

DOLLARS AND SENSE OF ALFALFA

Marketing Your High Yield, High Quality Alfalfa at High Prices

David C. Petritz

Professor of Agricultural Economics
and Assistant Director of Agriculture and Natural Resources
Purdue University, West Lafayette, IN 47907-1140

It seems every farmer wants to be in the commercial hay business--growing hay for the cash market. Have you ever stopped to think about the amount of hay that would be produced if everyone who talked about producing hay actually produced hay?

Why does everyone want to produce hay for the cash market? They have likely heard about the \$100 or \$140 per ton alfalfa prices and believe they can be part of that action. They believe it is easy to grow and market hay. Just plant it, harvest it when convenient, put a hand-made sign up along the road and wait for the customers to roll in!

You know that producing, feeding and marketing high quality alfalfa hay can be a means to increasing profits on your farm. But you appreciate the top management which is required to produce 6 or 8 tons or more of alfalfa year after year. You understand that a producer must plant high quality seed of disease and insect resistant varieties, use recommended fertilizer and pest management programs, harvest at the peak of quality, minimize field and storage losses, and move the hay to storage as quickly as possible to minimize loss of quality and quantity.

As an individual producer in the business of producing hay for the cash market, one must "know the territory". This includes the supply of and demand for forages and competing feedstuffs in the locale in which the hay will be marketed. Once the territory is known, one can identify the target market in terms of who, where, what, how much and when.

What would you tell your neighbors who asked about the economics of producing and marketing hay? Based on your knowledge and experiences in the hay business, you will likely tell them to study four aspects of the hay business:

1. current market situation for hay
2. how hay should fit into the farm business,
3. potential returns and costs, and
4. the importance of hay quality.

Producers are most interested in the market factors which directly affect them. These include supply and demand and those factors which increase price as well as the difficulty and the expense associated with hay marketing.

Current Market Situation for Hay

Depending on their location within the Nation, forage and livestock producers are facing a spectrum of hay supplies - from burdensome supplies to severe shortfalls. Inter-state shipment of hay is expected to be significant in the coming months, especially with the ASCS Feed Assistance Programs being available to subsidize purchase and delivery in drought-stricken areas.

All Hay

Production of all hay, including alfalfa, alfalfa mixtures and all other hay, is forecast to be 158.4 million tons, an increase of 8 percent from 1990. If achieved, this will be the largest hay harvest in over a decade. The larger production is the result of both higher yields and increased acreage. Area for harvest, totaling 63.1 million acres, is up 3 percent from last year. The forecast average yield of 2.51 tons per acre will be the largest yield since 1986 and is a new record exceeding the previous record of 2.5 tons that was harvested in 1982. Increases in hay production were forecast in 26 states.

Alfalfa

Production of alfalfa is forecast to be 87.3 million tons, 4 percent more than last year and if harvested, will be the largest alfalfa production level since 1986. The total acreage to be harvested at 25.8 million tons exceeds the 1990 acreage by 2 percent. Yield is forecast to average 3.38 tons per acre, up slightly from 1990. Increased production was forecast in 19 states; reductions were expected in 16 states. (Alfalfa production is estimated in only 42 states.)

Other Hay

Production of all other species and mixtures of hay is expected to total 71.1 million tons. This level is 12 percent more than a year ago. Area harvested is expected to total 37.3 million acres, 3 percent above 1990. Yield per acre is expected to average 1.91 tons, compared with 1.75 tons per acre in 1990.

Available Hay Supplies

Total hay supplies available for feeding during the forthcoming winter months include the 1991 production and May 1 Hay Stocks which represent the carryover from previous hay harvests. May 1 hay stocks were estimated to be 27 million tons, about the same as a year earlier. Combining this number with the expected 1991 production, hay supplies are estimated to be 185 million tons, nearly 6 percent more than a year ago and the largest in more than a decade, exceeding the supplies of 1986. Hay supplies are estimated to be smaller than a year ago in 23 States - mainly those located in the Eastern Corn Belt and Northeastern Regions.

