



Little Change in Soil Phosphorus and Potassium in the Northern Great Plains

By Adrian Johnston

Soil test phosphorus (P) and potassium (K) levels have shown little change in the provincial/state summaries prepared between 2001 and 2005 for the Northern Great Plains Region. Minor increases in soil test P were recorded, reflecting improved fertilizer P management on all lands and manure use in isolated areas. Soil test K levels have shown little change...with the exception of Manitoba where the growth of the potato industry on coarse textured soils has increased the number of fields that fall below the sufficient range.

Like people, soils need to be checked regularly to determine how they are doing as far as their nutrient status, and what we might need to do to improve their productivity. Well, 2005 marked the ninth summary of North American soil test levels by PPI/PPIC. Samples analyzed by public and private laboratories in the fall of 2004 and spring of 2005 were tabulated to assess the nutrient status of soils and any changes in nutrient levels.

In the Northern Great Plains Region there were very few changes in soil test levels to report from this summary. Sample numbers collected by province or state showed a general increase...with the exception of Saskatchewan, where the number of P and K samples considered decreased

(**Table 1**). The northern portions of the prairie provinces were affected by frost and delayed harvest in the fall of 2004, delaying soil sampling activities and reducing the numbers of samples submitted. A substantial increase in sample numbers was recorded in Manitoba, Montana, and North Dakota. In the case of Manitoba, we saw the inclusion of samples from a new laboratory in 2005 and a rapid expansion in the area seeded to potatoes, an intensively managed crop. In Montana, we had more labs submitting sample information in 2005 relative to 2001, and in North Dakota we had a large increase in sample numbers reflecting a much improved fall for sampling in 2004 than in 2000.

In evaluating soil test P in this sum-

Table 1. Soil test P frequencies (relative %) and median levels for 2001 and 2005.											
Prov/State and year	Samples	Bray P-1 equivalent, ppm									Median P, ppm
		0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	>50	
Alberta'01	37,437	4	17	21	18	12	11	7	3	8	17
Alberta'05	36,967	5	14	20	17	11	10	8	8	7	18
Saskatchewan'01	24,627	17	36	22	11	7	4	2	1	0.1	10
Saskatchewan'05	20,713	20	28	18	14	7	6	4	2	2	10
Manitoba'01	14,999	2	23	26	17	11	6	6	3	6	15
Manitoba'05	36,155	4	17	21	16	11	8	8	6	11	17
Montana'01	4,349	10	30	22	16	8	5	5	2	2	12
Montana'05	9,649	11	23	22	16	10	7	6	2	4	14
North Dakota'01	38,450	6	43	29	12	5	2	1	1	1	10
North Dakota'05	66,887	4	39	30	14	6	3	2	0	1	11

mary, we consider all samples with a Bray P-1 equivalence of 20 parts per million (ppm) or less to have potential to show a response to fertilizer P additions. In all states and provinces the soil test P levels of 20 ppm or less declined between the 2001 and 2005 summary reports, with the largest decline in Manitoba and the smallest decline in North Dakota (**Table 1**). As a result of these changes, the median P concentration in the soil either stayed the same, or showed a minor increase. One interesting observation from these data is the increase in samples testing >50 ppm P in some provinces, while little or no change was observed in others. Soil testing to maintain compliance with provincial or state regulations where livestock manure is being used may be reflected in the large increase in high testing soils in provinces like Saskatchewan and Manitoba. While soil test P is currently not a requirement for evaluating soils with regard to manure application, it has been proposed in Manitoba. One major consistency from past soil test summaries was that the Northern Great Plains Region continues to have the low-



est testing soils for P concentration in all of North America.

While our regional soils may be low in P, that is not the case for soil test K levels (**Table 2**). Median K levels are high in all states and provinces of the region, with little change observed between the results in 2001 and 2005. The number of samples considered for soil test K increased in all areas between 2001 and 2005, with the exception of Saskatchewan. Sample numbers more than doubled in Manitoba and Montana, and increased by 75% in North Dakota. Using 160 ppm of ammonium acetate equivalent soil test K as a division between medium and sufficient soil K levels, we observed an increase in medium and lower testing soils in both Manitoba and Montana. The increase is likely a reflection of the increase in samples collected between the two surveys, generally a reflection of shifting cropping practices in an area. In the case of Manitoba, the large increase in soils testing less than 160 ppm K, and decrease in median soil test K levels, reflects the rapid expansion of the potato industry in that province. Most of these potatoes

Table 2. Soil test K frequencies (relative %) and median levels for 2001 and 2005.											
Prov/State and year	Samples	Ammonium acetate equivalent K, ppm									Median K, ppm
		0-40	41-80	81-120	121-160	161-200	201-240	241-280	281-320	>320	
Alberta'01	28,858	1	4	12	17	17	14	16	12	9	201
Alberta'05	39,091	1	6	14	15	14	12	14	8	17	201
Saskatchewan'01	24,029	0	2	4	9	14	16	21	20	14	251
Saskatchewan'05	21,517	0	2	6	10	12	11	20	7	30	254
Manitoba'01	12,624	1	3	6	10	9	11	11	10	41	282
Manitoba'05	26,824	1	8	12	13	13	11	11	7	23	207
Montana'01	4,128	0	0	1	8	13	14	15	14	35	276
Montana'05	9,177	0	1	6	13	12	12	13	12	31	259
North Dakota'01	36,698	0	0	4	10	10	13	15	14	34	274
North Dakota'05	65,173	0	1	4	8	13	14	15	14	30	265

are being grown on coarse textured soils, fields which have been brought into production after growing forages, and are typically low in soil test K. The results from Manitoba, when considered by soil test K category, show a general shift in the distribution of data to lower available soil K levels.

The soil test summary also considered soil pH. Very little change was observed in the soil pH values between 2001 and 2005, with the 2005 medians for Alberta at 6.9, Manitoba at 7.8, Montana at 7.9, and North Dakota and Saskatchewan at 7.6. The lower pH in Alberta is commonly due to the increased number of soils in the 5.6 to 6.5 range, common for soils in the forested regions of the province.

The minor improvements in soil test P...and lack of change in soil K...indicate that we are doing fairly well in holding our

own with regard to the fertility of soils in the Northern Great Plains. Soil test P levels are low, and continued improvements with managing fertilizer and manure P inputs to balance crop removal will be critical to prevent a decline in soil nutrient status. These overview pictures for each province or state provide us with some insight into how soil fertility status is changing over time. At the individual field level, each grower can make the same assessment by evaluating soil test results collected over a similar time frame. In both instances, we receive the necessary insight for making nutrient management decisions that will help us with profitable crop production decisions. **BC**

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