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Is Land Rolling a Practice for Wisconsin Crop Production?

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Land rolling is the practice of pulling large cylindrical rollers over fields with the objective of smoothing the ground. Typically the practice is conducted just prior to or after seeding soybean, but some producers have conducted rolling well into the season over relatively large plants. The rollers press stones into the soil and break up corn root masses to provide a smooth, uniform surface area for harvesting. According to Mahdi Al-Kaisi of Iowa State University land rollers may cost over $50,000, with an average cost of $6.55 per acre according to the Iowa State Custom Rate Guide

Reported benefits of rolling include fewer machinery problems because soil and stones are not picked up and therefore damage to the cutting bar or components within the combine is avoided. The smoother surface allows for the lower setting of the head permitting the harvest of low hanging pods. Producers that use the practice claim less stress when harvesting and the ability to harvest at somewhat greater ground speeds. Concerns include the cost of conducting the rolling operation, the moderate compaction of the soil that may affect emergence or damage plants if emerged, the potential for greater runoff because of reduced infiltration from surface compaction, and the loosening of crop residue that may be blown off the field. Research studies examining rolling have not shown consistent yield benefits.

Rolling emerged soybean (Photo courtesy of Mahdi Al-Kaisi, Iowa State Univ.)

The practice of land rolling is more common in states just to the west of Wisconsin. Evaluations were recently conducted in Iowa by Mahdi Al-Kaisi of Iowa State University and Jodi DeJong-Hughes of the University of Minnesota. Jodi presented her findings at the recent Corn Soy Conference in Wisconsin Dells and together they published an article in Iowa State's *Integrated Crop Management News* in January 2011. The result of their studies presented in the accompanying table did not show a yield response relative to rolling, with the exception that rolling when plants are at the 6th trifoliate stage reduced yield because of plant damage.

Response of soybean yield to ground rolling in Minnesota and Iowa, 2009 - 2010.

Treatment Timing	Minnesota		NW Iowa		NC Iowa
	2009	2010	2009	2010	2010
	bu/a				
No Rolling	44.7	52.8	64.7	59.8	58.1
Pre-plant	46.6	52.1	--	--	--
Pre-emergence	46.6	51.2	64.2	58.8	57.4
50 % emergence	46.1	51.8	--	--	--
1st Trifoliate	45.2	51.6	65.5	58.2	58.3
3rd Trifoliate	45.3	50.0	--	--	55.7
6th Trifoliate	--	--	--	--	49.4
LSD	NS	NS	NS	NS	5.9

Source: Dr. Madhi Al-Kaisi et. al., Iowa State University. Published in the Iowa Crop Manager, 2011

Currently no research on land rolling has been conducted in Wisconsin. Like any soil management practice growers should consider the associated costs and benefits associated with the practice. Research has not demonstrated that land rolling will

produce a positive yield response, but my conversations with growers that have adopted the practice indicates a general satisfaction that they see relative to harvest management efficiency and reduced potential for machinery damage. Beyond the cost issue, the major concerns that exist with rolling are the potential for increased runoff and erosion from reduced infiltration and the loss of residue by wind once loosened by the rolling operation.

Phosphorus Content of Dairy Rations and Manure Wisconsin Trends 2002-2010

John Peters, Department of Soil Science

Comparison of dairy TMR total P levels with manure P content

For the past nine years the UW Soil and Forage Analysis Laboratory has been conducting a program to thoroughly evaluate total mixed rations (TMR's) for dairies. One of the outcomes of this has been the ability to monitor total P levels in these TMR rations. During this same time period there has been a tremendous amount of extension effort put into getting information to dairy farmers as to the appropriate levels of total dietary P in rations. In general, many dairy rations originally contained significantly more P than was necessary for herd health and proper milk production. Over the past nine years there has been a steady decline in the average total P content of dairy TMR's measured by the UW Soil and Forage Analysis Laboratory. There has also been a downward trend in liquid dairy manure P levels over this same time period (Fig. 1). Beginning in the last few years there has been a similar decrease in solid dairy manure P levels as well (Fig. 2).

