CANADA—DEPARTMENT OF TRADE AND COMMERCE
DOMINION BUREAU OF STATISTICS
MINING, METALLURGICAL AND CHEMICAL BRANCH

THE FERTILIZER TRADE IN CANADA

July 1, 1934—June 30, 1935

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PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1936

THE FERTILIZER TRADE IN CANADA

JULY 1, 1934-JUNE 30, 1935

By

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Chief of the Mining, Metallurgical and Chemical Branch

Production and sales of fertilizers in Canada during the fertilizer year ending June 30, 1935, showed marked increases over the preceding twelve months, according to the annual survey made by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics, in co-operation with the Fertilizer Division of the Department of Agriculture.

During the period under review, sales in Canada of fertilizer materials which were not used for manufacturing purposes totalled 104,711 tons and sales of mixed fertilizers reached 107,768 tons, a grand total of 212,479 tons as compared with 194,851 tons during the preceding fertilizer year.

Plants for the manufacture of fertilizers are conveniently located across Canada to meet the demands of the consumers. By far the largest tonnage is used in Ontario, Quebec and the Maritimes, but gradually the western provinces are using more fertilizer.

Superphosphate is used on the largest scale as the material for single application in Eastern Canada and British Columbia, while ammonium phosphate is more popular in the Prairie Provinces.

Large quantities of mixed fertilizers are used in the production of potatoes and garden crops throughout Canada, while the quantity used for general field crops is increasing year by year. Tobacco growing in south-western Ontario requires annually large quantities of special mixtures.

Production, Imports and Exports.—An analysis of the records received by the Bureau indicates that 20 plants were engaged in making mixed fertilizer in Canada during the year; 26 were manufacturing fertilizer materials; 6 firms made both. Reports were received from 5 companies which operated as dealers only. There were 34 importers and 20 exporters.

Production of fertilizers totalled 387,905 short tons of which 128,453 tons were mixed fertilizers. The principal fertilizer materials produced were calcium cyanamide totalling 107,059 tons, an increase of 29·3 per cent over the preceding year; sulphate of ammonia, 72,356 tons, a decrease of 10·4 per cent from the previous twelve-month output; superphosphate, 49,903 tons as compared with 45,179 tons for the twelve-month period ending June 30, 1934; ammonium phosphate, 24,395 tons, which was more than double the amount for the corresponding period of the year before. Other important fertilizer materials included bone meal and bone flour, 1,154 tons; tankage, 2,004 tons; dried blood, 743 tons; whale products, 542 tons; fish meal, 1,296 tons.

Imports of fertilizer materials totalled 195,297 tons, including superphosphate, 71,073 tons; muriate of potash, 45,628 tons; natural phosphate rock, 36,854 tons; nitrate of soda, 9,100 tons; basic slag, 8,615 tons; sulphate of ammonia, 8,253 tons; potash manure salts and kainite, 7,504 tons; sulphate of potash, 3,921 tons. Lesser amounts of cyanamide, calcium nitrate, nitrochalk, bone meal and bone flour, tankage, sheep manure, fish meal, ammonium phosphate, dried blood and other materials were also imported.

Exports of mixed fertilizers and fertilizer materials totalled 187,461 tons, consisting principally of cyanamide, 103,696 tons; sulphate of ammonia, 52,010 tons; ammonium phosphate, 12,178 tons; superphosphate, 9,435 tons; mixed fertilizers, 7,929 tons.

Sales.—Sales of fertilizer materials and mixed fertilizers, including exports and excluding sales for the production of mixed fertilizers, totalled 399,940 tons as against 361,096 tons in the preceding year. Sales in Canada totalled 212,479 tons as compared with 194,851 tons during the twelve-month period ending June 30, 1934. In Prince Edward Island sales of fertilizer materials gained 18·6 per cent but mixed fertilizers dropped 32 per cent from 7,842 tons to 5,301 tons.

Nova Scotia sales of both mixed fertilizers and fertilizer materials gained approximately 12 per cent over the preceding fertilizer year. In New Brunswick sales of fertilizer materials were off about 7·5 per cent and a slight gain was noted in sales of mixed fertilizers. Quebec used 23 per cent more mixed fertilizers and 5 per cent more fertilizer materials; consumption of mixed grades in Ontario was greater by 22·5 per cent but fertilizer material sales were off 5 per cent. Purchases of fertilizer materials in the Prairie Provinces rose from 4,924 tons during the twelve months ending June 30, 1934, to 10,466 tons (principally ammonium phosphate) during the year ending June 30, 1935. A gain was noted also in the consumption of mixed fertilizers. Sales in British Columbia were less than in the preceding twelve months though the drop in the consumption of mixed fertilizers was not appreciable.

