Understanding and Interpreting Soil Test Reports

Lethbridge College &
Lethbridge County

Feb. 23, 2017

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Soil Test Reports:

1. Provides the actual values of the soil analysis

2. Most labs will provide a rating for each value –
   - Use micronutrient ratings with caution!

3. Most labs provide general fertilizer recommendations:
   - But – this is really your job!

Address: [1]	**Grower Name:** Joe Smith [2]	**Tracking Number:** 200610-01999 [3]
ABC Farms	**Client's Sample ID:** 1a	**Date Received:** October 19, 2006
Box 123	**Field ID:** Brown Place	**Report Date:** October 26, 2006
My Town, AB T0G 0N0	**Legal Location:** NW 6-39-29-W4	**Disposal Date:** November 30, 2006

Nutrient Analysis (PPM) [4] | **Quality** [7]

Depth	N	P	K	SO_4	Cl	Cu	B	Ca	Mg	Fe	Zn	Mn	pH	EC	OM	Texture
0 - 6"	4	11	175	19	12	0.6	0.7	800	300	3	1.5	2.5	6.7	0.4	5.5	Loam
6 - 12"	1			10												
12 - 24"	1			8												
Total																
Range [6]	D	D	A	A	M	M	A	A	A	M	A	A	Neutral	Good	Normal	

E: Excess **A:** Adequate **M:** Marginal **D:** Deficient

	N	P	K	SO_4	Cl	Cu	B	Ca	Mg	Fe	Zn	Mn
lb/ac	14	22	350	90								
Available lb/ac	14	22	350	90								
[5]												

Cation Exchange [8]

TCEC: 44 meq/100g

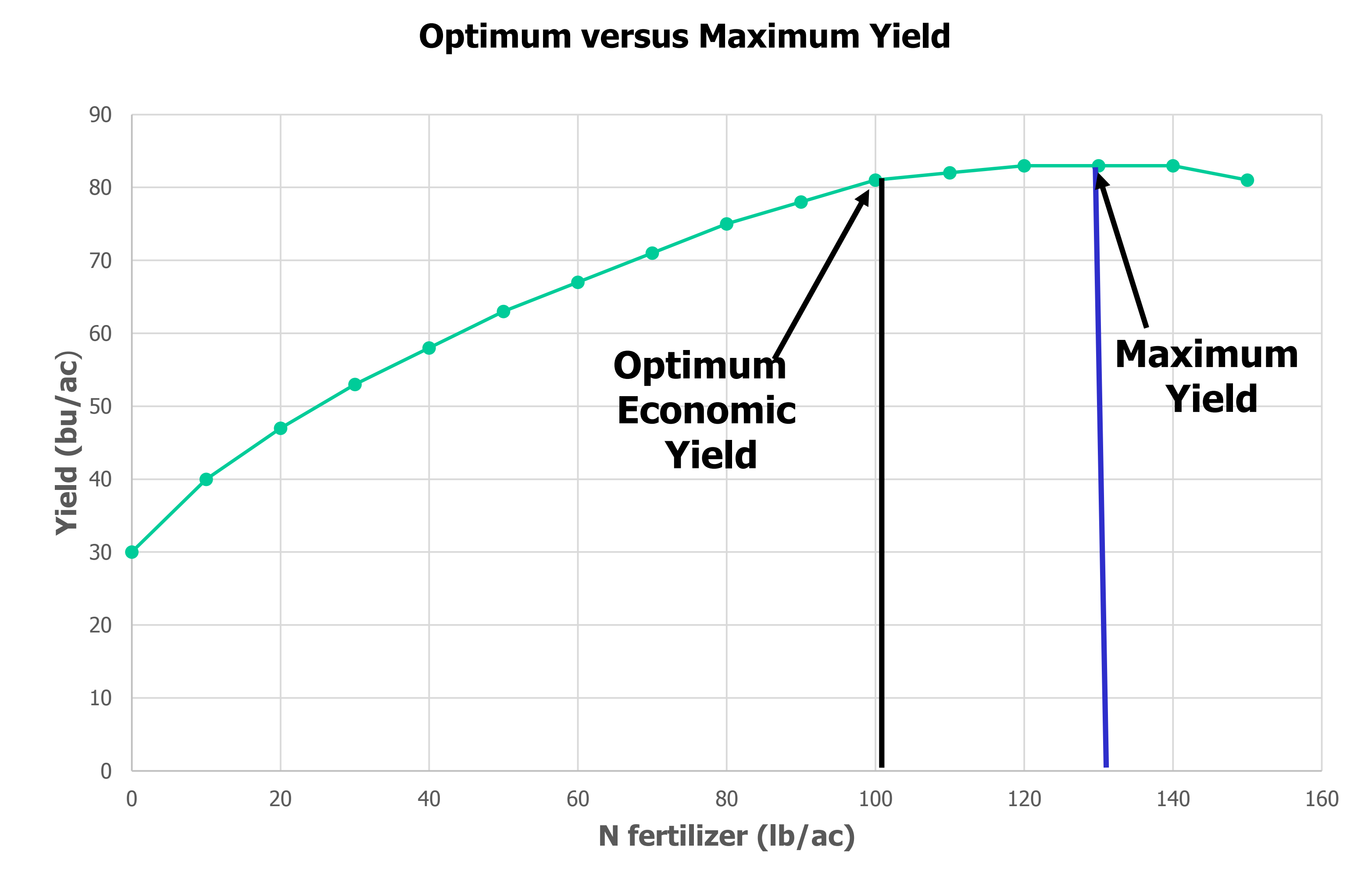
BS: 100%

Ca	Mg	K	Na
55%	35%	9%	1%

Recommendations (lb/ac) [9]

Crop	Conditions	Yield	N	P_2O_5	K_2O	S	Cl	Cu	B	Ca	Mg	Fe	Zn	Mn
Wheat	Excellent	68	125	30	0	0	0	0	0	0	0	0	0	0
	Average	57	100	25	0	0	0	0	0	0	0	0	0	0

Fertilize for Maximum Yield versus Optimum Economic Yield.



Sources of Nitrogen for Crops:

- **Soil test N level -** test each field
- **Mineralization -** N from soil organic matter
  - Soils will mineralize 20 to 40 lb N/ac
- **Biological N fixation -** Legume crops make their own N and can contribute 20-40 lb N/ac for next crop
- **Livestock Manure -** contribute significant N

- **Remaining N must come from commercial fertilizer –**
  - **Need to understand N fertilizer dynamics!!**

