



COMMUNITY

4-H & YOUTH

ENVIRONMENT

AGRICULTURE

FOOD

UNIVERSITY OF
VERMONT

EXTENSION

CULTIVATING HEALTHY COMMUNITIES

What's the Value of High Quality Forage?

Heather Darby, Agronomist & Dennis Kauppila, Farm Business Management Specialist

On our travels around farms, we've noticed wide variations in what farmers are feeding for grain. The quality and price have ranged anywhere from a 12% protein mix costing \$535/ton, to high-protein mixes costing over \$608/ton. These choices really affect the farm's yearly income. For example, 50 milking cows eating 15 lbs grain per day, paying \$100 per ton more for grain will cost an additional \$8,000 over a typical winter. That's not pocket change!

So what was the major difference between these farms? The farms feeding cheaper grain had put up higher-quality forage, even in a tough cropping summer. Their feed tested over 16% crude protein, with good energy and digestibility (45-50% NDF on the forage test). The cows made milk on good home-grown forage, instead of relying on pricy organic grain. What does it take to make good quality forage, year after year? The basics to producing high quality feed include a combination of good management practices and, of course, good fortune. We all remember how difficult it was to make high quality forage last year! Forage can lose 10 to 20 % of its CP and digestibility if it is damaged by rain. However, since we cannot control the weather, we should focus on the things we do have control over. Listed below are some of the key management factors influencing forage yield and quality.

- 1) **Harvesting forage on time is the first principle in producing good-quality forage.** As plants mature, go to head, and then flower, the forage increases in fiber, reducing the CP and digestible dry matter content of the resulting hay. Hay digestibility decreases between 0.33 and 0.50 percentage points per day. Optimum harvest dates will vary across the state so watch the growth stage of the grasses to determine when to start making first cut hay. Hay should be cut when grass is in the late-boot to early-head emergence stage. This stage provides the best compromise between yield and quality, and usually means late May here in Vermont for first cut. Later harvests should be made based on the growth stage of the legume. For highest quality, harvest when the legume is in the late-bud growth stage.
- 2) **Providing plants with the proper nutrition is critical to high yield and quality.** Maintaining adequate soil fertility will start with soil testing. If some fields have high fertility and some are low, focus on the low ones first. Soil pH must be corrected to at least 6.5 for alfalfa, 6.2 for red clover. Potassium is the most important nutrient for stand maintenance and yield retention. Phosphorus is very important in stand establishment. Don't forget to pay attention to neglected nutrients like calcium, sulfur and boron. Manure, compost and mineral applications can address immediate nutrient needs and build organic matter for longer term nutrient supply.
- 3) **Include legumes such as clover, alfalfa, or birdsfoot trefoil in your forage stands.** Old grass hayfields, even with manure applied, can lose yield and quality as less favorable forage species take over. You know those fields – where you have to rake together several windrows to get enough for the baler, and the hay only tests 12% protein. Seeding legumes into these fields can improve yield and

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. University of Vermont Extension, and U.S. Department of Agriculture, cooperating, offers education and employment to everyone without regard to race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or familial status. If you require special accommodations or financial assistance to participate in this program, please contact Sid Bosworth at (802) 656-0478 by March 3, 2009 so we may assist you.

quality of your forages. In general, a legume/grass stand having 25 – 50 % legume will provide grass with up to 150 lb/acre of actual N. First, legumes “fix” nitrogen from the air and make it available to the grasses, often increasing grass yields. Legumes can also increase the feed value by improving protein, energy, and digestibility. Finally, a legume-grass mix lengthens the harvest window for hay, since legumes generally mature later than grasses.

So, what are the costs and benefits you might expect from improving hay fields? We looked at the financials for three different options of managing crop fields (*see Table 1 on next page*): 1) low-input, 2) frost seeding¹, and 3) crop rotation. The values to produce the figures were adapted from published Northeast custom-hire rates, local seed and fertilizer costs, and our own best estimates. We only considered direct costs, and did not include fixed costs like land ownership or rent. We hope this is ‘food for thought’ as you think about the upcoming cropping season.

Interestingly, if organic protein costs \$0.46/lb (\$920 per ton for 46% soybean meal) then every 1% increase in forage protein content will be worth \$20/T (2000 lbs x 1% x 1.0). Therefore in option #2, increasing the hay protein by over 1% per ton, even without any yield increase, is profitable. An increase of 1% protein could easily be attended by increasing the legume content of the field to 30%. Also, the net increase with just a new hay seeding in option #3 (no corn silage) would be 42%.

Growing corn silage may be an option for farms interested in reducing the amount of energy supplements, such as corn meal, that they purchase from off-farm sources. According to our model it costs about \$35/T to produce organic corn silage. On a dry matter basis this estimated cost is about \$100/T DM. Current prices for organic corn meal are approximately \$500/T DM. Growing corn silage as an energy-rich feed may be a profitable option for some farms. It cannot replace corn meal pound for pound as it has somewhat lower energy content (0.93 Mcals/lb NEI for corn meal, 0.75 Mcal/lb NEI for well-eared corn silage). Corn silage consists of stalks, leaves, and ears and therefore is both “forage” and a “grain”.