Table IV presents the details of sales of mixed fertilizers by grades in the various provinces of Canada. A mixture containing 2 per cent nitrogen, 12 per cent phosphoric acid, and 6 per cent potash was sold in larger quantities than any other kind. Of the 21,780 tons of this mixture sold, Ontario accounted for over fifteen thousand tons and over five thousand tons were sold in Quebec. The mixture next to this in total amount sold was a 4-8-10, and Prince Edward Island and Quebec used more of this grade than of any other. Nova Scotia farmers used various mixtures, some of the more important being: 2-10-4; 4-8-4; 4-8-7; 9-5-7; 4-6-10 and 5-10-5.

New Brunswick consumers favoured the following: 4-6-10; 4-8-13; 5-9-8; over fifteen hundred tons of a 2-10-4 mixture were also used. Quebec agriculturists used various grades and those used by Ontario consumers were more diversified than in any other province. Nearly half the total sales in British Columbia were made up of a 3-10-8 mixture, a grade not used to any extent in other Canadian provinces.

I.—Total Sales of Fertilizer Materials and Mixed Fertilizers for the Fertilizer Years ended June 30, 1934 and 1935

(Short tons)

Provinces	Fertilizer materials			Mixed fertilizers		
	1934	1935	Percentage increase + decrease −	1934	1935	Percentage increase + decrease −
	tons	tons	p.c.	tons	tons	p.c.
Prince Edward Island	9,644	11,440	+ 18·6	7,842	5,301	− 32·4
Nova Scotia	11,534	12,839	+ 11·3	14,222	16,011	+ 12·6
New Brunswick	16,584	15,333	− 7·5	12,841	12,957	+ 0·9
Quebec	24,994	26,245	+ 5·0	15,404	19,016	+ 23·4
Ontario	25,840	24,533	− 5·1	38,912	47,686	+ 22·5
Manitoba, Saskatchewan, and Alberta	4,924	10,466	+112·6	68	299	+339·7
British Columbia	5,435	3,855	− 29·1	6,607	6,498	− 1·6
Canada	**98,955**	**104,711**	+ 5·8	**95,896**	**107,768**	+ 12·4
Exported	153,017	179,532	+ 17·3	13,228	7,929	− 40·1
Grand Total	**251,972**	**284,243**	+ 12·8	**109,124**	**115,697**	+ 6·1

II.—Production in Canada, Imports and Exports of Fertilizers, as Reported by the Manufacturers and Importers during the Years ended June 30, 1934 and 1935

(Short tons)

Items	1934			1935		
	Manufactured	Imported	Exported	Manufactured	Imported	Exported
Mixed fertilizers	119,795	1,032	13,228	128,453	630	7,929
Sulphate of ammonia	80,753	7,395	71,442	72,356	8,253	52,010
Calcium cyanamide	82,755	40	71,802	107,059	106	103,696
Calcium nitrate	–	1,400	–	–	152	–
Nitrate of soda	–	8,892	180	–	9,100	209
Superphosphate*	45,179	70,165	2,953	49,903	71,073	9,435
Basic slag	–	1,992	4	–	8,615	11
Nitrochalk	–	61	6	–	56	1
Bone phosphate	–	25	–	–	–	–
Natural phosphate rock	–	13,426	–	–	36,854	–
Bone meal and bone flour	871	246	–	1,154	145	–
Muriate of potash	–	26,677	218	–	45,628	371
Sulphate of potash	–	3,502	41	–	3,921	81
Potash manure salts and kainite	–	7,038	–	–	7,504	–
Tankage	1,823	1,016	1,023	2,004	550	923
Sheep manure	–	429	–	–	787	–
Dried blood	874	20	413	743	10	345
Whale products	–	65	–	542	–	272
Fish meal	616	492	40	1,296	124	–
Ammonium phosphate	10,765	653	4,859	24,395	922	12,178
Other materials	1,522	1,189	36	–	867	–
Total	**344,953**	**145,755**	**166,245**	**387,905**	**195,297**	**187,461**

*Contains 16%, 20% and 45% superphosphate.

III.—Sales of Fertilizers, except for Manufacturing Purposes, during the Year ended June 30, 1935

(Short tons)