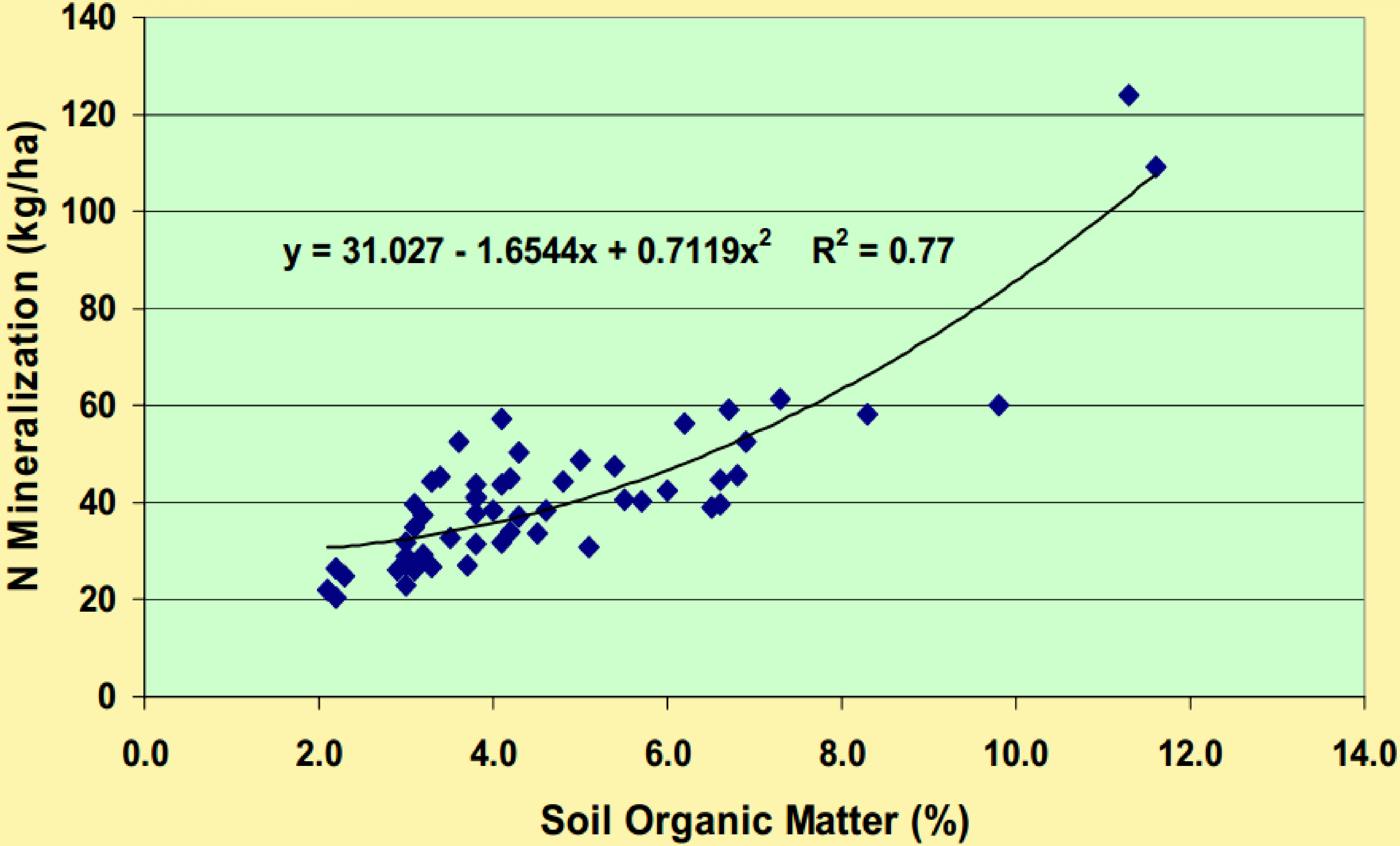
Understanding Nitrogen

<u>Almost all Nitrogen in soil is in the Organic Matter (OM)</u>

- NO_3^- -N comes from breakdown (mineralization) of soil OM and from applied fertilizers

- <u>Mineralization potential</u> of soils is very important and is affected by:
  - Amount of soil Organic Matter
  - Previous crop – legumes (alfalfa and pea) release more N
  - Soil moisture and temperature

Estimated Soil Nitrogen Mineralization Relationship with Soil Organic Matter



1. Crop Removal Method:

Apply the approximate amount of N fertilizer that would be removed by the target yield of the crop.

Disadvantages of this method:

- Don’t consider soil test N - on fields high in soil N, the fertilizer N will be over applied.
- Don’t consider total N requirement of the crop
- N fertilizer rate is not based on cost of the fertilizer, value of the crop or the yield increase from the fertilizer.

2. Calculation Method:

With this method the estimated total N needed for the target yield is determined.

Apply N fertilizer based the calculated value minus the soil N level and an estimated mineralization N value.

Info Needed:

- Need soil test N information plus the estimated mineralization of N.
- Should consider N efficiency of uptake
- Not based on fertilizer price or crop value

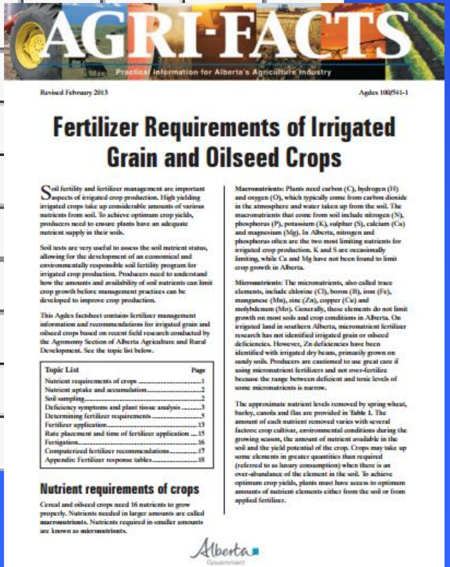
3. Economic Method:

Apply N fertilizer based on crop yield increase per unit of nitrogen, cost of N fertilizer and value of the crop.

- Info Needed:
  - Nitrogen fertilizer response curve
  - Soil test N information
  - Soil moisture information
  - N fertilizer cost/lb
  - Predicted crop value

Nitrogen fertilizer response table for irrigated hard red spring wheat in southern Alberta, assuming irrigation for optimum yield, showing predicted yield in bushels/acre and N rates are in pounds/acre.

Soil Test N (lb/ac)	Fertilizer Nitrogen Rate (lb/ac)																				
0-24"	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
10	25	30	39	48	56	64	71	78	84	90	95	100	104	108	111	114	116	118	119	120	121
20	30	39	48	56	64	71	78	84	90	95	100	104	108	111	114	116	118	119	120	121	
30	39	48	56	64	71	78	84	90	95	100	104	108	111	114	116	118	119	120	121		
40	48	56	64	71	78	84	90	95	100	104	108	111	114	116	118	119	120	121			
50	56	64	71	78	84	90	95	100	104	108	111	114	116	118	119	120	121				
60	64	71	78	84	90	95	100	104	108	111	114	116	118	119	120	121					
70	71	78	84	90	95	100	104	108	111	114	116	118	119	120	121						
80	78	84	90	95	100	104	108	111	114	116	118	119	120	121							
90	84	90	95	100	104	108	111	114	116	118	119	120	121								
100	90	95	100	104	108	111	114	116	118	119	120	121									
110	95	100	104	108	111	114	116	118	119	120	121										
120	100	104	108	111	114	116	118	119	120	121											
130	104	108	111	114	116	118	119	120	121												
140	108	111	114	116	118	119	120	121													
150	111	114	116	118	119	120	121														