Geographical Examination

Year-to-year changes in alfalfa hay production ranged from increases of 75 and 43 percent in North and South Dakota, respectively, to reductions of 24 percent in Illinois, 28 percent in Indiana, and 36 percent in Ohio. Year-to-year changes in expected hay supplies ranged from increases of 42 percent, 30 percent and 33 percent in North Dakota, Wisconsin and South Dakota, respectively, to declines of 18 percent, 20 percent and 23 percent in Illinois, Indiana, and Ohio.

Table 1. Estimated Hay Production and Supplies, By State, 1990-91, USDA October Crop Report

	<u>Percent Change 1990 vs. 1991</u>		
	<u>Production</u>		<u>Hay</u>
	<u>Alfalfa</u>	<u>All Hay</u>	<u>Supplies</u>
Kentucky	+12.6	+ 5.7	- 3.6
Indiana	- 28.2	- 23.9	- 19.7
Illinois	- 24.0	- 17.3	- 17.9
Wisconsin	+27.1	+27.8	+32.6
Michigan	- 8.9	- 6.0	- 4.6
Ohio	- 35.7	- 26.9	- 22.6
Pennsylvania	- 16.5	- 17.0	- 14.4
New York	- 13.4	- 2.2	- 1.6
Florida	--	+25.0	+ 9.9
Maryland	- 24.4	- 24.3	- 18.7
Virginia	- 9.5	- 0.5	+ 2.2
Tennessee	+14.3	+20.5	+11.7
North Carolina	+37.9	+16.3	+ 8.3

Kansas and Iowa are not to be overlooked as weather conditions have sharply reduced their hay production and supplies.

Kentucky hay production was forecast to increase nearly 6 percent from 1990, due mainly to an increase in acreage. Alfalfa production was forecast to increase by over 12 percent, due in a large part to continued expansion in acreage.

Hay Prices

Data available through mid-November for the Nation and individual States reflect the regional impact of the drought. Nationally, prices averaged \$73 per ton in mid-November after peaking at \$93 in April. Alfalfa hay prices across the Nation have declined almost continuously since May 1990 when prices peaked at \$108 per ton.

Alfalfa prices in Indiana averaged \$95 per ton in mid-November after an average of \$82 in September. This is the highest alfalfa price since January 1990 and October 1989. The lowest monthly prices of 1991 occurred in June when the average was \$69 per ton.

Sales of hay reported at hay auctions in Northern Indiana began to reflect the impact of the drought by late July. During early November prices for top selling hay reached peak levels achieved last winter. Further price increases are expected as the limited supplies of high quality alfalfa become more obvious.

Implications and Strategies

From this information, owners of forage-consuming livestock in the Northeastern quadrant of the Nation face difficult decisions regarding forage supplies and needs. They will have to consider:

- a) decreasing their use of hay by reducing livestock herds,
- b) importing hay from the Lake States and northern Great Plains, and/or
- c) substituting feed grains and protein meal for forages in rations.

Supplies of hay, especially higher quality alfalfa, will be very limited in the Eastern Corn Belt and Northeast Regions where generally smaller livestock producers typically depend on home-grown forage supplies. For the second time since 1988 many of these producers will become participants in the hay market and seek purchased supplies of hay and forages.

Because of sharp reductions in milk prices, dairy herd reductions and liquidations have been occurring since late 1990. If hay prices increase sharply by winter, herd liquidations will advance further which will reduce the long-term demand for alfalfa hay.

Several factors need to be revisited:

- 1) The Crop Report only indicates the quantity of hay produced. The data do not reflect quality. It is presumed that the quality of the first cutting of hay was abnormally reduced by the excessive rains that occurred during May.
- 2) The deficit of hay is largely alfalfa. The carry-over of hay from previous crops is most likely lower quality legume mixtures and grasses. The hay harvested from set-aside acres will likely be grass and weed mixtures.
- 3) Quality testing of forages will be prudent. Producers should balance rations based on a range of available ingredients including substituting lower quality forages plus grains and protein meal for higher quality forages. This will be especially true if grain prices do not increase relative to forage prices.

