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Case Study 8.1-1 Cropping history influences decisions on soil sampling depth.

The importance of knowing the cropping history of a field was shown in a case near Calgary, Alberta in Canada. A new landowner wanted to grow a crop of oats as green feed hay on a 160 acre field. The local agriculture retail facility was contacted to take soil samples on the field and develop a fertilizer recommendation prior to planting the oat crop in mid-May. A retail staff member went to the field and took 15 random soil cores down to a depth of 6 inches, combined these together and took a sub-sample that was sent to a soil test laboratory for analysis. The soil test analysis reported levels of available macro nutrients for N, P, K, and S. Based on those levels, the fertilizer recommendation was 118 lb N, 10 P_2O_5, and 15 lb K_2O/A for a target yield of 4 ton/A. The fertilizer applied in the seed row blend consisted of a blend of ammonium phosphate (11-52-0) and potassium chloride that supplied 2 lb N/A. The balance of N was applied as broadcast urea fertilizer at a rate of 252 lb/A, supplying 116 lb N/A. The urea was incorporated by tillage prior to planting. The crop grew well because of early summer rains followed by a hot dry July and August. The hay yield was close to the target yield.

All was well until the farmer had a feed analysis done on a hay sample. The analysis showed nitrate levels of 6,000 ppm, far above the generally regarded safe level of 1,500 ppm nitrate for hay to be fed to beef cattle (Cash et al. 2007). The farmer complained that the N recommendation from the agricultural retail location was too high and had caused excessive nitrate levels in the hay. Further investigation by a regional agronomist with the agriculture retail company found that the field had been in alfalfa for 5 years, disked under late in the summer of the fifth year, and fallowed for a year before being sold to the new owner. The year of fallow had above average rainfall and therefore the agronomist suspected that N mineralized from the decomposing alfalfa, in the year of fallow, had been leached below the 6-inch soil sampling depth. Soil sampling to a depth of 48 inches by the regional agronomist, late in the summer of the year of the oat hay, showed residual nitrate N in the soil to be 71 lb/A. The high nitrate in the hay was a result of considerable nitrate in the soil below the original sampling depth, which combined with the added N in the fertilizer excessive N available to the oat crop. The hot dry weather in July and August made the nitrate accumulation in the oats even worse.

In hindsight, had the cropping history of the field been investigated, and that information known, it would have been wise to take soil samples to a depth greater than just 6-inch depth. In this type of situation three depths of soil samples are advised: 0 to 6, 6 to 24, and 24 to 48 inches. The residual N would have been accounted for and a much lower N recommendation for the oat crop would have been given.

References

Cash, D. et al. 2007. Nitrate Toxicity of Montana Forages, Montana State University. [On-line].

Submitted by T.L. Jensen, IPNI, Canada, February 2012.