Economic N Fertilization Determination

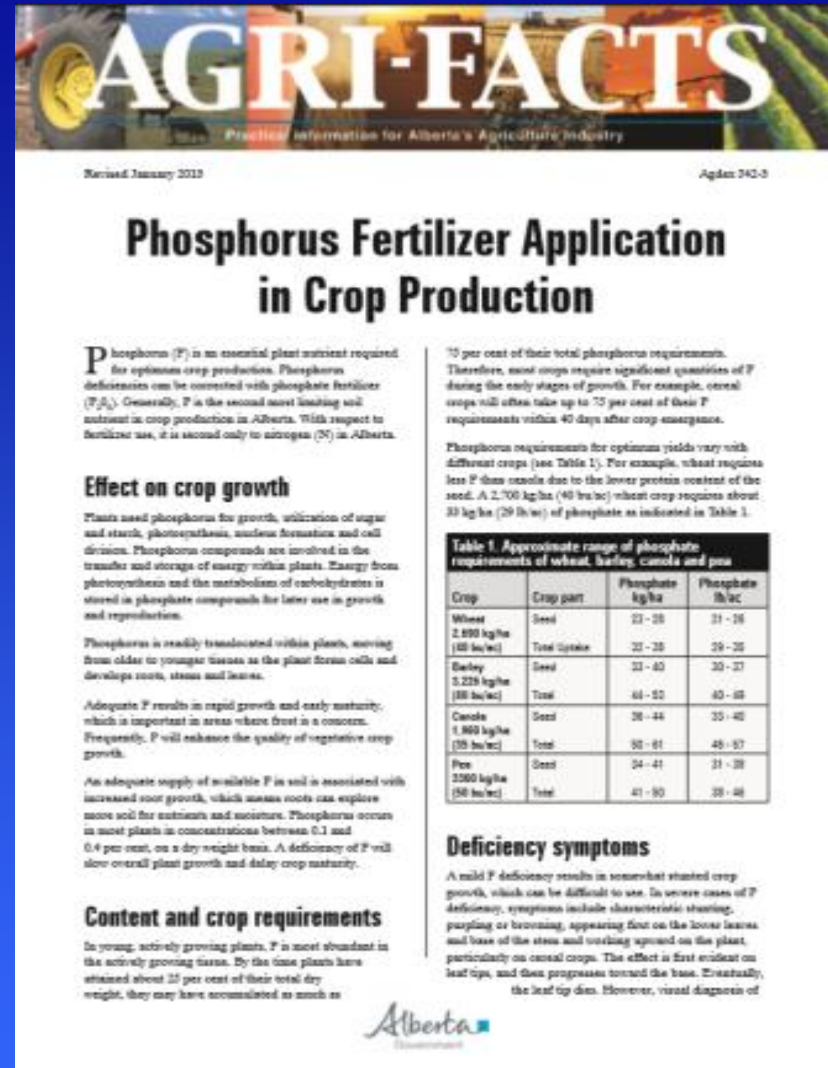
N Fertilizer (lb/ac)	0	10	60	70	80	90	100	110	120	130	140	150	160
Estimated Yield (bu/ac)	48	56	90	95	100	104	108	111	114	116	118	119	120
Yield increase (bu/ac)	-	8	6	5	5	4	4	3	3	2	2	1	1
Scenario #1													
Fertilizer cost at 65¢/lb	-	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Crop value $8.00/bu	-	64.00	48.00	40.00	40.00	32.00	32.00	24.00	24.00	16.00	16.00	8.00	8.00
Scenario #2													
Fertilizer cost at 65¢/lb		6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Crop value $5.00/bu		40.00	30.00	25.00	25.00	20.00	20.00	15.00	15.00	10.00	10.00	5.00	5.00

You Can Use AFFIRM to Determine N Rates.

- **The program is free and can be downloaded from the Alberta Agriculture Web site:**
  - **http://www.agric.gov.ab.ca**

Phosphorus (P)

Phosphate (P_2O_5)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Phosphorus Fertilizer Application in Crop Production

Effect on crop growth

Content and crop requirements

Table 1. Approximate range of phosphate requirements of wheat, barley, canola and pea

Deficiency symptoms

Alberta

Soil test rating for plant available P
Modified Kelowna Method

Soil test level rating	Phosphorus (P) (lb/ac)	
Very low	0 – 15	High probability of crop response to P
Low	15 – 30	
Medium	30 – 60	Moderately high probability
Medium to Adequate	60 – 90	Moderate probability
High	>90	Low probability of crop response to P

Example of P Soil Test Calibration Data

- **Alberta has an excellent data based on P responses at many sites over a number of years**

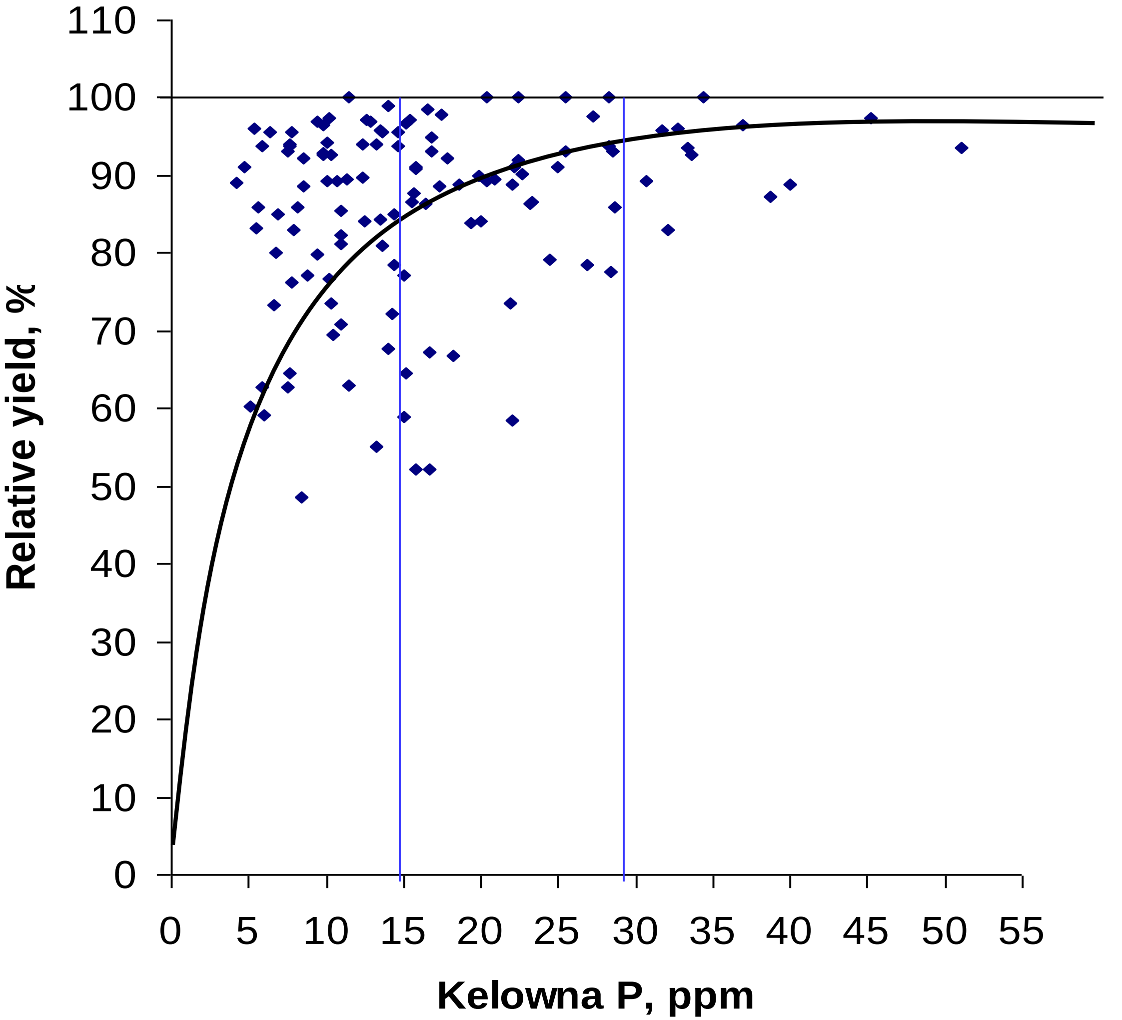


Table 8. Phosphate fertilizer recommendations for spring wheat on a medium to fine textured soil with a neutral pH, based on the Kelowna soil test method. Recommendations are given for each soil zone at three soil moisture condition levels at the time of seeding