- 4) Producers who think they will need to purchase higher quality hay in the months ahead should be developing purchase strategies. How much hay will be needed and when? Making contact with potential suppliers yet during the harvest season appears to be a prudent management strategy.

The hay market is an imperfect marketplace. Hay is a bulky product and is not readily transported. Communication linkages, movement patterns and price registry points are not well established. The hay market in the Eastern Corn Belt and Northeast will be a seller's market.

Prudent forage producers should not rest on their supplies and wait for the buyers to come to their barn door. Sellers should be contacting long-time buyers, informing them of the supply situation, reassuring them that hay will be for sale even if the source is another producer.

For buyers who face a long winter of limited supplies and high prices, the first step is to determine what needs to be purchased and when and how much financial assistance will be needed in purchasing extra feed. The next step is to contact their lender, explain the situation and determine the level of financial assistance available. Then, locate hay supplies and assess these supplies relative to prices and trucking charges in light of their location.

How Hay Should Fit into the Farm Business

To be successful, a producer needs an effective marketing program and/or an efficient livestock enterprise to combine with a strong forage production system if the full potential of the forage enterprise is to be realized. Forages must be an integral part of the total farm business if it is to contribute to the net farm income.

Your neighbor will have to look in the mirror and ask tough questions just as you did when you decided to produce hay for the cash market.

1. Do I possess the management skills needed to consistently produce and market high quality hay?
2. Am I willing to develop a marketing plan and stick to it?
3. Am I willing to seek out hay buyers and then develop a long-term business relationship with them?
4. Will the labor be available at the times needed to harvest hay at the right stage of growth?
5. How much additional investment must be made in equipment and storage facilities?

6. Am I willing to represent my hay honestly?
7. Is hay the most profitable alternative crop for my farm?
8. Is hay production and marketing consistent with the long-run goals developed by my family?
9. Will my lender stay the course in the hay enterprise?
10. Am I willing to support the Forage Council as it works to identify new markets for hay and forages?

Being successful in the hay business requires hard work and hard thinking. The competition is improving in the hay market and there is only one way to meet and beat your competition -- "out produce them, out sell them, and out smart them."

Potential Returns and Costs

Hay is not a low cost production enterprise. Total costs can be \$400 or more per acre depending on the yield goal. Production costs per acre increase as yield increases. Costs per ton decline because of the fixed nature of the costs associated with seeding and land preparation and ownership or rental of machinery and land.

Net returns per acre increase with higher yields and selling prices. But a price of over \$60 per ton and a yield of over 6 tons per acre is needed to generate a positive return to land. As prices increase, the break-even yield declines. Whatever the combination, budgets indicate that large yields of high quality hay are needed in order for alfalfa to be an alternative cash crop that will contribute to farm income. A tough question faced by many producers is what to do about hay storage facilities. Are they necessary? The answer depends in part on the species, quality and therefore value of the hay to be stored. If it is high quality alfalfa hay, storage is a must. If it is average quality, beef cow hay, a well prepared outside site is adequate for large round bales.

Hay storage facilities are a large capital investment. A clear-span building may cost several dollars per square foot. About 14 square feet are needed to store a ton of hay. Assuming annual ownership costs of 14 percent of the initial investment, the annual storage costs for a hay storage barn would be \$7.50 per ton if the initial investment in the barn were \$3.50 per square foot. The costs of the labor needed to get the hay into the barn may add another \$10 - \$15 per ton. The question is whether the price will rise enough to offset the increase in costs.

The Importance of Forage Quality: Alfalfa Quality is Job #1

The title implies that forage quality is a definable term that can be measured, has economic value and that a person desires to improve the quality of hay produced. Most participants in the livestock-forage business will agree that forage quality is measurable, has economic value and that higher quality forage generally has a higher value than lower quality forage.