Fig. 1. Long term trends in P levels in liquid dairy manure vs. TMRs.

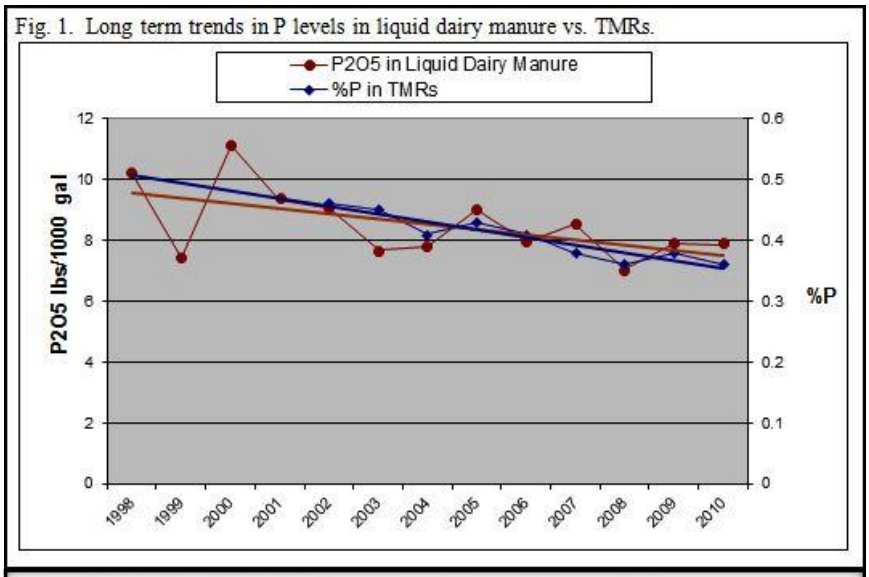
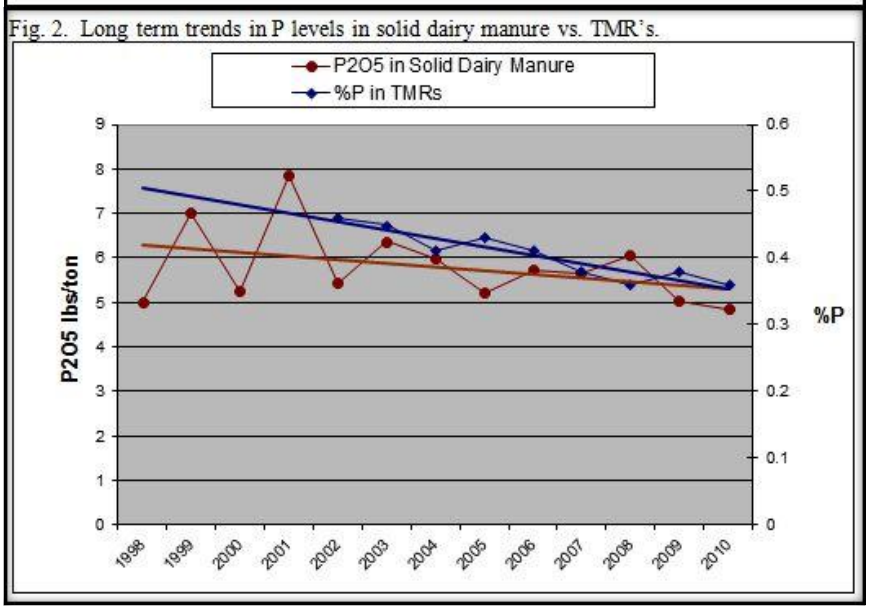


Fig. 2. Long term trends in P levels in solid dairy manure vs. TMR's.



