Nutrients removal by forage crops

Dr. Tarlok Singh Sahota CCA

In my last note, I discussed nutrients removal by some grain crops. This is to apprise you of nutrients removal by forage crops. As you know, a sound plan for a soil/ plant fertility program, takes into account the nutrients removed by the crops so that the same can be replenished to maintain soil fertility at a reasonably high level. However, this isn't a substitute to soil tests required to know which nutrients need to be replenished and to what extent. Averaged over multiyear (2008-'13) data, at the Thunder Bay Agricultural Research Station, we found that nutrients removal by forage crops was as follows:

Table 1: Macro nutrients removed by forages from grass family (kg/MT dry matter)

Crop	**N**	**P**	**K**	**S**
Spring barley	28	2.2	13	1.1
Winter wheat	15	1.9	12	0.8
Corn	10	1.3	9	0.7
Italian ryegrass	24	2.0	20	1.2
Bromegrass	18	2.5	23	1.4
Timothy	20	2.4	22	1.5

Please note that barley was harvested at soft dough, winter wheat at flag leaf and fenugreek at pod formation stage! Corn yield (7.06 MT/ha) wasn't all that great.

Table 2: Macro nutrients removed by forages from grass family (kg/ha)

Crop	**N**	**P**	**K**	**S**
Spring barley	118	9.2	56	4.7
Winter wheat	62	7.7	47	3.4
Corn	74	9.0	64	5.2
Italian ryegrass	46	3.9	38	2.3
Bromegrass	83	11.2	107	6.2
Timothy	84	10.4	94	6.4

Table 3: Micro nutrients removed by forages from grass family (g/MT dry matter)

Crop	Cu	Zn	Mn	B
Spring barley	7	37	30	3
Winter wheat	5	23	26	2
Corn	6	27	17	13
Italian ryegrass	10	34	87	34
Bromegrass	9	27	99	6
Timothy	9	28	56	7

Table 4: Micro nutrients removed by forages from grass family (g/ha)

Crop	Cu	Zn	Mn	B
Spring barley	29	155	127	11
Winter wheat	20	93	106	7
Corn	43	193	120	82
Italian ryegrass	19	65	167	58
Bromegrass	40	125	453	27
Timothy	39	120	234	31

Table 5: Macro nutrients removed by legume forages (kg/MT dry matter)

Crop	N	P	K	S
Alfalfa	31	2.9	24	2.4
Galega	34	2.8	21	1.9
Fenugreek*	22	3.5	20	2.3
Berseem clover	33	3.0	20	2.2

Table 6: Macro nutrients removed by legume forages (kg/ha)

Crop	**N**	**P**	**K**	**S**
Alfalfa	157	14.4	118	12.2
Galega	168	13.5	102	9.3
Fenugreek*	67	10.8	61	7.2
Berseem clover	104	9.5	60	6.5

Table 7: Micro nutrients removed by legume forages (g/MT dry matter)

Crop	**Cu**	**Zn**	**Mn**	**B**
Alfalfa	12	38	47	31
Galega	12	36	35	26
Fenugreek	10	40	32	24
Berseem clover	12	37	40	27

Table 8: Micro nutrients removed by legume forages (g/ha)

Crop	**Cu**	**Zn**	**Mn**	**B**
Alfalfa	64	189	246	146
Galega	59	167	178	136
Fenugreek	32	122	99	74
Berseem clover	36	118	128	75

Amounts of calcium, magnesium, sodium and iron aren't reported in this note, but could be found in TBARS Annual Report 2014 (pages 17-21). Please note that amounts of nutrients applied to the soil will in most cases be more than what is removed by the crops, because not 100 % of the applied nutrients are taken up by the crops; some quantities get transformed/or fixed in the soil and some could be lost to the environment (rendering nutrients unavailable!). Therefore, test your soils and always consult an experienced researcher/or a Certified Crop Advisor.

What we observe from the data in this note is that:

- Timothy and bromegrass removed more K, S, Mn and B than cereals and corn. Italian ryegrass removed the highest amount of Mn per unit dry matter.
- Spring barley removed the highest amount of N per unit area and timothy and bromegass removed more N than corn and winter wheat.
- K removal by grasses per unit dry matter was ~10 times more than the P removal.
- Galega removed more N, but less P, K and S per unit area than alfalfa.
- Micronutrients (Cu, Zn, Mn and B) removal by alfalfa was higher than that by galega and other legumes.

Abbreviations used in this note: N, P, K and S stand for nitrogen, phosphorus, potassium and sulphur, respectively; Cu, Zn, Mn and B stand for copper, zinc, manganese and boron, respectively, kg for kilogram, g for gram, MT for metric ton and ha for hectare. To convert P to P_2O_5 multiply P by 2.29, K to K_2O by 1.2 and S to SO^{-}_{4} by 3.0.

Acknowledgement: Thanks to Limin Luan for summarizing and tabulating multiyear (2008-2013) data (TBARS Annual Report 2014; pages 17-21).

Published in Northwest Link, October 2015, Pages 5-6 & 8.