But defining quality in forages is a complex chore. The first reason is that quality is a relative measure. Persons evaluating quality may give different extents of emphasis on content of protein, fiber, minerals, foreign material, leaves, or its appearance or palatability, or other factors. Many obvious as well as subtle factors interact to determine the final quality of a forage.

The second reason for the difficulty in determining forage quality is that forages are not important in and of themselves because forages are only a means to an end. Since forages are feedstuffs and are converted to meat, milk and fiber by animals, the quality of a forage is related to the conversion of its nutrients to a marketable animal product. Thus forage quality is an expression of the characteristics that affect intake, nutritive value and resulting animal performance.

The term quality, as applied to forages, generally means the same as feeding value and may be defined as the ability of a forage to supply animal nutrient requirements for a specific production function - meat, milk, or fiber.

An equation for quality could be written:

$$\text{Quality} = \frac{\text{Available nutrients}}{\text{per unit of forage}} \times \text{Rate of intake}$$

The value of forage therefore depends on the availability of the nutrients contained within the forages and the quantity of forages voluntarily consumed.

Quality in a forage represents its productive worth and its nutritive value as a feedstuff.

Forage quality measurements must reflect the characteristics that affect animal performance. To have high quality, a forage must have high nutritive concentration, digestibility, intake and efficiency of utilization.

Factors affecting quality of alfalfa include leafiness, maturity, and harvest and storage conditions. Leaves contain more protein, sugars and starches than stems and are highly digestible. As forage plants mature, the ratio of leaf to stem decreases and concentration of fiber in the plant increases.

Visual appraisal is the oldest and most widely accepted method used for forage evaluation. But it is subjective based on leafiness, color, odor, and texture. Two people will most likely not evaluate a forage in the same way.

Quickly knowing the chemical composition of a forage enables the livestock producer to feeding strategies. Proper ration balancing based on forage test results will result in more efficient use of available feed supplies.

The chemical composition of a feed is important but so is visual appraisal. Color, texture, presence of weeds and molds are factors which can be determined through sight and smell. Better for the livestock producer to determine these prior to purchase of the forage than for the livestock to determine the acceptance (or lack of it) of the forage after purchase.

"Pretty is as pretty does." Forages may have an excellent composition but the value of a forage is determined by what animals can do in terms of performance.

Is forage quality important to animal performance? Stage of maturity has one of the biggest effects on the quality of alfalfa as a feed for dairy cows. From Wisconsin studies, it was observed that "in general, milk production declined 1 pound per cow per day for each day advance in maturity beyond pre-bloom" (1). Part of the reason is because the digestible part of the forage consumed by the cows declines as maturity increases. Simply put, the cow can not consume and digest enough of the more mature hay to produce at maximum milk capability.

Forage quality must be high if dairy cows are to achieve their maximum production. Wisconsin studies indicated that production of 4% fat corrected milk was the highest for pre-bloom alfalfa at all levels of alfalfa feeding. More milk was obtained by feeding only 20% grain plus high quality hay than when feeding 54 or 71% grain and lower quality hay. High quality hay is essential to achieving high milk production.

While the quality of hay does affect the performance of dairy cows, the economic value or worth of the hay must still to be determined. Establishing the value of a forage is a complex task. Just knowing the composition of a forage does not provide the key to determining economic value because of two factors.

Table 2. Relative Economic Values for Alfalfa Harvested at Four Stages of Maturities, For Two Forage:Concentrate Mixtures, For Alternative Concentrate Price Levels.

