapted from Bish (1999).*

[2]*Each value is the mean from 100 nuts. Wild trees are on Hammons Products Company SHONEF Plantation, Stockton, MO.*

For nut varieties, this region should be bounded at about 50 miles north and south and about 100 miles east and west of a variety's viable location. This does not mean trees will not perform well outside the area. It does mean that if one is going to invest in nuts for commercial purposes, one should be conservative on large-scale selections. Trees should be tested by planting small tests of varieties outside the geographic region and expand after proven performance. It also appears that if a variety is viable within a region, the source of scion wood has little or no impact on that cultivar's viability (Hanson 1999).

Sustainable, commercial black walnut nut production in orchards will be impossible without substantial yearly inputs of nitrogen (N) and perhaps other nutrients. Although specific recommendations are still in the developmental stage, all nut tree literature supports the need for N for producing trees. In general, to satisfy N needs for nut production, a split application of 90 to 100 lbs of actual N per acre should be applied with about two-thirds applied in March to early April and the remainder in early August. Phosphorus and potassium (K) should be applied based on soil and analyses. Both P and K, when needed, do not exceed a rate of 60 to 100 pounds of actual ingredient and should be applied in the spring. In cases of severe deficiency larger quantities can be applied. To conserve moisture and improve nutrient uptake when both nutrients and moisture are adequate, mulching trees may be applicable.

Most producers plant more than one variety, primarily for adequate pollination, because varieties behave differently to natural environmental occurrences and to cultural treatments. Aside from nut maturity (early, mid season, and late), planting several varieties will likely minimize risks of weather insects, and disease; and for growers with limited labor and equipment, spread out the harvest workload. Spreading out the commercial harvest would allow more nuts to be harvested before juices produced by decaying husk darken nutmeats and degrades nut quality.

With all this information for the grower, "Quality" for black walnuts is ultimately defined by the consumer (and therefore the industry). It is a nutmeat that is light brown to tan in color, is full-meated, with a rich, naturally pungent flavor. It must also be firm, but not too crunchy in texture, and relatively large in size, over 0.25 inches (~6.3 mm). To provide these nutmeats, the industry needs in-shell nuts that produce a high percentage of high quality kernels. And the growers will need a higher price.

PRICING MODEL

If growers can produce and deliver nuts with higher nutmeat yields that meet the desired characteristics of quality and flavor, Hammons Products Company, currently the only commercial processor of eastern black walnuts, can pay producers a much higher price based upon a hand-tested sample of each delivery. For example, a load of nuts of a single variety, hulled and in-shell, and dry, delivered to the shelling plant, with a hand test yield of 28%, could be worth at least $0.42 per pound. In some years, such nuts with particularly good flavor and color could be worth between $0.50 and $0.60. Nuts with 30% nutmeats could bring $0.45, or perhaps over $0.60 in some years. The seller gets the best price when varieties and orchard locations are kept separate because poor quality nuts will affect the overall price of the load. Also, if varieties are commingled, larger testing samples may be needed to accurately measure average yield, and the price may be less. Other key variables affecting growers' profit will be moisture, harvesting, hulling, drying, and freight costs.

Guidelines developed by Hammons Products Company provide a mechanism for industry and growers to use in planning and trading eastern black walnuts from improved varieties (Table 2). These guidelines show that the price for nuts

increases as nutmeat yield increases. This will result in more dollars to the grower for better quality nuts. The price quoted per percent yield may vary upward in some years, as noted above.

It is important to note that in order to sell improved varieties of nuts using these guidelines the amount of hulled nut delivered should weigh at least 1,000 pounds and be clean and dry (Table 2). (Smaller deliveries have been handled in order to test the concept, but ideally in the future purchases would be in full truckload lots of 35,000 – 40,000 pounds.) An adjustment in nut weight is necessary to compensate for the moisture that must be removed before processing (Table 3). In this example, the in-shell delivered weight was reduced by 72 pounds (8.0% moisture – 4.5% moisture = 3.5% moisture x 1.25% of weight for each 1% above 4.5 = 4.375% x 1635 pounds = 71.53 or 72 lbs). In order to hull and clean the nuts, the buyer may provide that service and charge separately, or the buyer may lease the hulling machine to the seller. The buyer, a third party, or a grower cooperative may also provide drying service. If the buyer provides hulling or drying, a fee for that could be stated separately and deducted.