Fertilizers	P.E.I.	N.S.	N.B.	Que.	Ont.	Man., Sask. and Alta	B.C.	Total sold in Canada	Exported from Canada	Grand total
Nitrate of soda	116	1,884	1,075	266	773	1	188	4,303	209	4,512
Sulphate of ammonia	1,533	1,438	2,628	4,274	1,055	68	953	12,549	52,010	64,559
Calcium cyanamide	–	581	–	89	1,008	–	14	1,692	103,696	105,388
Nitrochalk	23	3	1	15	19	–	8	69	1	70
Calcium nitrate	–	280	–	7	–	–	8	295	–	295
Bone phosphate	–	–	–	–	3	–	1	4	–	4
Superphosphate	7,909	4,014	9,005	16,829	16,882	572	883	56,091	9,435	65,526
Natural phosphate rock	–	–	–	–	–	1	–	1	–	1
Basic slag	–	3,803	599	1,656	–	–	58	6,116	11	6,127
Bone meal and bone flour	–	98	25	36	506	68	404	1,137	–	1,137
Muriate of potash	1,859	727	1,941	2,370	1,130	2	372	8,401	371	8,772
Sulphate of potash	–	2	5	202	160	–	71	440	81	521
Potash manure salts and kainite	–	–	–	–	–	–	–	–	–	–
Tankage	–	4	15	90	559	47	312	1,027	923	1,950
Sheep manure	–	5	6	129	352	19	76	587	–	587
Dried blood	–	–	–	–	201	38	165	404	345	749
Whale products	–	–	1	–	–	–	15	16	272	288
Fish meal	–	–	–	–	–	–	90	90	–	90
Ammonium phosphate	–	–	32	6	866	9,650	237	10,791	12,178	22,969
Other fertilizer materials	–	–	–	276	419	–	–	695	–	695
Total Fertilizers	**11,440**	**12,839**	**15,333**	**26,245**	**24,533**	**10,466**	**3,855**	**104,711**	**179,532**	**284,243**
Total mixed fertilizers	5,301	16,011	12,957	19,016	47,686	299	6,498	107,768	7,929	115,697
Grand Total, 1935	**16,741**	**28,850**	**28,290**	**45,261**	**72,219**	**10,765**	**10,353**	**212,479**	**187,461**	**399,940**
Grand Total, 1934	**17,486**	**25,750**	**29,425**	**40,398**	**64,752**	**4,992**	**12,042**	**194,851**	**166,245**	**361,096**

IV.—Mixed Fertilizers Sold during the Year ended June 30, 1935

(Short tons)

Formulae			P.E.I.	N.S.	N.B.	Que.	Ont.	Man., Sask., Alta.	B.C.	Canada	Exported from Canada	Grand total
N	P_2O_5	K_2O										
0	10	10	–	–	–	69	44	–	–	113	–	113
0	10	16	–	–	–	–	–	–	311	311	–	311
0	12	6	–	–	–	14	4,582	–	–	4,596	–	4,596
0	12	10	–	–	–	–	370	–	169	539	–	539
0	12	15	–	–	–	–	715	–	–	715	–	715
2	8	4	–	–	19	645	3,308	–	–	3,972	–	3,972
2	8	5	–	–	–	–	1,919	–	–	1,919	–	1,919
2	8	6	–	–	–	–	418	–	–	418	–	418
2	8	10	–	–	–	270	772	–	–	1,042	–	1,042
2	8	16	–	–	–	–	410	–	–	410	–	410
2	8	24	–	–	–	–	51	–	–	51	–	51
2	10	4	124	2,486	1,516	–	–	–	–	4,126	122	4,248
2	10	6	–	–	–	–	243	–	–	243	–	243
2	10	8	–	–	–	–	3,280	–	–	3,280	–	3,280
2	12	6	409	672	250	5,085	15,362	2	–	21,780	8	21,788
2	12	10	–	–	–	725	879	–	–	1,604	–	1,604
2	16	6	–	–	–	18	3,515	3	7	3,543	–	3,543
3	7	10	–	–	–	–	–	–	84	84	–	84
3	8	4	–	–	45	1	1,074	–	–	1,120	30	1,150
3	8	6	–	–	–	56	192	–	–	248	–	248
3	9	6	–	–	–	–	320	–	–	320	–	320
3	10	5	–	–	–	14	2,646	–	2	2,662	–	2,662
3	10	6	–	–	–	2	1,020	–	–	1,022	–	1,022
3	10	8	–	–	–	–	40	151	3,131	3,322	–	3,322
3	12	5	–	–	–	–	91	–	–	91	–	91
4	6	10	1	1,283	2,310	3	–	–	–	3,597	313	3,910
4	8	4	–	2,986	167	167	13	–	–	3,333	188	3,521
4	8	6	–	–	240	94	1,458	–	–	1,792	–	1,792
4	8	7	746	2,213	453	3	–	–	–	3,415	385	3,800
4	8	10	2,642	488	166	8,213	2,759	13	–	14,281	547	14,828
4	8	13	670	305	3,285	–	–	–	19	4,285	27	4,312
4	8	15	398	–	–	–	–	–	–	398	–	398
4	9	4	–	–	–	–	190	–	–	190	–	190
4	10	8	3	3	–	22	29	–	5	62	1	63
4	10	10	–	–	–	–	–	1	1,202	1,203	–	1,203
4	12	4	–	–	–	15	272	–	2	289	–	289
4	12	6	–	–	–	6	182	–	–	188	–	188
5	6	9	–	–	–	275	–	–	–	275	–	275
5	8	7	–	38	96	1,152	400	–	–	1,686	291	1,977
5	8	10	–	–	23	–	48	–	–	71	275	346
5	8	12	–	13	989	58	–	–	–	1,060	2,235	3,295
5	9	8	301	1,052	3,233	5	4	–	–	4,595	2,278	6,873
5	10	5	–	2,117	76	–	187	4	313	2,697	79	2,776
5	10	10	–	–	–	–	–	–	–	–	121	121
5	12	2	–	2	5	42	37	–	91	177	1	178
6	6	5	–	–	–	–	256	–	–	256	–	256
6	7	4	–	–	–	–	–	–	369	369	–	369
6	7	10	–	–	–	–	–	–	188	188	–	188
6	8	10	–	–	1	1,394	135	–	–	1,530	–	1,530
6	10	10	–	–	–	–	–	–	386	386	–	386
7	5	2	–	7	1	18	60	2	9	97	3	100
8	16	14	–	–	–	–	–	–	–	–	176	176
8	16	16	–	–	–	–	75	–	–	75	–	75
8	16	20	–	–	–	146	–	–	–	146	–	146
9	5	7	1	2,312	–	200	42	–	–	2,555	–	2,555
10	5	2	–	–	–	39	14	–	–	53	2	55
12	16	20	–	–	4	–	2	–	–	6	790	796
Other mixtures			–	34	78	265	272	123	210	982	57	1,039
Total			**5,301**	**16,011**	**12,957**	**19,016**	**47,686**	**299**	**6,498**	**107,768**	**7,929**	**115,697**