More information on the P levels of TMR rations can be found by viewing the searchable database of the UW Soil Testing Labs at http://uwlab.soils.wisc.edu/ForageDatabase/

2011 Soybean Yield Contest Announcement

The Wisconsin Soybean Program has announced the 2011 WI Soybean Yield Contest. This contest encourages growers to challenge themselves to produce higher yields and to be rewarded for their efforts. Top growers will be recognized for achieving high yields while using sound, environmentally friendly production practices that are profitable as well.

Trophies and cash prizes will be awarded to first, second, and third place winners in each of two contest classes: non-irrigated and irrigated. The winner is the entry that has the highest soybean yield based on bushels per acre at 13 percent moisture. Contest brochures, rules and entry forms can be found at www.coolbean.info.

For more information feel free to contact Shawn Conley at 608-262-7975.

WSMB Offers Free Soybean Cyst Nematode Testing

Shawn Conley, UW-Madison Agronomy

The UW-Madison Agronomy Department, in cooperation with the Wisconsin Soybean Marketing Board, is again offering free soybean cyst nematode (SCN) soil testing for Wisconsin growers. This program is intended for growers to sample several of their fields in order to identify if SCN is present and at what levels. For a detailed history of this program as well as the current state of SCN in WI please see Soybean Cyst Nematode Sampling and Testing in Wisconsin.

Growers will be responsible for collecting soil from fields suspected to have SCN and then sending the sample to the SCN testing laboratory for analysis. They will receive a lab report back with the SCN egg count and a brochure to help plan future rotations and other cultural practices to lower SCN infestation if they exist.

We have a limited number of these free kits available and will furnish them on a first come - first served basis at up to

four per farm. Crop consultants, advisors, and crop input retailers are encouraged to request kits for their client's farms. Each kit has a bag and a prepaid mailer for one soil sample, which should represent about 10-15 acres. Both the postage and lab fees are prepaid ($50 value). Anytime before, during, or right after the growing season are great times to collect soil samples for routine soil fertility analysis and for SCN monitoring.

Soil sample test kits are available now and can be requested from My Linh Do at My Linh Do or at 608-262-1390.

For more information on SCN testing and management practices to help reduce the losses from this pest, please contact: Shawn Conley: spconley@wisc.edu; 608-262-7975.

Nutrients to Watch in 2011: Sulfur and Potassium

Carrie Laboski, Extension Soil Fertility Specialist, University of Wisconsin-Madison, Jerry Clark, Crop & Soils Agent, University of Wisconsin-Extension, Chippewa and Eau Claire Counties

Sulfur (S) and potassium (K) are two nutrients that Wisconsin alfalfa growers should watch based on an alfalfa plant analysis survey conducted in 2010 by the University of Wisconsin. Samples were collected from the top six inches of new growth when the crop was in the bud to first flower stage. Thirty-nine samples were collected from 17 counties in Wisconsin (Figure 1), with 37 samples collected prior to first cutting (May 19 to June 10) and the other two samples collected prior to second cutting (June 28 to July 13). Eight of the samples submitted came from fields, or portions of fields that were poor in appearance and noted a being lighter green

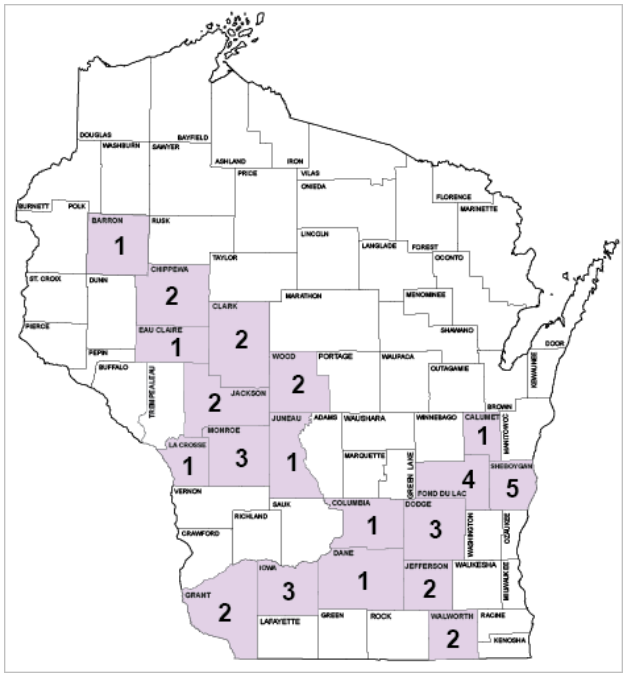


Figure 1. Location of alfalfa plant tissue samples collected in 2010.

