

Nutrient Balances in Manitoba

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Periodically it is beneficial to review the nutrient balance within the province as a whole, to see how fertilizer applications compare to crop removal.

The following figures illustrate the historic and recent fertilizer additions and crop removal values for nitrogen, phosphorus, potassium and sulphur up to 2019. The format for these charts was initially developed by Dr. Adrian Johnston (from the former International Plant Nutrition Institute) and is periodically updated by MB Ag staff. The information sources are Statistics Canada¹ for crop production and fertilizer volumes and crop nutrient removal values from the former Canadian Fertilizer Institute². Data does not consider nutrient additions as manure applied and legume N or removals as straw.

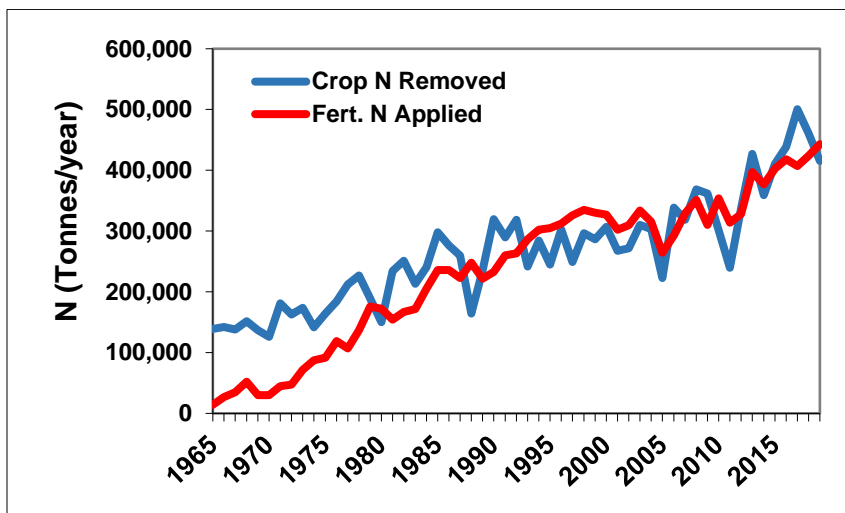


Figure 1. Fertilizer nitrogen applications and crop removal of nitrogen in Manitoba (1965-2019)

It is apparent that prior to 1980 much more nitrogen was being removed from Manitoba soils than what was applied, much of which could be attributed to summer fallowing (Figure 1). Since that time the application of fertilizer and the nitrogen removed from crops appears much more balanced. In recent years, the balance is occasionally negative, probably with the high portion of soybeans in the rotation and its N needs being met through inoculation.

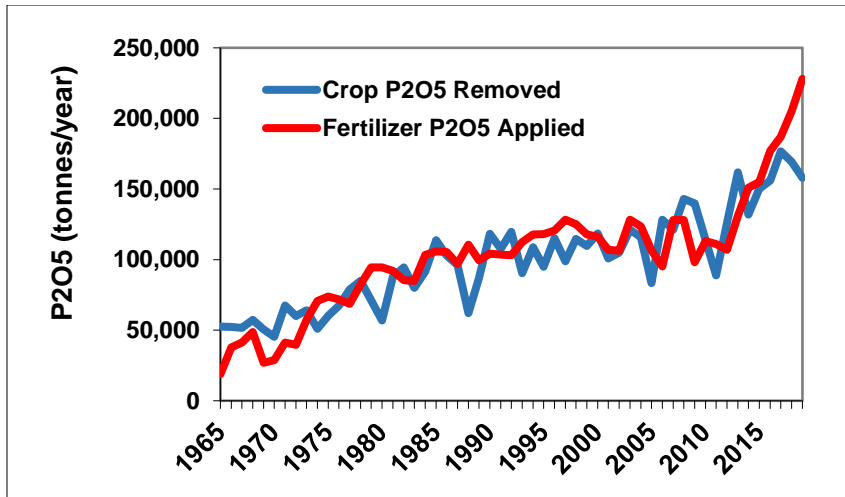


Figure 2. Fertilizer phosphorus applications and crop removal in Manitoba (1965-2019)

As with nitrogen, the balance of phosphorus with crop removal was negative until the late 1970's (Figure 2). Some surplus P was applied in the 1990's but 3 of the past 5 years have seen removals exceeding the fertilizer applications.

With the spike in fertilizer price in 2008, P use declined remained flat for a couple years. Coupled with the increase in soybeans, which frequently are not fertilized with P, and high yields of other crops, soil P tests were observed to decline. Since 2013, applied P use has increased annually, presumably to address this negative P balance.

Potassium removals have always outstripped applications in Manitoba, with a marked increase in removal following soybean acreage and yields (Figure 3). There is a general trend for increasing K use the past 10 years, which may be prompted by recognition of higher K removals by the soybean and other high yielding crops.