Variation in Concentrates	Alfalfa Maturity (Bloom)			
	Pre	Early	Mid	Full
46:54 Forage/Conc. Ration				
- 20%	120	114	107	100
- 10%	122	115	107	100
Base *	124	117	108	100
+10%	126	118	108	100
+20%	128	120	109	100
63:37 Forage/Conc. Ration				
- 20%	123	119	109	100
- 10%	125	121	109	100
Base *	127	122	110	100
+10%	130	124	111	100
+20%	132	126	111	100

* Assigned costs used for the base ration were \$1.60 a bushel for corn and \$215 a ton for 49% SBM. Costs were then varied by 10 and 20 percent with the change in costs of corn and SBM being made concurrently.

The first is that forages are feedstuffs and their economic worth is tied to the performance of the consuming animal. The second reason is that the value of the forages will vary by the activity of the animal to which it is fed.

The relative economic values of the higher qualities (more immature) of alfalfa were calculated by attributing the reduced costs of the concentrates to the increase in the quality of the hay. These relative economic values can be expressed as a percentage value with fully mature alfalfa having a base value of 100. These data are shown in Table 2. For instance, the pre-bloom alfalfa is worth 24 percent more than full bloom alfalfa in the 46:54 forage:concentrate ration--given the assumptions used in this least-cost analysis.

To broaden the scope of the analysis, the relative economic values of the four maturities of alfalfa were determined for four variations in the cost of the corn and soybean meal. The conclusions of this least cost ration analysis were:

- Pre-bloom alfalfa was found to have a value some 20 to 30 percent higher than alfalfa harvested at full bloom.

- The relative economic value of the higher quality alfalfa increased (decreased) as the cost of the concentrates increased (decreased) from the base values.
- As the proportion of alfalfa increased in the ration, the relative economic value of the pre-bloom alfalfa increased (decreased) more sharply as concentrate costs increased (decreased).

There is no easy and simple way to determine the value of alfalfa. A computerized least-cost ration model will provide the most accurate estimate based on the type of livestock being fed and the cost of alternative feeds.

The unwillingness to use existing quality descriptions is of concern. The NIR system is being more widely accepted and used in the Midwest. Yet many producers, particularly sellers, are unwilling to avail themselves of its potential benefit--knowing exactly what is the value of the forages are which they are offering for sale.

An article in the Drovers Journal highlights the problem. "Trading hay by analysis still lags 'sell by smell' system... The big resistance is from the sellers. The seller is the one who has to pay for the test. Even if it only costs them \$12.00 per 1,000 bales, they won't do it... So the great hay debate continues, but nutrient pricing remains only an interesting concept." (2)

What does all of this mean for the alfalfa producer and/or user? It means that forage quality is tied to economic value. But this task requires that producers consider the activity and performance of the animal to which the hay will be fed and the costs of alternative sources of feed nutrients. It also requires that producers have accurate forage tests completed. Finally, it requires the producer to work with a feed company representative, consulting nutritionist or Extension staff person to develop a series of least cost rations.

Is the effort worth the trouble? You will have to determine whether the benefits outweigh the costs involved. However, in a free market, having more information is always superior to having less. Knowing the economic value of various qualities of alfalfa when you buy or knowing what various qualities are worth when you sell will enhance your bargaining position.

Relative feed value is a means of assigning a single numeric value to a forage which reflects the sum total of the quality factors, mainly digestibility and intake. This single value is useful in comparing various samples of hay. A relative feed value of 100 refers to a full-bloom legume with 40 percent grass. A relative feed value of greater than 140 refers to a high quality legume in a prebloom stage (Table 3).

In 1985, The Minnesota Forage and Grassland Council accepted the use of quality standards to market hay recommended by the National Alfalfa Hay Quality Committee. In addition to using crude protein (CP), acid detergent fiber (ADF) and digestible dry matter (DDM), Minnesota and Wisconsin established relative feed value

index (RFV) as a quality test standard to voluntarily market hay. Relative feed value is an index which ranks cool-season legume and grass forages by digestible dry matter intake potential. Neutral detergent fiber (NDF) is used to predict dry matter intake. Several states use these tests to evaluate alfalfa hay.

Table 3. Chemical Composition and Relative Feed Value for Hay and Grasses Harvested at Various Stages of Maturities.