When corn silage is included in a diet it may also reduce the overall forage protein levels in the diet. This may be an important consideration for farms having a hard time putting up consistently high quality hay crops. It is generally more expensive to supplement protein than energy. For some situations, however, the lower protein levels in corn silage may be helpful. Rotationally grazed herds sometimes can benefit from feeding some corn silage as it dilutes the excess protein levels in lush grazing situations.

While there are some benefits to growing corn silage it will not fit into every farm’s cropping system or land resources. Growing corn adds complexity to the cropping system. There are additional equipment, storage, and time considerations that come with growing corn. In addition, for those that have not grown corn organically, there is a learning curve to managing weeds and fertility. If you are interested in adding annual crops to the rotation try small acreages initially.

There are other ways to increase the energy value of perennial forages, including proper harvest time. Late harvested forage can result in energy value of 0.39 Mcal per lb feed. If this same forage was harvested prior to “heading,” the energy value could be increased 0.51 Mcal per lb of feed. Interestingly, it costs \$84 per ton to produce the forage regardless of the amount of Mcal you harvest per acre. As the energy content of the forage declines, the cost of producing these energy Mcals increases. Other practices such as wide-swath haylage practices can increase for energy by 6%.

¹ February 2005 NODPA News, page 18, at <http://www.nodpa.com/newsletters/feb-05.pdf>

Table 1. Financials for three different options of managing crop fields

Option #1: Permanent Grass Hay – the ‘basic’ option: 2 cuts per year, 1 cut wrapped silage, 1 cut dry hay. Yield is 2.5 tons/acre. No new seed, manure as fertilizer.

Option #2: Frost-seeding - the “low-input” option: clover frost-seeded every other year. Yield is 3 tons/acre. Manure and lime as soil amendments.

Option #3: 6-year crop rotation: 2 years corn silage, 4 years hay with a field peas and oats nurse crop in the seeding year.

	Option 1	Option 2	Option 3	
Income:	2.5 ton/a hay	3 ton/a hay	3 ton/a hay	Notes
Hay	\$400	\$480	\$480	Hay @\$160/T
Peas/oats silage			\$210	1.5 T/A @\$140/T, in seeding year
Total income	\$400	\$480	\$690	
Direct expenses:				
Clover frost seed		\$14		5 lbs clover, 2.88/lb, seeded every other year
Forage seed			\$8.50	20-lb seeding, \$1.70/lb, over 4 years
Nurse crop seed			\$11	60 lbs/A peas/oats @ 42 \$/bag
Lime		\$27	\$27	2 T/A, spread every 3rd year
Manure spreading	\$50	\$50	\$50	estimate from custom rates
Plow rye			\$4.50	18 \$/A, amortized over 4 years
Harrow			\$11	3X @ \$14/pass, over 4 years
Seeding			\$4.30	17 \$/A, amortized over 4 years
Mowing	\$30	\$30	\$30	2X at 15 \$/A
Raking & tedding	\$36	\$36	\$36	4X at 9 \$/A
Baling	\$39	\$47	\$47	\$5.50 /bale
Bale wrapping	\$39	\$47	\$47	\$5.50/bale
Total expenses:	\$194	\$251	\$276	
Income - expenses (net/acre)	\$206	\$229	\$414	
Income:				
Corn silage			\$600	12 T/A @\$50/T
Direct expenses				
Corn seed			\$52	\$130/bag, 2.5 A/bag
Winter rye/vetch seed			\$40	100 lbs rye year 1, 100 lbs rye year 2
Lime			\$27	2 T/A, spread every 3rd year @ 40 \$/T
Manure spreading			\$50	estimate from custom rates
Plow rye			\$18	18 \$/A
Harrow			\$45	3X @ \$15/pass
Plant corn			\$18	
Cultivate			\$45	3X @ \$15/pass
Chop, haul and fill silo			\$120	12 tons/A @ \$10/ton
Seed cover crop			\$10	
Total expenses			\$425	
Income - expenses (net/acre)			\$175	
Average net for 6-year rotation	\$206	\$229	\$250	
% increase from option #1		10%	18%	

With extremely high grain prices, it is essential to produce the highest quality forages on your own farm. Ultimately, improving forage quality and yield will improve your bottom line. In both the frost-seeding and crop rotation options, it seems that improving hayfields should be worthwhile and profitable. But there is always risk in farming - if you do not get the yield or hay quality increases, you may lose money. Remember that these numbers are averages; you will find better figures for your own farm by doing a little experimenting with your cropping. Have a good crop season!

This article was updated from an earlier version written by Nat Bacon and Heather Darby.