



High Nitrogen Prices and Hay Production

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When looking to improve pastures after a drought, one of the points to consider is whether to use fertilizer nitrogen (N) to improve productivity. This becomes questionable given the price of fertilizer this year whether the benefit that fertilizer provides is affordable.

I once read that you can't starve a profit into a cow or into a hay crop. When it comes to forages this means that you probably should look to strategically fertilize a forage crop via:

- Soil testing your fields so that you know which nutrients are needed and if they will offer a return on your investment.
- Using manure as a good source of nutrients. Knowing what's in manure and spreading it where it's needed -not just where it is convenient -can help cut fertility costs.

Are your field stands grass or legume?

Fields with high percentages of legumes (greater than 50 percent) may not need additional nitrogen whereas stands with mostly grass (less than 30 percent legume) will benefit with proper/timely applications of nitrogen.

Increasing legume percentages to 50 per cent or greater or spreading manure where N is needed are two practices that should be part of a longer term strategy.

After last year's drought, some producers are looking to get cattle out on productive pasture as quickly as possible. Pastures that weren't over-grazed last fall or that have adequate N available will be able to take advantage of spring moisture and heat to grow quickly and be ready for grazing.

The addition of N fertilizer on stressed pastures can help promote quicker growth early allowing cattle access to enough forage to meet their needs.

Which brings us back to the question: Given the price of N, is the benefit affordable?

To better understand the price/benefit effect I contacted John Heard, Crop Production Specialist with Manitoba Agriculture.

According to Heard, when determining economic fertilizer rates, farmers need to consider both the value of the crop and cost of the N, or the Price Ratio: the cost per lb of N divided by hay value/lb. In these examples it is standing hay, so growers need to factor their own harvesting costs.

Table 1. Price ratio across a range of hay value and nitrogen costs.

Hay value		N cost \$/lb N				
\$/t	\$/lb	\$0.40	\$0.60	\$0.80	\$1.00	\$1.20
\$44	\$0.02	20	30	40	50	60
\$88	\$0.04	10	15	20	25	30
\$132	\$0.06	6.7	10	13	16	20
\$176	\$0.08	5	7.5	10	12.5	15
\$220	\$0.10	2.5	6	8	10	12

Once you know the price ratio that applies to your situation, determining the best economical rate of N is the next step. Yield curves provide an understanding between fertilizer rates and yield response. For most crops each additional lb of N doesn't provide the same yield response. The graph below shows how the first 20 lbs of N gives a greater response per lb than the last 20 lbs.

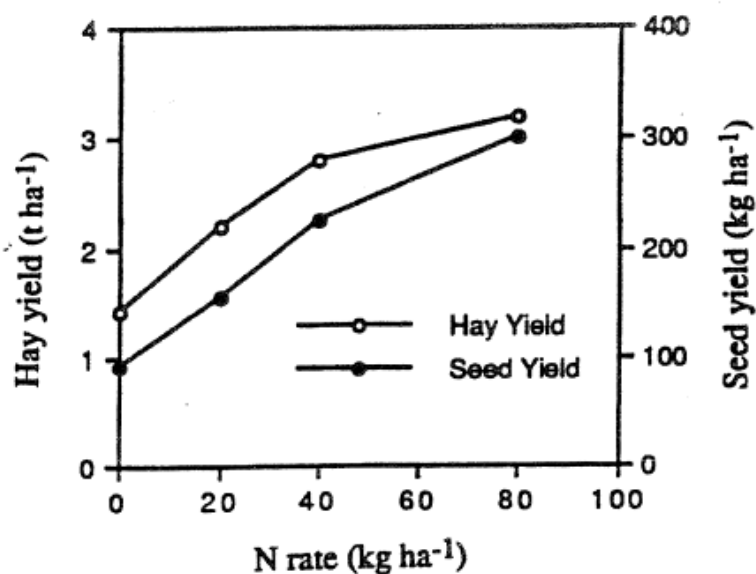


Figure 3. Hay and seed yield response to N fertilizer at five sites near Unity, Saskatchewan (from Knowles and Cooke, 1952).