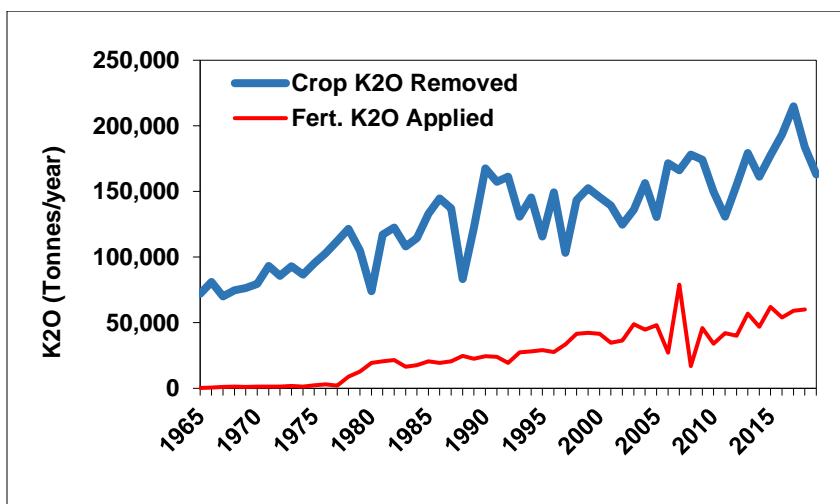


Figure 3. Fertilizer potassium applications and crop removal in Manitoba (1965-2019)

The crop removal and addition of sulphur for recent years is shown in Figure 4. Fertilizer S use is not reported in all years since data may be suppressed to meet the

confidentiality requirements of the *Statistics Act*. In general, sulphur use is matching removal values.

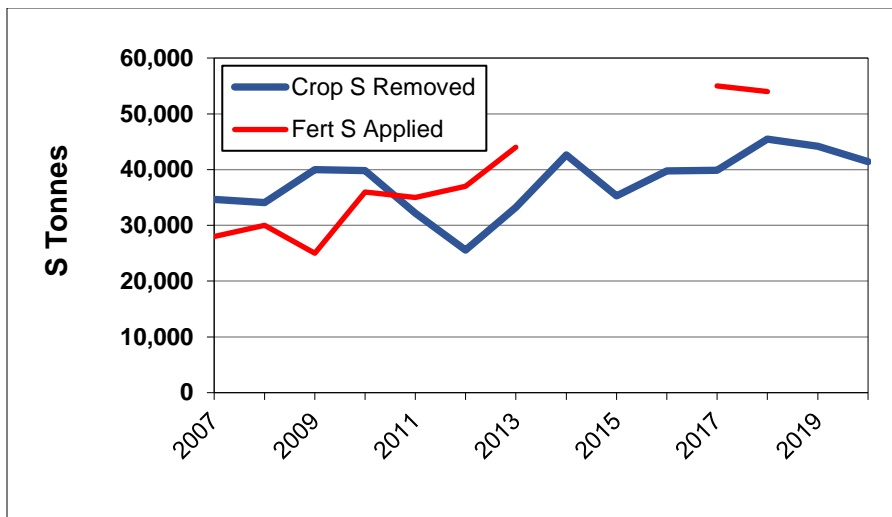


Figure 4. Fertilizer sulphur applications and crop removal in Manitoba.

The source of nutrients discussed here are only those fertilizer nutrients – other important sources should be considered:

1. Natural soil reserves – high soil organic matter supplied nitrogen and phosphorus for many decades through summer fallow practices. These reserves were largely depleted and almost all Manitoba cropland is continuously cropped now. Soil reserves still sustain much of the potassium needs of our crops. Potassium applications have never kept pace with removal in Manitoba with removal exceeding applications some 4 fold. Many of our soils are clay-based in texture with a high natural reserve of potassium. However over time we may see deficiencies appearing in high demand crops like forages, cereal and corn silage, potatoes and soybeans, especially on coarser-textured soils with lower potassium reserves.
2. Manure – recycled nutrient can manure can help meet crop nutrient needs. Survey data of Manitoba farmers by STRATUS Research³ indicated that manure was applied to cropland by 5.1, 6.9 and 24% of canola, wheat and grain corn growers, respectively (crop year 2014 for canola and wheat, crop year 2017 for corn).
3. Biological nitrogen fixation – legume crops do not require fertilizer N application. In fact, the crop removals in Figure 1 include some estimated 78,000 t N from pulse crops of peas and soybeans in 2019.

References

¹Statistics Canada. Table 32-10-0359-01 Estimated areas, yield, production, average farm price and total farm value of principal field crops, in metric and imperial units <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210035901>

²Nutrient uptake and removals – Western Canada. 2001. Canadian Fertilizer Institute

³Fertilizer Use Survey. Stratus Ag research. 2015-2019. Available by request from Fertilizer Canada. info@fertilizercanada.ca