and shorter/stunted. Tissue S concentrations were considered low (less than 0.25% S) in 88% of these samples and K concentrations were found to be low (less than 2.25% K) in 75% of the samples. A vast majority of samples (31 of 39) came from fields that appeared normal. In normal appearing fields, tissue S levels were low in 58% of the samples and K levels were low in 45% of the samples. For all samples submitted, 64% were low in S, 51% were low in K, and 31% were low in S and K. The range in tissue S concentrations was 0.11 to 0.34% S, while for tissue K it was 1.50 to 3.16%. Other tissue nutrient concentrations did not suggest widespread deficiencies, though boron (B) was low in 10% of all samples.

The results of this plant analysis survey are not entirely surprising. Potassium applications were generally less than University of Wisconsin-Extension recommendations based on soil test K levels in each field. As potash fertilizer prices have remained elevated for several years, growers in Wisconsin, and likely many other regions in the USA, have applied less potash. Potassium deficit results from a greater amount of K being removed in the harvested crop compared to what has been applied in manure or fertilizer.

As a rule of thumb, approximately 60 pounds of K_2O is removed for every ton of dry matter harvested. Potassium deficit will result in soil test K levels declining over time. If soil test K levels are very high, then declining soil test K levels are not as big of a problem for crop production, provided the grower recognizes that at some point in time they will need to resume K applications as fertilizer or manure. However, if soil test K levels are optimum or lower, then reducing soil test K levels further may result in production problems such as reduced yield and/or poor winter survival. Soil testing every three to four years and following Land Grant University recommendations for K applications is the best way to ensure that K does not limit alfalfa production.

In a plant analysis survey conducted in 2000 and 2001, S was low in 38% of the alfalfa fields sampled in Wisconsin (Kelling et al., 2002). Sixty-four percent of all the alfalfa fields sampled in 2010 were considered low in S. The large increase in potential S deficiency is likely attributable to reduced atmospheric deposition of sulfate-S since enactment of the Clean Air Act. Atmospheric deposition has been a historically significant source of S for Wisconsin. The maps in Figure 2

show how much atmospheric S deposition has been reduced from 1985 through 2009. Recently S deficiency was diagnosed in some alfalfa fields in Iowa (Lang et al., 2006). Thus, finding alfalfa fields in Wisconsin with low tissue S concentrations is not surprising. However, the large percentage of samples with tissue S concentrations below 0.25%, and which otherwise appeared normal, is surprising.