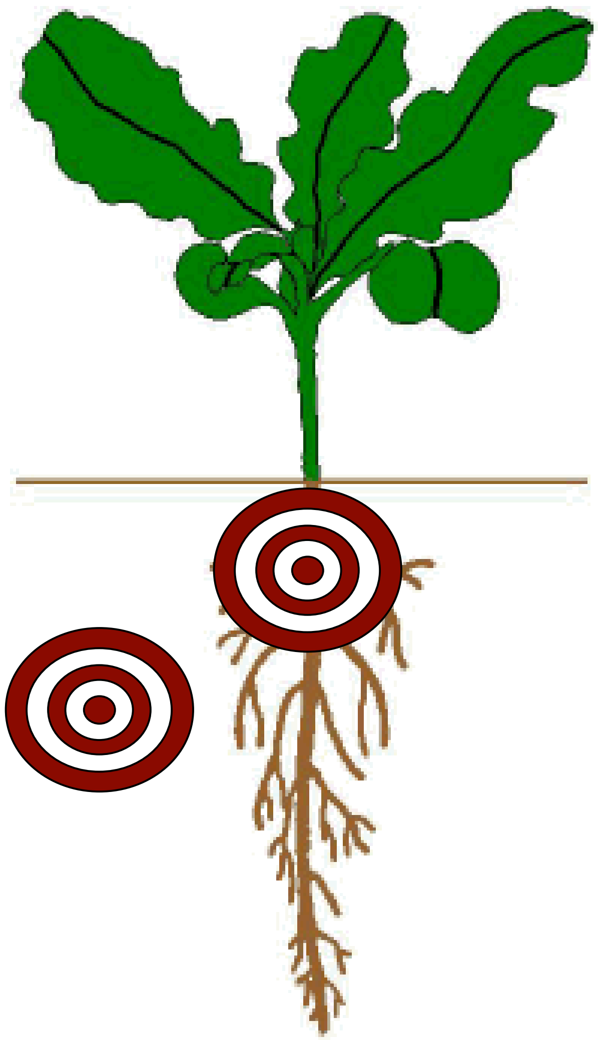
Soil test P (lb/ac)	Brown			Dark Brown			Thin Black			Black			Gray Wooded			Irrigated
	D*	M*	W*	D	M	W	D	M	W	D	M	W	D	M	W	
	P_2O_5 lb/ac															
0 - 10	30	35	40	35	40	45	40	45	50	40	45	50	40	45	50	50
10 - 20	25	30	35	30	35	40	35	40	45	35	40	45	35	40	45	45
20 - 30	20	25	30	25	30	35	30	35	40	30	35	40	30	35	40	40
30 - 40	15	20	25	20	25	30	25	30	35	25	30	35	25	30	35	35
40 - 50	15	15	20	20	20	25	25	25	30	25	25	30	25	25	30	35
50 - 60	15	15	20	15	15	25	20	20	30	20	20	30	20	20	30	30
60 - 70	15	15	15	15	15	20	15	20	25	15	15	25	15	15	25	25
70 - 80	0	15	15	0	15	15	0	15	20	0	15	20	0	15	20	20
80 - 90	0	0	15	0	0	15	0	0	15	0	0	15	0	0	15	15
>90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Seedbed soil moisture conditions at seeding D = 25%; M = 50%; W = 75% of field capacity.

Table 9. Approximate probability of a greater than 2 bu/ac and 5 bu/ac wheat response to phosphate fertilizer when following recommendations											
Soil test P (lb/ac)	Brown		Dark Brown		Thin Black		Black		Gray Wooded		Irrigated
	>2	>5	>2	>5	>2	>5	>2	>5	>2	>5	
	%										
0 - 10	95	75	95	80	95	95	95	95	95	90	80
10 - 20	90	70	90	75	95	80	95	90	90	80	70
20 - 30	80	60	80	65	90	70	90	80	80	70	60
30 - 40	80	50	70	55	85	60	85	70	75	60	50
40 - 50	60	40	60	45	80	50	80	60	70	50	40
50 - 60	50	30	50	35	70	40	70	50	60	40	30
60 - 70	40	30	40	30	50	30	50	30	50	30	30
70 - 80	30	20	30	25	40	25	40	25	40	25	25
>80	25	20	25	20	30	25	30	25	35	25	25

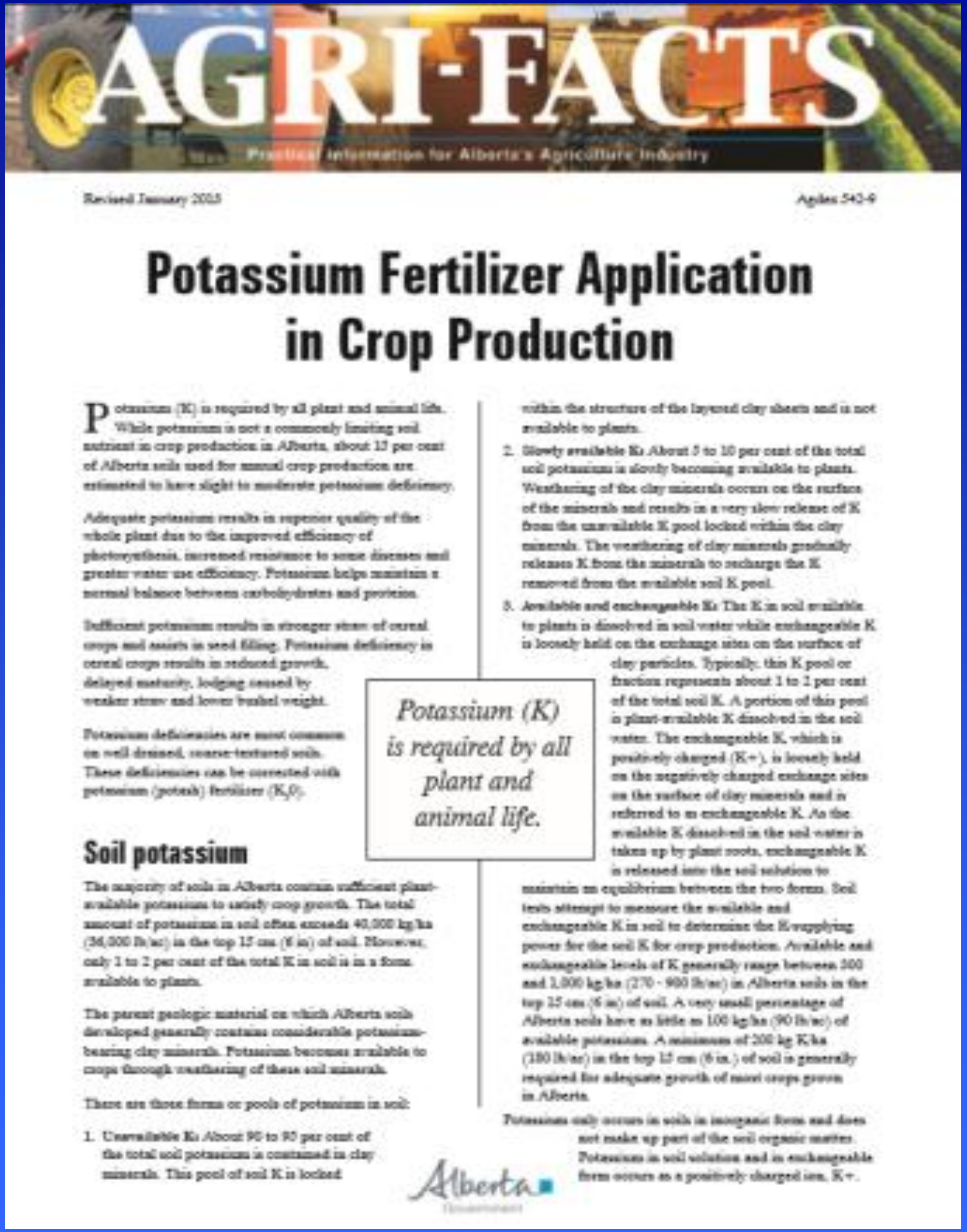
Why is seed-placed or band placement of P near the seed important?

