

Nutrients removal by field crops at Thunder Bay

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By the time you see this note, you may be combining the grain crops; removing both grains and straw from the fields. This also means removal of all nutrients taken up by the grain crops. To plan for a good soil/plant fertility program, it is essential to know the nutrients removed by the crops so that the same can be replenished to maintain soil fertility at a reasonably high level. Soil tests will still be needed to know whether all or part or no nutrient need to be replenished. Averaged over multiyear (2008-'13) data, at the Thunder Bay Agricultural Research Station, we found that removal of nutrients per MT of grains and straw was as listed in the following tables:

Table 1: Macro nutrients removed by grains (kg/MT)

Crop	N	P	K	S
Barley	20	3.6	5	1.0
Oat	20	3.8	5	1.2
Wheat	28	4.6	4	1.6
Soybean	61	6.5	19	2.7

Table 2: Macro nutrients removed by straw (kg/MT)

Crop	N	P	K	S
Barley	13	1.0	14	0.6
Oat	12	0.7	17	0.4
Wheat	13	1.0	11	0.6
Soybean	9	1.2	7	0.5
Canola	10	1.0	14	3.2

Table 3: Total macro nutrients removed by grain + straw (kg/ha)

Crop	N	P	K	S
Barley	145	21	83	7.1
Oat	140	20	109	7.2
Wheat	140	19	69	7.7
Soybean	134	15	53	6.1

Table 4: Micro nutrients removed by grains (g/MT)

Crop	Cu	Zn	Mn	B
Barley	8	37	12	1
Oat	8	35	32	1
Wheat	8	49	30	1
Soybean	16	45	21	19

Table 5: Micro nutrients removed by straw (g/MT)

Crop	Cu	Zn	Mn	B
Barley	5	17	14	3
Oat	5	11	8	2
Wheat	6	21	12	2
Soybean	12	15	12	22
Canola	1	10	8	10

Table 6: Total micro nutrients removed by grain + straw (g/ha)

Crop	Cu	Zn	Mn	B
Barley	58	235	113	18
Oat	60	209	176	15
Wheat	58	248	154	16
Soybean	61	118	68	85

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:

- Wheat grains removed more N and S than barley and oats.
- Soybean grains removed more N, P, K and S than cereals.
- Oat straw removed more K than barley and wheat straws.
- Canola straw removed 5-8 times more S than the cereals straw.
- In total (grain + straw) macro nutrients removal; wheat removed the least K and oat the most K.

- Soybean grains removed double the amount of copper and 19 times boron removed by cereals grains.
- Zinc and manganese removal by wheat and soybean grains was higher than that by barley and oat grains. Zinc removal by wheat straw too was higher than that by barley and oat straw.
- In total (grain + straw) micro nutrients removal; wheat removed the highest amounts of zinc, oat the highest amount of manganese and soybean removed 5-6 times more boron than the cereals did!

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.

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