Price per pound of delivered nuts is based upon nutmeat grade and yield. The price per percent yield is based on a buyer's assessment of crop availability, market conditions, and nutmeat desirability. For example, in Table 3, the quoted price of $0.018 per 1% yield of fancy kernel, with $0.0075% yield of standard kernel is not static. Thus, if a delivery tested 30% average hand-test yield, all fancy grade, and if all nuts were cleaned with moisture less than 4.5%, the grower could be paid $0.45 per pound. If the nut quality is particularly desirable, especially in flavor, aroma, and color, the quoted price could be higher, perhaps $0.02 or more per 1% yield resulting in $0.60 per pound or more. Compared to $509.54 that was paid to the seller in the example in Table 3 for nuts from trees of an improved variety, the seller would have been paid only $164.00 at $0.10 per pound for the same amount (1,635 lbs) of nuts from wild trees.

Equipment modifications for processing nuts from trees of improved varieties are made necessary because of shell thickness. Generally, nuts from trees of improved varieties crack more easily. Also, processing time could be reduced because nuts of improved varieties tend to have fewer small kernel parts.

The vision for the future of the black walnut nut industry includes new ways of buying nuts and paying much higher prices for improved varieties harvested from managed orchards. It is reasonable to anticipate that harvesting, hulling and drying nuts will be done differently as more managed plantations come into production. Most importantly for the grower is, how much will nuts be worth and how can the price be higher? Our long-term goal is to assure that both industry and consumers have a growing supply of black walnuts at a reasonable cost. Increasing the purchase price of improved varieties of orchard grown black walnuts will help the species to become a more popular and viable agricultural crop.

Table 2.—Purchase guidelines for improved varieties of eastern black walnuts.

Delivery—Minimum delivery quantity of 1,000 pounds from one orchard or contiguous orchards planted predominately in one variety. All nuts are delivered clean and dry.

Sampling—Approximately one pound (25-30 nuts) per 1,000 pounds will be drawn from different points within the load (in bags or bulk, maximum of ten samples). After mixing all samples together, two one-pound samples will be tested.

Testing—Each sample will be hand-cracked using an appropriate cracker before removing and separating all nutmeats into 3 grades.

1. Fancy - light brown to tan in color, full-meated;
2. Standard – dark brown to nearly black, but full-meated;
3. Reject – dark, shriveled, light weight material that will not produce salable nutmeats.

All nutmeats from the sample will then be tested for moisture with the results reported on the sample evaluation.

Moisture—Kernel moisture must be no greater than 4.5% based on oven or validated meter test. For nuts delivered with greater moisture, an adjustment of 1.25% of the delivery weight will deducted for each 1% moisture over 4.5% in calculating delivery weight for payment.

Payment—The sample evaluation will report the percentage of total in-shell weight for each grade and yield, which will be the basis for payment. Moisture is considered in adjusting the purchase weight and not the price.

Table 3.—An example of Hammons Products Company black walnut test report.

NAME OF GROWER/PRODUCER _____

DATE OF DELIVERY 12/14/02 **DATE OF TEST** 1/03/03

NUT VARIETY Emma K

POUNDS IN-SHELL DELIVERED 1635

MOISTURE ADJUSTMENT (less 1.25% of wt. for each 1% above 4.5 - 72 lbs

POUNDS IN-SHELL DELIVERED, net of adjustment 1563

SAMPLE ANALYSIS, from 2 samples of about 1 pound each

	In-shell weight	Fancy kernel		Choice kernel	
	g	Weight (g)	Percent	Weight (g)	Percent
Sample #1	388.0	80.9	20.9	1.9	0.49
Sample #2	481.4	70.1	14.6	12.5	2.60
TOTAL	869.4	151.0	17.4	14.4	1.66
Moisture test (%)	8.0				

PRICE CALCULATION:

1. Price quoted for Fancy Kernel $0.018 X Percent Fancy 17.4 = 0.313
2. Price quoted for Choice Kernel $0.0075 X Percent Choice 1.66 = 0.013
3. Total price per pound $0.326
4. Total Pounds Delivered, net of moisture adjustment 1563
5. TOTAL PURCHASE PRICE TO BE PAID $ 509.54

Tester _____ **Accepted by** _____

LITERATURE CITED

Bey, C.F. 1973. Growth of black walnut trees in eight midwestern states—a provenance test. Res. Pap. NC-91. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 12 p.

Bish, C. 1999. Twenty years of nut evaluation. Annual Report Northern Nut Growers Association. 90: 67-83.

Hanson, B.L. 1999. Commercial black walnut orchard in Iowa (Ben's black walnuts). Annual Report Northern Nut Growers Association. 90: 119-126.

Hammons, B. 2001. A vision for the black walnut industry: more $$$$ with better nuts. Annual Report Northern Nut Growers Association. 92: 57-59.

Rink, G.; Kung, F.H.; Cutter, B.E. 1994. Selection effectiveness for black walnut nuts and timber. Annual Report Northern Nut Growers Association. 85: 44-52.