- **P is very immobile!**
- **Most effective when soil P is low**
- **Placement with the seed can provide a starter or pop-up effect – in cool, wet soils**
- **Is often the most effectively placement method – except when soils are drier!**
- **Be aware of maximum safe seed-placed rates!!**



Potassium - K

Potash - K_2O



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Revised January 2015 Agdex 542-9

Potassium Fertilizer Application in Crop Production

Potassium (K) is required by all plant and animal life. While potassium is not a commonly limiting soil nutrient in crop production in Alberta, about 13 per cent of Alberta soils used for annual crop production are estimated to have slight to moderate potassium deficiency.

Adequate potassium results in superior quality of the whole plant due to the improved efficiency of photosynthesis, increased resistance to some diseases and greater water use efficiency. Potassium helps maintain a normal balance between carbohydrates and proteins.

Sufficient potassium results in stronger straw of cereal crops and assists in seed filling. Potassium deficiency in cereal crops results in reduced growth, delayed maturity, lodging caused by weaker straw and lower bushel weight.

Potassium deficiencies are most common on well drained, coarse-textured soils. These deficiencies can be corrected with potassium (potash) fertilizer (K_2O).

Potassium (K) is required by all plant and animal life.

Soil potassium

The majority of soils in Alberta contain sufficient plant-available potassium to satisfy crop growth. The total amount of potassium in soil often exceeds 40,000 kg/ha (36,000 lb/ac) in the top 15 cm (6 in) of soil. However, only 1 to 2 per cent of the total K in soil is in a form available to plants.

The parent geologic material on which Alberta soils developed generally contains considerable potassium-bearing clay minerals. Potassium becomes available to crops through weathering of these soil minerals.

There are three forms or pools of potassium in soil:

1. Unavailable K: About 90 to 98 per cent of the total soil potassium is contained in clay minerals. This pool of soil K is locked within the structure of the layered clay sheets and is not available to plants.
2. Slowly available K: About 5 to 10 per cent of the total soil potassium is slowly becoming available to plants. Weathering of the clay minerals occurs on the surface of the minerals and results in a very slow release of K from the unavailable K pool locked within the clay minerals. The weathering of clay minerals gradually releases K from the minerals to recharge the K removed from the available soil K pool.
3. Available and exchangeable K: The K in soil available to plants is dissolved in soil water while exchangeable K is loosely held on the exchange sites on the surface of clay particles. Typically, this K pool or fraction represents about 1 to 2 per cent of the total soil K. A portion of this pool is plant-available K dissolved in the soil water. The exchangeable K, which is positively charged (K+), is loosely held on the negatively charged exchange sites on the surface of clay minerals and is referred to as exchangeable K. As the available K dissolved in the soil water is taken up by plant roots, exchangeable K is released into the soil solution to maintain an equilibrium between the two forms. Soil tests attempt to measure the available and exchangeable K in soil to determine the K-supplying power for the soil K for crop production. Available and exchangeable levels of K generally range between 300 and 1,000 kg/ha (270 - 900 lb/ac) in Alberta soils in the top 15 cm (6 in) of soil. A very small percentage of Alberta soils have as little as 100 kg/ha (90 lb/ac) of available potassium. A minimum of 200 kg K/ha (180 lb/ac) in the top 15 cm (6 in.) of soil is generally required for adequate growth of most crops grown in Alberta.

Potassium only occurs in soils in inorganic form and does not make up part of the soil organic matter. Potassium in soil solution and in exchangeable form occurs as a positively charged ion, K+.

Alberta Government

Soil Potassium Rating
For most annual Alberta Crops

Soil K: 0-6" (lb/ac)	Rating	
<100	Extremely deficient	K Recommended
100-150	Very deficient	K Recommended
150-200	Moderately deficient	K Recommended
200-250	Marginally deficient	K Recommended
250-300	Adequate - Maintenance appl.	
>300	Adequate K NOT Required for most annual crops	

Response of Barley to K

Soil Test K (lb/ac)	No. of Responsive Research Sites (%)
>50	100
50-100	75
100-150	66
150-200	24
200-250	18
>250	3

Table 3. Soil test potassium and corresponding recommended rate of potassium application for cereal crops for the various soil zones in Alberta

Soil test K (lb/ac in 0-6 in. depth)		Brown soil	Dark Brown soil	Thin Black soil	Black soil	Dark Gray and Gray soil	Irrigated soils
		($lb\ K_2O/ac$)					
0 - 50	Very deficient	80-100	90-110	90-110	95-115	95-115	100-120
50 - 100		60-80	65-90	65-90	70-95	70-95	80-100
100 - 150		40-60	45-65	45-65	50-70	50-70	60-80
150 - 200	Moderately deficient	20-40	25-45	25-45	30-50	30-50	40-60
200 - 250		15-20	15-25	15-25	15-30	15-30	20-40
250 - 300	marginal	0-15	0-15	0-15	0-15	0-15	0-15
>300	adequate	0	0	0	0	0	0

* Rates above 30 lb K_2O/ac for cereals crops should be banded or broadcast to avoid seedling injury. At low rates of application, placement with the seed is more effective than banding, and banding is more effective than broadcast (see Methods of Application section).

