

NEWS & VIEWS

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Western Canada

Forage Fertilization—How Important Is It?

AFTER last year's long, cold winter and this summer's hot, dry conditions, the demand for hay could be great in many areas of the Prairies. But, it's not just the weather... demand for forage has been increasing in recent years and acreage has gone up. Since 1991, forage acreage has increased by 10 percent to just over 10 million acres (**Table 1**).

Table 1. Forage acreage increases in western Canada.

	1991	1996	% Change
----- acres -----			
British Columbia	807,127	859,857	6.5
Alberta	4,336,356	4,753,165	9.6
Saskatchewan	2,336,543	2,691,702	15.2
Manitoba	1,724,528	1,851,590	7.4
Total	9,204,554	10,156,314	10.3

Statistics Canada

Acreage of tame hay and fodder now ranks 1st in British Columbia, 3rd in Alberta, 5th in Saskatchewan and 2nd in Manitoba, compared to other major crops.

Demand for forage is expected to continue. Census data for 1996 show that cow and calf numbers have increased 22 percent to 10.8 million animals since 1991. Future forage acreage may be limited, but production potential is not...at least we're a long way from achieving the yield potential for this important crop.



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Nutrient Needs

Forages are very responsive to fertilizer, but more often than not, they're under fertilized or not fertilized at all. It is estimated that less than 25 percent of improved pasture and hay land receives fertilizer and only 15 percent of alfalfa is fertilized annually. Despite this, forages have a high nutrient removal for nitrogen (N), phosphorus (P), potassium (K), and sulfur (S). Hay harvests can remove 30 to 60 lb of N, 10 to 15 lb of P₂O₅, 40 to 60 lb K₂O and 4 to 6 lb of S per ton.

Grasses don't remove quite as much P, K, and S as alfalfa, but they have a high N requirement and respond well to N fertilizer application. Legume forages generally do not need N fertilization. If properly inoculated, legumes form symbiotic relationships with N-fixing bacteria in the soil and get most of their N from the air. Both grass and legume forages need relatively large amounts of P and K.

Phosphorus Fertilization

A few facts to remember about P...it's important for successful establishment and good root development. And, it's essential for energy metabolism. Nitrogen fixation has a high energy requirement. Phosphorus deficiency decreases nodulation and N fixation. Phosphorus also increases winter survival.

Sufficient P can be applied in a large single application at seeding for several years of production, but annual applications tend to produce higher yields. A common question of many producers is: Which is the best application method... broadcast or band?

In our annual cropping systems in the Prairies, subsurface banding is usually the most effective way to apply immobile nutrients like P. In established forage stands, broadcasting has always been the standard, but is it the most effective? In past years, researchers from across the Prairies have been evaluating subsurface band applications in forage stands with mixed results. Banding occasionally outperforms broadcasting, but not as often as might be expected. The reason is usually due to mechanical damage of plant roots. The banding operation can prune and disrupt the roots, offsetting the potential advantages of the subsurface placement.

Table 2. Subsurface banding improves alfalfa yield at Ponoka, Alberta.

Year	Check	Annual P Application ¹			Single Application ²		
		Broadcast	Band	Banding Advantage	Broadcast	Band	Banding Advantage
----- dry matter, lb/A -----							
'92	2,609	5,425	5,979	554	7,074	6,831	-243
'93	914	5,430	6,035	605	6,310	7,348	1,038
'94	1,273	4,561	5,569	1,008	4,552	5,406	854
'95	2,145	4,921	5,704	783	4,276	4,642	366
'96	2,701	7,313	8,546	1,233	5,904	7,191	1,287

¹averaged over several P rates (20, 41, 62, 82 lb/A P₂O₅)

²averaged over several P rates (102, 205, 307, 410 lb/A P₂O₅)

S.S. Mahli, Agriculture Canada

The key to successful banding is the fertilizer opener. Recent studies using a coulter type disc opener demonstrate that subsurface banding can be a viable option for forage growers. **Table 2** compares subsurface banding to surface broadcasting in a 5-year experiment on an existing alfalfa stand in a P deficient soil in central Alberta. Phosphorus was applied annually for the 5 years, or was applied at comparable rates, but only once as a single application at the beginning of the study.

Banding P produced better alfalfa yields than broadcasting P in nine of the 10 comparisons. The average yield advantage of banding was 836 lb/A for the annual application and 660 lb/A for the single application. Even at a low price for the alfalfa of \$40/ton, that's a benefit of about 13 to 17 \$/A... more than enough to cover the additional cost of the annual banding operation.

Don't forget the economics. Remember the costs need to be amortized over two or more years. A Saskatchewan study evaluated banded P in established alfalfa using back swept knives. Based on one year of production, only two of 10 sites produced enough yield to cover the cost of the P and the banding operation. However, based on two years of production, eight of the 10 sites produced sufficient yields to cover the costs of the fertilizer and the banding operation. The residual effects of the P and recovery of the plant roots during the second year of production made the banding application economical. Whether broadcasting or banding, the economics for P fertilization must consider 2 or more years of production.

Potassium Fertilization

Potassium is just as important for forage production as P, and is required in much larger amounts. Potassium increases disease resistance and helps the plant endure and recover from stressful conditions like drought, heat and cold. Potassium also helps with stand maintenance and longevity, which is especially important for alfalfa.

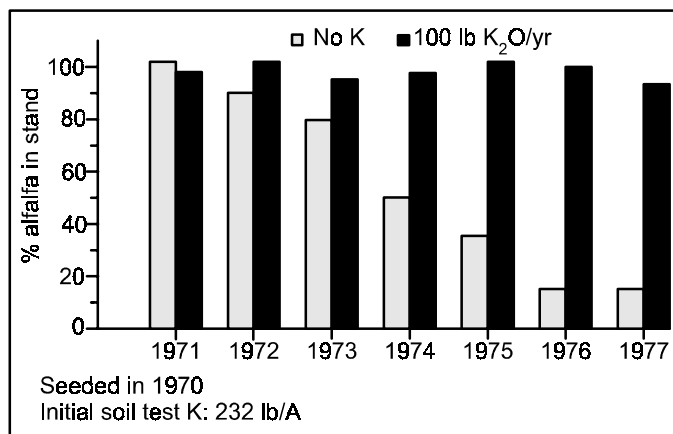


Figure 1. Annual applications of potash maintain alfalfa in a stand in Manitoba.

L.D. Bailey, Agriculture Canada

Figure 1 shows the effect of K fertilization on preventing winter kill on an alfalfa stand in a sandy loam soil in Manitoba. Over a seven year period, alfalfa fertilized with K was able to maintain its density in the stand and its yields between 1.2 and 2 ton/A. After seven years, the stand for the unfertilized treatment was only 15 percent alfalfa and its yields had decreased from 1.1 to 0.2 ton/A.

Potassium increases the carbohydrate or food reserves in the roots during the fall, which enhances winter hardiness and early spring growth. Potassium also encourages quick re-growth after cutting.

The same arguments for P application apply to K. However, K is more mobile in the soil than P, so subsurface placement is not as critical.

Summary

Forages are becoming more important in western Canada and warrant more attention—especially fertilizer management. Test your soil and fertilize accordingly. And pay close attention to fertilizer placement. Broadcasting is good... banding may be better! ■