NUTRIENT UPTAKE AND REMOVAL BY FIELD CROPS

WESTERN CANADA 2001

The ranges in nutrient uptake[1] and removal[2] values given in this chart are general estimates. They are based on typical nutrient concentrations and yields for good growing conditions in western Canada. Actual uptake and removal will vary with crop yield, crop variety, soil fertility and from year to year. Accurate removal values can only be determined by laboratory analysis.

Crop uptake of nutrients is affected by soil and climatic conditions. Low soil moisture, poor aeration due to compaction or excessive moisture, low soil temperatures, high lime in the root zone, nutrient imbalances, and other factors may restrict uptake of plant nutrients.

Crop fertility requirements will differ from these nutrient removal values. Crops are not able to extract all available plant nutrients from the soil, and fertilizers are not 100 percent efficient. For any given yield, the total nutrient supply in the soil (soil plus added fertilizer) will be somewhat greater than the amount removed by the crop. The best way to determine fertilizer requirements is regular soil analysis.

Pounds per Acre

Grains		N	P_2O_5	K_2O	S
Spring Wheat	uptake[1]	76 - 93	29 - 35	65 - 80	8 - 10
40 bu/A *(2690 kg/ha)*	removal[2]	54 - 66	21 - 26	16 - 19	4 - 5
Winter Wheat	uptake	61 - 74	27 - 34	64 - 78	9 - 11
50 bu/A *(3360 kg/ha)*	removal	47 - 57	23 - 28	15 - 19	6 - 8
Barley	uptake	100 - 122	40 - 49	96 - 117	12 - 14
80 bu/A *(4300 kg/ha)*	removal	70 - 85	30 - 37	23 - 28	6 - 8
Oats	uptake	96 - 117	36 - 45	131 - 160	12 - 14
100 bu/A *(3584 kg/ha)*	removal	55 - 68	23 - 28	17 - 20	4 - 5
Rye	uptake	83 - 101	41 - 51	117 - 144	14 - 17
55 bu/A *(3450 kg/ha)*	removal	53 - 64	22 - 27	18 - 22	4 - 5
Corn	uptake	138 - 168	57 - 69	116 - 141	13 - 16
100 bu/A *(6272 kg/ha)*	removal	87 - 107	39 - 48	25 - 30	6 - 7

Oilseeds		N	P_2O_5	K_2O	S
Canola	uptake	100 - 123	46 - 57	73 - 89	17 - 21
35 bu/A *(1960 kg/ha)*	removal	61 - 74	33 - 40	16 - 20	10 - 12
Flax	uptake	62 - 76	18 - 22	39 - 48	12 - 15
24 bu/A *(1492 kg/ha)*	removal	46 - 56	14 - 17	13 - 16	5 - 6
Sunflower	uptake	67 - 82	23 - 28	33 - 44	8 - 9
50 bu/A *(2240 kg/ha)*	removal	48 - 59	14 - 18	11 - 13	4 - 5

[1] Total nutrient taken up by the crop
[2] Nutrient removed in harvested portion of the crop

Oilseeds		N	P_2O_5	K_2O	S
Pulse Crops*					
Peas	uptake	138 - 168	38 - 46	123 - 150	11 - 14
50 bu/A *(3360 kg/ha)*	removal	105 - 129	31 - 38	32 - 39	6 - 7
Lentils	uptake	82 - 101	22 - 27	69 - 84	8 - 10
30 bu/A *(2016 kg/ha)*	removal	55 - 67	17 - 20	29 - 36	4 - 5
Fababeans	uptake	257 - 314	89 - 108	229 - 280	12 - 15
50 bu/A *(3808 kg/ha)*	removal	154 - 188	55 - 67	47 - 57	6 - 8
Other Crops					
Sugarbeets	uptake	190 - 232	61 - 75	347 - 424	30 - 36
22 tons/A *(49.4 tonnes/ha)*	removal	79 - 97	36 - 45	128 - 157	12 - 14
Potatoes	uptake	205 - 251	60 - 73	268 - 327	16 - 20
20 tons/A *(44.8 tonnes/ha)*	removal	115 - 141	33 - 40	194 - 238	11 - 13

Forages - Dry Matter		N	P_2O_5	K_2O	S
Alfalfa *					
5 tons/A *(11.2 tonnes/ha)*	removal	261 - 319	62 - 76	270 - 330	27 - 33
Clover *					
4 tons/A *(9 tonnes/ha)*	removal	194 - 237	50 - 61	181 - 222	10 - 12
Grass					
3 tons/A *(6.7 tonnes/ha)*	removal	92 - 113	27 - 33	117 - 143	11 - 14
Barley Silage					
4.5 tons/A *(10 tonnes/ha)*	removal	130 – 180	46 – 60	114 – 132	14 - 21
Corn Silage					
5 tons/A *(11.2 tonnes/ha)*	removal	140 - 172	57 - 70	181 - 222	12 - 14

*** Legumes such as pulse crops, alfafla, clover, etc. obtain most of their N from the air if root nodule bacteria are actively fixing N. Legumes should be inoculated prior to seeding.**

Approximate Bushel Weights

Crop	Pounds
Fababeans	68
Wheat, alfalfa, clover, birdsfoot trefoil	60
Beans, peas, lentils, potatoes	60
Rye, corn, flax	56
Canola, mustard	50
Barley, buckwheat	48
Timothy seed	45
Reed canary grass	44-48
Oats	32
Sunflower	28
Crested wheat grass	20-24
Bromegrass, Kentucky bluegrass, Orchard grass	14
Slender wheat grass	13

Residue Produced by Crops

Crop	Unit	Approximate lb residue/unit
Rye, fababeans	bu	110
Spring wheat, durum, canola	bu	100
Mustard, flax, lentils	bu	100
Winter wheat	bu	75
Barley	bu	80
Corn	bu	60
Oats	bu	64
Flax	bu	80
Sunflower	lb	1.5
Dry beans	lb	1.0
Sugarbeets, potatoes	ton	200

Conversion Factors

Tonne (metric)/hectare x 0.446 = ton/acre
Ton/acre x 2.24 = tonne/hectare
Tonne x 1.102 = ton
Ton x 0.9072 = tonne
Kilogram (kg) x 2.205 = pound
Pound x 0.454 = kilogram (kg)
Hectare x 2.472 = acre
Kilogram/hectare x 0.891 = pound/acre
Pound/acre x 1.12 = kilogram/hectare
Acre x 0.405 = hectare
P x 2.3 = P_2O_5
P_2O_5 x 0.43 = P
K x 1.2 = K_2O
K_2O x 0.83 = K

Compiled by the

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from research and agronomic information obtained in Canada, 1998.