K Fertilizer Application:

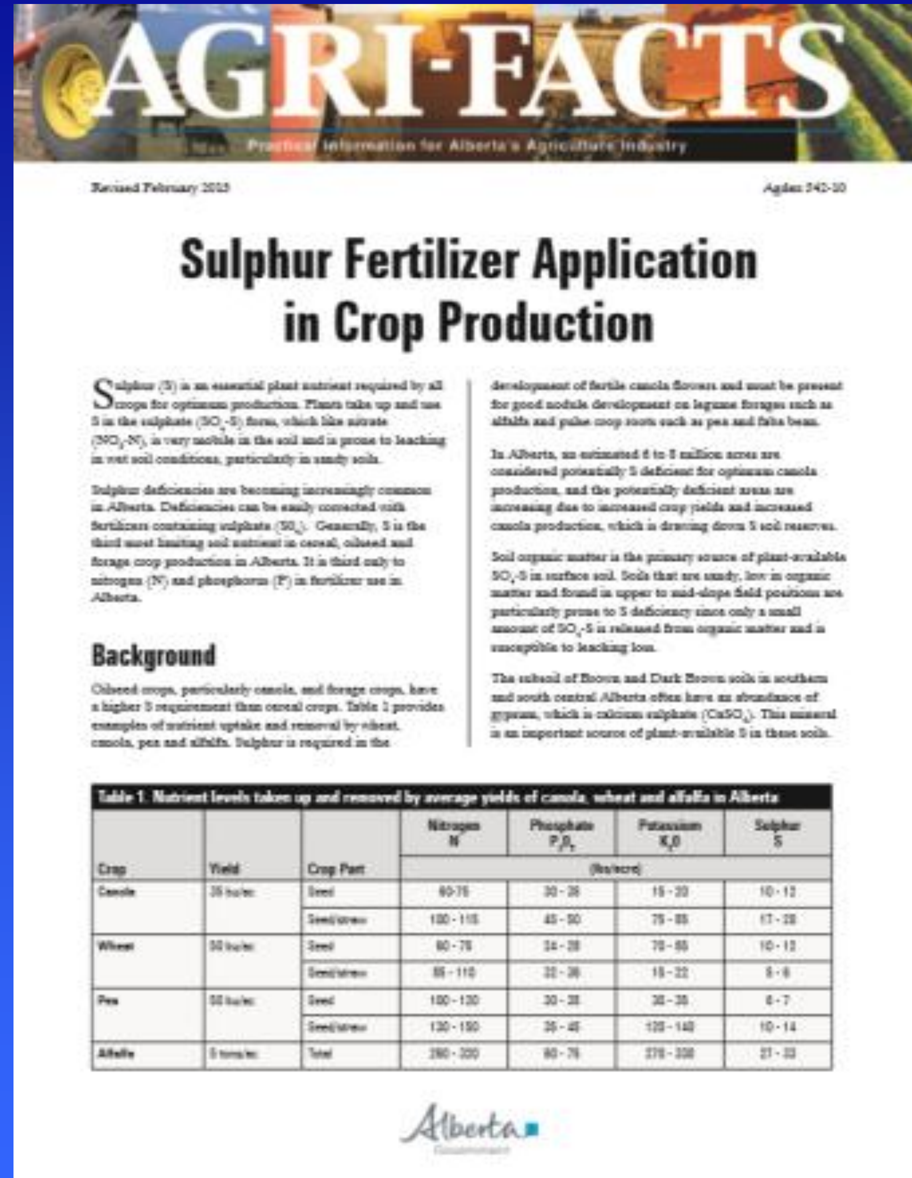
- **Irrigated sandy soils that are intensively cropped to alfalfa, potatoes or sugar beets – are most susceptible to K deficiency**

- **K fertilizer has limited movement in soil –**
  - **placement <u>near</u> the seed will improve uptake.**

- **KCl fertilizer has a high salt index**
  - **too much seed-placed K will decrease emergence**

Sulfate Sulfur (SO_4^{-2} – S)

Elemental Sulfur (S)



Revised February 2015

Agdex 542-10

Sulphur Fertilizer Application in Crop Production

Sulphur (S) is an essential plant nutrient required by all crops for optimum production. Plants take up and use S in the sulphate (SO_4-S) form, which like nitrate (NO_3-N), is very mobile in the soil and is prone to leaching in wet soil conditions, particularly in sandy soils.

Sulphur deficiencies are becoming increasingly common in Alberta. Deficiencies can be easily corrected with fertilizers containing sulphate (SO_4). Generally, S is the third most limiting soil nutrient in cereal, oilseed and forage crop production in Alberta. It is third only to nitrogen (N) and phosphorus (P) in fertilizer use in Alberta.

Background

Oilseed crops, particularly canola, and forage crops, have a higher S requirement than cereal crops. Table 1 provides examples of nutrient uptake and removal by wheat, canola, pea and alfalfa. Sulphur is required in the development of fertile canola flowers and must be present for good nodule development on legume forages such as alfalfa and pulse crop roots such as pea and faba bean.

In Alberta, an estimated 6 to 8 million acres are considered potentially S deficient for optimum canola production, and the potentially deficient areas are increasing due to increased crop yields and increased canola production, which is drawing down S soil reserves.

Soil organic matter is the primary source of plant-available SO_4-S in surface soil. Soils that are sandy, low in organic matter and found in upper to mid-slope field positions are particularly prone to S deficiency since only a small amount of SO_4-S is released from organic matter and is susceptible to leaching loss.

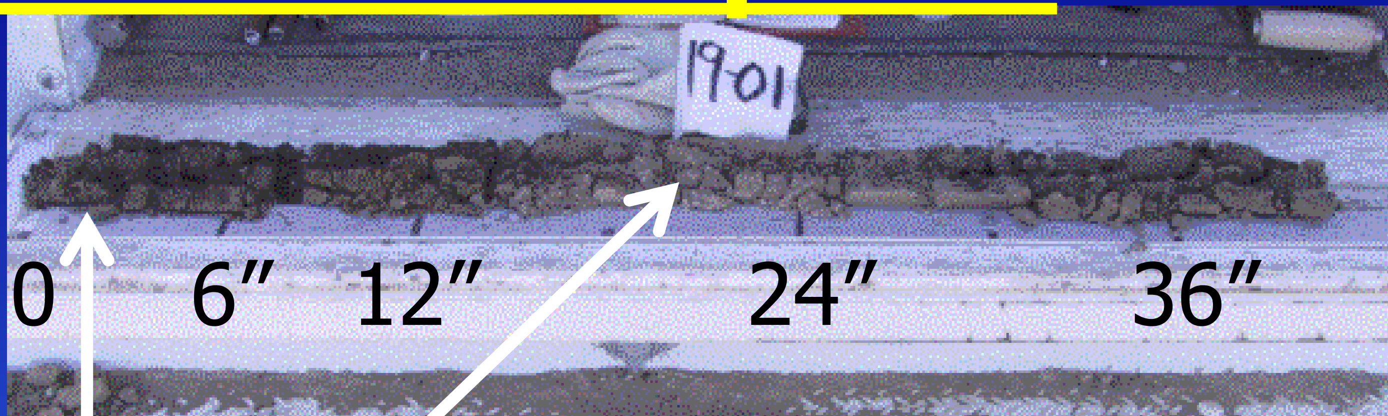
The subsoil of Brown and Dark Brown soils in southern and south central Alberta often have an abundance of gypsum, which is calcium sulphate ($CaSO_4$). This mineral is an important source of plant-available S in these soils.

