

NUTRIENT UPTAKE AND REMOVAL BY FIELD CROPS

WESTERN CANADA 2001

The ranges in nutrient uptake¹ and removal² 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 ₂ O ₅ | K ₂ O | S |
|---|----------------------|-----------|-------------------------------|------------------|---------|
| Spring Wheat 40 bu/A (2690 kg/ha) | uptake ¹ | 76 - 93 | 29 - 35 | 65 - 80 | 8 - 10 |
| | removal ² | 54 - 66 | 21 - 26 | 16 - 19 | 4 - 5 |
| Winter Wheat 50 bu/A (3360 kg/ha) | uptake | 61 - 74 | 27 - 34 | 64 - 78 | 9 - 11 |
| | removal | 47 - 57 | 23 - 28 | 15 - 19 | 6 - 8 |
| Barley 80 bu/A (4300 kg/ha) | uptake | 100 - 122 | 40 - 49 | 96 - 117 | 12 - 14 |
| | removal | 70 - 85 | 30 - 37 | 23 - 28 | 6 - 8 |
| Oats 100 bu/A (3584 kg/ha) | uptake | 96 - 117 | 36 - 45 | 131 - 160 | 12 - 14 |
| | removal | 55 - 68 | 23 - 28 | 17 - 20 | 4 - 5 |
| Rye 55 bu/A (3450 kg/ha) | uptake | 83 - 101 | 41 - 51 | 117 - 144 | 14 - 17 |
| | removal | 53 - 64 | 22 - 27 | 18 - 22 | 4 - 5 |
| Corn 100 bu/A (6272 kg/ha) | uptake | 138 - 168 | 57 - 69 | 116 - 141 | 13 - 16 |
| | removal | 87 - 107 | 39 - 48 | 25 - 30 | 6 - 7 |
| Oilseeds | | N | P ₂ O ₅ | K ₂ O | S |
| Canola 35 bu/A (1960 kg/ha) | uptake | 100 - 123 | 46 - 57 | 73 - 89 | 17 - 21 |
| | removal | 61 - 74 | 33 - 40 | 16 - 20 | 10 - 12 |
| Flax 24 bu/A (1492 kg/ha) | uptake | 62 - 76 | 18 - 22 | 39 - 48 | 12 - 15 |
| | removal | 46 - 56 | 14 - 17 | 13 - 16 | 5 - 6 |
| Sunflower 50 bu/A (2240 kg/ha) | uptake | 67 - 82 | 23 - 28 | 33 - 44 | 8 - 9 |
| | 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

| | | N | P ₂ O ₅ | K ₂ O | S |
|--|---------|-----------|-------------------------------|------------------|---------|
| Oilseeds | | | | | |
| Pulse Crops* | | | | | |
| Peas 50 bu/A (3360 kg/ha) | uptake | 138 - 168 | 38 - 46 | 123 - 150 | 11 - 14 |
| | removal | 105 - 129 | 31 - 38 | 32 - 39 | 6 - 7 |
| Lentils 30 bu/A (2016 kg/ha) | uptake | 82 - 101 | 22 - 27 | 69 - 84 | 8 - 10 |
| | removal | 55 - 67 | 17 - 20 | 29 - 36 | 4 - 5 |
| Fababeans 50 bu/A (3808 kg/ha) | uptake | 257 - 314 | 89 - 108 | 229 - 280 | 12 - 15 |
| | removal | 154 - 188 | 55 - 67 | 47 - 57 | 6 - 8 |

Other Crops

| | | | | | |
|---|---------|-----------|---------|-----------|---------|
| Sugarbeets 22 tons/A (49.4 tonnes/ha) | uptake | 190 - 232 | 61 - 75 | 347 - 424 | 30 - 36 |
| | removal | 79 - 97 | 36 - 45 | 128 - 157 | 12 - 14 |
| Potatoes 20 tons/A (44.8 tonnes/ha) | uptake | 205 - 251 | 60 - 73 | 268 - 327 | 16 - 20 |
| | removal | 115 - 141 | 33 - 40 | 194 - 238 | 11 - 13 |

Forages - Dry Matter

| | | N | P ₂ O ₅ | K ₂ O | 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, alfalfa, 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 = P₂O₅
 P₂O₅ x 0.43 = P
 K x 1.2 = K₂O
 K₂O x 0.83 = K

Compiled by the



from research and agronomic information obtained in Canada, 1998.