Brief Description	Chemical Composition			Relative Feed Value
	% (DM basis)			
	CP	ADF	NDF	
Pre-bloom	> 19	< 30	< 39	> 143
Legume, early bloom, 20% grass	17-19	31-35	40-46	127-142
Legume, mid-bloom, 30% grass	14-16	36-40	47-53	109-126
Legume, full bloom, 40% grass	11-13	40-42	53-60	95-108
Legume, full bloom, 50% grass	8-10	43-45	61-65	81-94

Adapted: Rohweder, Barnes and Jorgensen, *J. Animal Science*, 47:No. 3, 747-759, 1978

Table 4. Average Crude Protein, Relative Feed Value, and Price of Load-lots by Quality Standard Sold at Quality Tested Hay Auctions in Minnesota¹ and Wisconsin².

Quality Standard	No. of lots	Minnesota			Wisconsin	
		CP %	RFV index	Price \$/T	No. of lots	Price \$/T
Prime	209	21.6	166	124	412	135
1	579	19.7	137	105	2408	106
2	600	17.3	114	74	5965	98
3	325	14.9	96	52	1855	70
4	114	13.1	82	43	469	61
5	30	11.8	72	39	167	60
Total/avg ³	1857	17.8	121	83	8853	120

¹Averaged over six (6) seasons. 1985-91.

²Averaged over 500 auctions and seven (7) seasons 1983-91. Personal communication with Dan Undersander, University of Wisconsin.

³Average price is weighted for number of lots by standard.

Source: Martin, Neal

Quality-tested hay auctions (hay is tested and test results are posted on load-lots before bids are taken) have been operated in Wisconsin since 1983 and Minnesota since 1985. RFV index is highly correlated with price. The data in Table 4 shows the average price by quality standard in Minnesota and Wisconsin quality-test auctions. Average prices range from 124 to 39 dollars per ton for Prime through standard 5 in Minnesota, and 135 to 60 in Wisconsin. Farmers continue to request RFV because it is the best quality indicator for animal performance levels. Hence, the spread in hay price was 75 and 85 dollars per ton for hay sold in Minnesota and Wisconsin, respectively. In Minnesota, average price was highest for legume hays (1200 legume loads averaged \$95; 573 legume-grass loads averaged \$71; 58 grass-legume loads averaged \$61; and 58 grass loads averaged \$56/ton, respectively). Price of hay of quality tested hay auctions was also influenced by auction location and bale type. (3)

Alfalfa is superior in quality to other legumes and grasses because its rate of digestion is more rapid. Because RFV index includes an estimate of intake potential, high quality and immature alfalfa will grade higher than immature grasses. The highest efficiency of nutrient use from forages from high producing dairy cows in their first trimester of milk production need hay testing at 141 or higher and later lactations or middle production levels will

tolerate RFV index's for 124 or greater. There is less added value of producing RFV index above 175 than increasing from 124 to 151.

Summary

The forage industry and the individuals who compose the industry will face many of the challenges during the coming years that their grain production colleagues are now facing, particularly the imbalance of supply and demand. Yet, there are many opportunities in the forage industry. But the foresight and enthusiasm of those in the industry will be critical to the building of a foundation for the future.

With determination and much patience, there are a lot of opportunities now and more in the future in the hay business. However, individuals must work at solving not only the challenges they face but also those which will continue to grip the industry.

References

1. Rohweder, et. al., Alfalfa for Dairy Animals, Certified Alfalfa Seed Council, Inc., P.O. Box 1017, Davis, California, 95617.
2. Walker, Warren, "Trading Hay By Analysis Still Lags 'Sell By Smell' System", Drovers Journal, August 27, 1987 issue, page 15.
3. Martin, Neal P., "Marketing Alfalfa Hay by Quality Standards," Alfalfa Talk, Certified Alfalfa Seed Council, Inc., P.O. Box 1017, Davis, California, 95617.