Table 1. Nutrient levels taken up and removed by average yields of canola, wheat and alfalfa in Alberta

Crop	Yield	Crop Part	Nitrogen N	Phosphate P_2O_5	Potassium K_2O	Sulphur S
			(lbs/acre)			
Canola	35 bu/ac	Seed	60-75	30 - 35	15 - 20	10 - 12
		Seed/straw	100 - 115	45 - 50	75 - 85	17 - 20
Wheat	50 bu/ac	Seed	60 - 75	24 - 28	70 - 85	10 - 12
		Seed/straw	85 - 110	22 - 28	15 - 22	5 - 6
Pea	50 bu/ac	Seed	100 - 120	30 - 33	30 - 35	6 - 7
		Seed/straw	130 - 150	35 - 45	120 - 140	10 - 14
Alfalfa	5 tons/ac	Total	280 - 330	60 - 75	270 - 330	27 - 33

Alberta

Sources of Sulphate



- Gypsum salts are frequently in higher amounts in subsoil – source of S for crops
- Irrigation water (12") adds 30 lb $S0_4$/ac
- But – surface soil can be deficient especially in wet years if sulphate moves downward

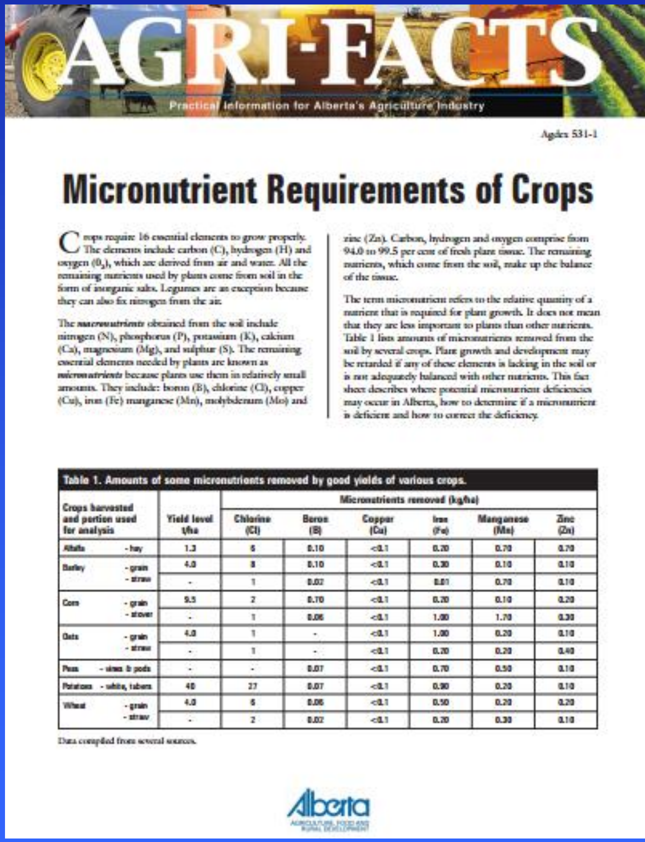
General sulphur fertilizer recommendations for Alberta crops.

Soil test level S (lb/ac)[z]	S recommendation (lb/ac)		
(0 to 6 + 6 to 12 inch depth)	Grains	Canola	Pulse
30	0	0	0
20 - 30	0	10	5
15 - 20	5	15	10
10 - 15	10	20	15
5 - 10	15	25	20
0 - 5	20	30	25

[z] CaCl extraction method.

Micronutrients in Southern AB

- Micronutrient deficiencies have rarely been observed in Southern AB.
- Fertilizer trials on irrigated soils in S AB in the in the past (>200 trials) did not show response to any micronutrient fertilizers.
- Irrigated dry bean is the only crop that has shown response to zinc



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Agdex 531-1

Micronutrient Requirements of Crops

Crops require 16 essential elements to grow properly. The elements include carbon (C), hydrogen (H) and oxygen (O_2), which are derived from air and water. All the remaining nutrients used by plants come from soil in the form of inorganic salts. Legumes are an exception because they can also fix nitrogen from the air.

The *macronutrients* obtained from the soil include nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulphur (S). The remaining essential elements needed by plants are known as *micronutrients* because plants use them in relatively small amounts. They include: boron (B), chlorine (Cl), copper (Cu), iron (Fe) manganese (Mn), molybdenum (Mo) and zinc (Zn). Carbon, hydrogen and oxygen comprise from 94.0 to 99.5 per cent of fresh plant tissue. The remaining nutrients, which come from the soil, make up the balance of the tissue.

The term micronutrient refers to the relative quantity of a nutrient that is required for plant growth. It does not mean that they are less important to plants than other nutrients. Table 1 lists amounts of micronutrients removed from the soil by several crops. Plant growth and development may be retarded if any of these elements is lacking in the soil or is not adequately balanced with other nutrients. This fact sheet describes where potential micronutrient deficiencies may occur in Alberta, how to determine if a micronutrient is deficient and how to correct the deficiency.

Table 1. Amounts of some micronutrients removed by good yields of various crops.

Crops harvested and portion used for analysis		Yield level t/ha	Micronutrients removed (kg/ha)					
			Chlorine (Cl)	Boron (B)	Copper (Cu)	Iron (Fe)	Manganese (Mn)	Zinc (Zn)
Alfalfa	- hay	1.3	6	0.10	<0.1	0.20	0.70	0.70
Barley	- grain	4.0	8	0.10	<0.1	0.30	0.10	0.10
	- straw	-	1	0.02	<0.1	0.01	0.70	0.10
Corn	- grain	9.5	2	0.70	<0.1	0.20	0.10	0.20
	- stover	-	1	0.06	<0.1	1.00	1.70	0.30
Oats	- grain	4.0	1	-	<0.1	1.00	0.20	0.10
	- straw	-	1	-	<0.1	0.20	0.20	0.40
Peas	- vines & pods	-	-	0.07	<0.1	0.70	0.50	0.10
Potatoes	- white, tubers	40	27	0.07	<0.1	0.90	0.20	0.10
Wheat	- grain	4.0	6	0.06	<0.1	0.50	0.20	0.20
	- straw	-	2	0.02	<0.1	0.20	0.30	0.10

Data compiled from several sources.

Alberta

Table 2. Range levels of micronutrients in soils.

	Deficient	Medium	Adequate
Boron (Hot Water Extracatable - ppm)	0.0 - 0.4	0.5 - 1.2	>1.2
Chlorine (Water Extractable - ppm)	0.0 - 8.0[a]	-	-
Copper (DTPA Extractable - ppm)	0.0 - 0.2[b]	0.3 - 1.0	>1.0
	0.0 - 0.5[c]	0.6 - 1.0	>1.0
	0.0 - 2.5[d]	-	>2.5
Iron (DTPA Extractable - ppm)	0.0 - 2.0	2.0 - 4.5	>4.5
Manganese (DTPA Extractable - ppm)	0.0 - 1.0	-	>1.0
Zinc (DTPA Extractable - ppm)	0.0 - 0.5	0.5 - 1.0	>1.0

[a] This level is used by some labs as a critical level for recommending Cl for disease suppression in cereals.
[b] Brown and Dark Brown soil areas.
[c] Black and Grey Wooded soil areas.
[d] Organic soils.

If a micronutrient soil test is deficient OR Micronutrients are recommended to you ---

Seek opinion from unbiased experts for advice!