The economic optimum N application rate is obtained at that point where the last dollar spent on N fertilizer returned one dollar in additional income. This is where the price ratio comes in.

Table 2. Economic optimum N supply vs Price ratio (fertilizer N/standing hay value) on smooth brome grass on 2 soil types.

Price ratio	Economically optimum N supply (lb N/ac)	
(N cost/hay value)	Sandy loam soil	Clay loam soil
4	162	277
6	149	251
8	136	224
10	124	198
12	111	172
14	99	146
16	86	119
18	73	93
20	61	67

So having said all that, if you were looking to determine a rate of N that would determine the point where the last dollar you spent on N returned you a dollar, here is an example: If N is priced at \$1.20/lb of N and grass hay next year is .06 cent/lb then your price ratio from Table 1 is 20. Going to Table 2 we see that with a price ratio of 20, depending on your soil type you could look at a range of N between 61 and 67 lbs/ac. If you think that hay prices might be higher or fertilizer prices lower you can use the same process to determine the economical optimum rate at those price points.

Heard is quick to point out that rainfall or lack of rainfall greatly impacts hay productivity, but was also found to influence the optimum N rate.

If two inches less or two inches more rainfall was received than the 6.6" normal at the test sites, the yields and economics changed.

Yields on the sandy loam decreased or increased 0.85 t/ac respectively. Accordingly the most economic N rate either increased or decreased by 60 lb N/ac to match the productivity.

Yields on the clay loam decreased or increased 1.2 t/ac respectively. Again the most economic N rate either increased or decreased by 100 lb N/ac to match productivity.

In the long term, there is obviously incentive to establish a mixed alfalfa-grass mixture, which avoids the need for nitrogen fertilizer, until the legume component declines. As you can see in the graph below the addition of N required for alfalfa/grass mixture is less than for pure grass stands. As the alfalfa portion increases the N rate should be reduced accordingly. Generally little N is required if alfalfa content exceeds 50 percent of the stand.

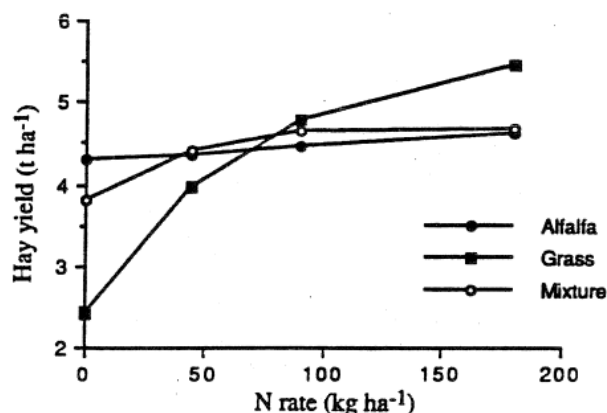


Figure 4. Average yield of alfalfa, crested wheatgrass and alfalfa-grass mixtures as affected by N fertilizer. Alfalfa component of the mixture was 67, 53, 51 and 48% for N rates of 0, 45, 90, and 180 kg ha⁻¹, respectively (from Lutwick and Smith, 1977).

The general recommendation for applying N for two cuts of hay is to apply about 60 percent of N of this rate as soon as possible in the spring, with the remainder following the first cut. For pasture, this N could be applied in up to four splits. At the very low rates, it may not be feasible to split N applications over this number of applications.

For those with predominantly grass hay forages, this should prompt you to use your stockpiled manure or access neighboring manure to us for your advantage or to adjust your N fertilizer application rates, depending on your economics and value you place on forage.

The real question then, is does it make economical sense to fertilize? When you look at the price that you may have to pay for N fertilizer, the price of forage in the coming year or the amount of forage (hay and pasture) you will have for 2022-23, the answer will depend on your individual situation.

Hopefully this information will help you formulate a short and long term plan for your operation.