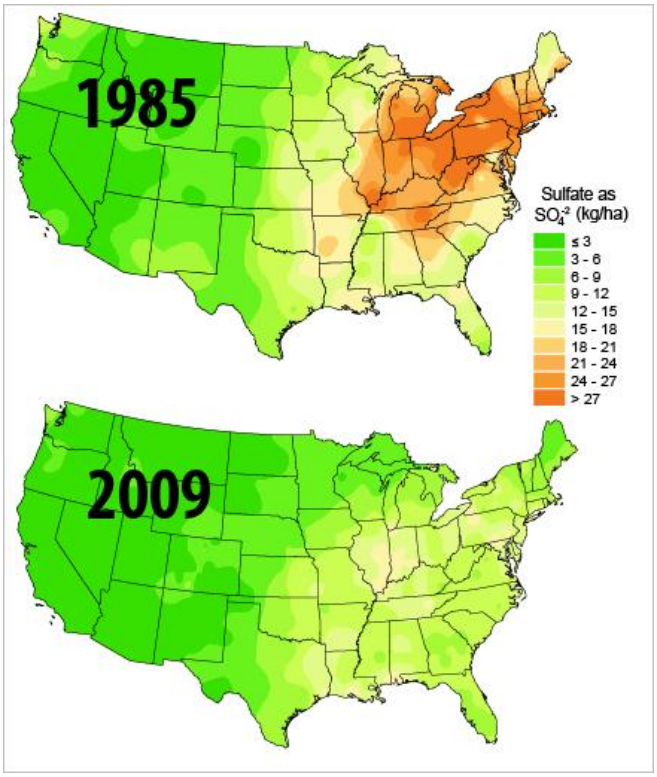


Figure 2. Sulfate ion wet deposition in the continental USA in 1985 (left) and 2009 (right). Inits conversion: 1.0 kg/ha is 0.89 lb/a. Maps obtained from the National Atmospheric Deposition Program website: http://nadp.sws.uiuc.edu/

Manure and soil organic matter are other significant sources of S for crop production. Manure was last applied more than five years ago on 31% of all fields sampled, while 26% of fields had manure applied within the last crop year. There was no significant difference in tissue S concentration based on years since the last manure application. There was also no significant relationship between soil organic matter content and tissue sulfur content. Tissue S concentration was not related to estimated available S in 2010 (based on manure and fertilizer S). At this time, prediction of S deficiency continues to be best done with plant sampling.

Lighter green, stunted, and spindlier plants with delayed maturity and thin stands characterize sulfur deficiency in alfalfa. If S deficiency is suspected, then tissue samples can be collected to determine the crops S status. Tissue samples should be collected from the top six inches of 30 to 40 plants that are at the bud to first flower growth stage and composited into one sample. Samples can be taken prior to any cutting. However if S deficiency is found earlier in the growing season, then fertilizer applications can be made earlier and yield increased. Tissues samples should be placed in paper envelopes after any soil or dust is brushed off and submitted to a soil testing laboratory. It is best to contact the laboratory prior to sample submission to verify sample handling procedures and confirm that the laboratory analyzes plant samples. Soil samples, collected at the same times as plant samples, can be useful in interpreting plant analysis results for phosphorus and K.

Plant samples that test less than 0.23% S will likely benefit from an application of 25 pounds of S per acre in a sulfate form. Samples that test 0.23% to 0.24% may also respond to fertilizer applications. A profitable response to S fertilizer is not expected if tissue S is 0.25% or greater. Fertilizer should be applied immediately after cutting before there is substantial regrowth to prevent injuring the regrowth with wheel traffic. If the grower would like to confirm a yield response to S, then fertilizer may be applied to field length strips or even small 10 foot by 10 foot areas (Lang et al., 2006). Visual responses to fertilizer, such as greenness and crop height, can be compared to untreated areas. It may take four weeks before visual responses can be seen and will be dependent upon soil moisture and temperature. If a grower would like to test for S response in a 10 foot by 10 foot area, then one-third pound of calcium sulfate (18% S) or one-quarter pound of ammonium sulfate (24% S) can be applied to the 100 square foot area.

In summary, S and K are two key nutrients that alfalfa growers should pay attention to improve yield. Neglecting K applications on soils testing low or optimum may decrease soil test K levels further and lead to production problems in alfalfa and rotational crops. Atmospheric deposition of S is decreasing and high demand crops such as alfalfa may require additional fertilizer or manure S to ensure high yields.

The experience in this survey was specific to Wisconsin, however low S and/or K can be problems in other regions as well. The alfalfa plant analysis survey will continue in 2011. If Wisconsin growers are interested in participating by having a field sampled and providing detailed field history, then they should contact their County Extension office. This survey was funded by the Midwest Forage Association and was made possible by the work of many University of Wisconsin-Extension faculty and staff.

References

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