Other Sources of Fertilizer Information

AGRI-FACTS
Practical information for Alberta's Agriculture Industry

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Fertilizer and Nutrient Management of Timothy Hay

Timothy has a relatively high demand for nutrients. Under excellent moisture conditions or irrigation and when supplied with the optimum nutrients, timothy is capable of producing yields in the range of 5 to 6 t… acre, typically 3 to 3.5 tons for first cut and 1.5 to 2… for second. With reasonable precipitation, non-irr… timothy will produce 2 to 4 tons/acre annually.

Table 1 provides approximate amounts of each nut… removed per ton of timothy dry matter. Nutrients … removed are not necessarily closely related to ferti… requirements.

Table 1. Approximate nutrient removal per to… timothy dry matter forage

Nutrient	Amount Remov… (lb/ton)*
Nitrogen (N)	35.0
Phosphorus (P)	4.0
Phosphate (P_2O_5)	10.0
Potassium (K)	40.0
Potash (K_2O)	50.0
Calcium (Ca)	7.0
Magnesium (Mg)	5.0
Boron (B)	0.08
Copper (Cu)	0.01
Iron (Fe)	0.3
Manganese (Mn)	0.1
Molybdenum (Mo)	0.002
Zinc (Zn)	0.05

* Amounts of removal are approximate and vary dependin… growing season conditions

Soil testing

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Fertilizing Grass for Hay and Pasture

An important part of efficient livestock production is ensuring there is sufficient grass for both hay and pasture. However, low soil nutrient levels often limit forage production. With good soil fertility and fertilizer management, the productivity of many hay and pasture fields can be greatly improved.

Brown and Dark Brown soils in southern and east-central Alberta have several characteristics:

- often deficient in nitrogen (N)
- often moderately deficient in phosphorus (P)
- rarely deficient in potassium (K) and sulphur (S)

Two key conditions affect Black, Gray Wooded and Gray-Black transition soils in central and northern Alberta:

- commonly deficient in nitrogen and phosphorus
- occasionally deficient in potassium and sulphur, particularly in sandy soils

This fact sheet reviews the following:

- grass nutrient requirements
- fertilizer practices that can aid Alberta producers to optimize grass production
- several soil sampling techniques and their suitability

Nutrient requirements and yield potential

Grass has a relatively high demand for nutrients. Table 1 provides approximate amounts of nutrient removed per ton of dry matter. Removal will vary depending on grass species and growing conditions.

Table 1. Nutrient removal per ton of grass

Nutrient	Nutrient removed (lb/ton – dry matter basis)[z]
Nitrogen (N)	30 to 35
Phosphorus (P)	4
Phosphate (P_2O_5)[y]	10
Potassium (K)	40
Potash (K_2O)[x]	50
Calcium (Ca)	7
Magnesium (Mg)	5
Sulphur (S)	5
Boron (B)	0.08
Copper (Cu)	0.01
Iron (Fe)	0.3
Manganese (Mn)	0.1
Molybdenum (Mo)	0.002
Zinc (Zn)	0.05

[z] Amounts of removal are approximate and vary depending on grass species and growing season conditions.
[y] To convert P to P_2O_5, multiply P by 2.3
[x] To convert K to K_2O, multiply K by 1.6

Grass grown under irrigation or with optimum precipitation and nutrients is capable of producing high annual yields of over 5 tons/ac. However, under dryland rain-fed conditions, yields of 1.5 to 4 tons/ac are more common.

Nutrient requirements

Nitrogen is often the most limiting nutrient in grass production across Alberta. A 3 ton/ac grass crop will remove 90 to 100 lbs N/ac. Little research data is available on what the economic rates of nitrogen fertilizer are for grass production in Alberta.

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Mustard Production for Alberta

Mustard is an important special crop grown on the Canadian prairies. It is well suited to production in the southern prairies including the Brown and Dark Brown soil zones.

Mustard has allowed producers in the drier regions to add an oilseed crop to their rotations, which has helped disrupt pest cycles, increase moisture use efficiency and increase farm income.

Mustard factsheet topics

- mustard types and uses
- production and variety selection
- cropping systems and rotations
- water use and yield
- benefits and establishment
- seeding and fertilizing
- weed control, disease management and insect pests
- harvesting, drying and storage

Background

Mustard i… value rang… annually. … primarily … Saskatche… (150,000 s… tonnes of …

Mustard i… tolerant to… condimen… and orient… grown in …

Table 1. Mustard production in Canada from 1998 to 2008

Year	Harvested area (ha)	Average yield (t/ha)
1998	279,000	0.85
1999	273,000	1.12
2000	208,000	0.97
2001	158,000	0.86
2002	255,000	0.61
2003	328,000	0.69
2004	304,000	1.0
2005	206,000	0.98
2006	130,000	0.84
2007	176,000	0.70
2008	186,000	0.87
Mean	227,500	0.845

(Source: Statistics Canada)

Alberta Government
agriculture.alberta.ca

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Agronomic and Fertilizer Management of Barley in Alberta

Barley production in Canada is focused primarily in the prairie provinces of Alberta, Saskatchewan and Manitoba (Table 1). Approximately 94 per cent of barley of production in Canada is in the prairie provinces, with Alberta generally producing the most. Barley is the third most commonly grown crop on the prairies, after wheat and canola.

Barley production

Barley production in Alberta is primarily for grain for malt or livestock feed with lesser amounts grown for silage for the feedlot industry. Most of the barley production in Alberta is rain fed. A small proportion of barley is grown under irrigation in Alberta. In 2007, some 72,000 and 37,000 hectares (ha) were seeded to irrigated barley for grain and silage production, respectively.

Western Canadian barley production has averaged 12 million metric tones (MMT) annually over the last 10 years (1998 to 2007), of which approximately 9 MMT has been malt barley varieties (Table 1). However, the selection of barley for malt quality is generally only 25 to 30 per cent of malt barley production.

Currently, 2-row malting barley varieties dominate western Canada's malting barley production, accounting for approximately 50 per cent of total seeded area, with 6-row malting varieties at about 10 to 15 per cent.

The remaining seeded area is devoted primarily to feed varieties. As a result, about 2.5 MMT of total production is used for malt with the remaining production used for livestock feed or export. In the future, with increasing demand by Asian markets, the malt selection rate could potentially increase to 40 per cent of current malt variety production.

top 2-row malt grades have returned a premium of almost $50.00 per acre (ac) over feed market prices.

The challenge in the future for prairie farmers will be production of the newest malt barley varieties with a careful focus on agronomic practices including crop rotations for disease management, seeding dates, seeding rates and fertilizer management to ensure barley seed production will meet malt quality standards.

Table 1. Barley production in Canada in 2007 and the average of 1998 to 2007

	2007	1998 - 2007 Average
	Hectares (per cent)	
Canada	4,398,114	4,623,986
Eastern provinces		
Prince Edward Island	34,399 (0.7)	38,529 (0.7)
Nova Scotia	2,832 (0.06)	4,223 (0.09)
New Brunswick	14,569 (0.03)	15,549 (0.3)
Quebec	95,022 (2.2)	128,336 (2.8)
Ontario	68,798 (1.6)	111,484 (2.4)
Western provinces		
Manitoba	412,788 (9.4)	437,383 (9.5)
Saskatchewan	1,780,655 (40.5)	1,854,412 (40.1)
Alberta	1,962,768 (44.6)	1,998,976 (43.2)
British Columbia	24,281 (0.5)	37,060 (0.8)

(Source: Statistics Canada Table 001-0017, Field Crop Reporting …

Questions ?

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