V.—Nitrogen, Phosphoric Acid and Potash contained in Mixed Fertilizers Sold in Canada, during the Years ended June 30, 1934 and 1935

(Short tons)

Provinces	1934				1935			
	Total tonnage	Nitrogen	Phosphoric acid	Potash	Total tonnage	Nitrogen	Phosphoric acid	Potash
	tons	lb.	lb.	lb.	tons	lb.	lb.	lb.
Prince Edward Island	7,842	620,240	1,272,540	1,515,860	5,301	400,880	875,880	1,015,980
Nova Scotia	14,222	1,236,120	2,333,820	1,680,840	16,011	1,450,900	2,528,580	1,978,920
New Brunswick	12,841	1,026,400	2,063,320	2,551,920	12,957	1,057,440	2,127,140	2,353,280
Quebec	15,404	1,194,070	2,713,410	2,599,620	19,016	1,360,800	3,522,920	3,188,560
Ontario	38,912	1,792,880	8,246,220	4,651,280	47,686	2,089,050	10,289,020	6,205,900
Manitoba, Saskatchewan and Alberta	68	6,020	17,880	6,120	299	18,020	54,700	32,820
British Columbia	6,607	445,660	1,300,260	1,094,260	6,498	457,690	1,257,260	1,091,800
Exported from Canada	13,228	1,274,300	2,322,920	2,447,660	7,929	870,280	1,469,620	1,652,280
Total	**109,124**	**7,595,780**	**20,270,370**	**16,547,560**	**115,697**	**7,704,970**	**22,125,120**	**17,519,540**
Miscellaneous (no analyses given)	255	–	–	–	316	–	–	–

VI.—Reporting Companies

Nature of Trade*	Names	Addresses
m.m.f.; i.	Agricultural Chemicals, Ltd.	Port Hope, Ont
m.s.a.; e.	Algoma Steel Corporation, Ltd.	Sault Ste. Marie, Ont.
d.; i.	Aldershot Distributing Co-op. Co., Ltd.	Aldershot, Ont.
d.; i.	Associated Shippers Inc.	Charlottetown, P.E.I.
	B.C. Electric Railway Co.	425 Carrall St., Vancouver, B.C.
d.; i.	Buckerfield's, Limited	Vancouver, B.C.
m.o.; e.	Burns, P. and Company	Calgary, Alta.
m.o.; e.	" "	Edmonton, Alta.
	" "	Regina, Sask.
m.o.; e.	" "	Winnipeg, Man.
m.m.f.; o.; i.	" "	Vancouver, B.C.
d.	Canada and Dominion Sugar Co., Ltd.	Chatham, Ont.
m.m.f.; o.; i.	Canada Packers Limited	West Toronto, Ont.
m.m.f.; i.; e.	" "	Montreal, Que.
m.m.f.; i.; e.	" "	St. John, N.B.
m.m.f.; i.; e.	Canadian Fertilizer Co., Ltd.	Chatham, Ont.
m.m.f.; s.p.; i.; e.	Canadian Industries, Limited	Montreal, Que., Plants at Halifax, N.S., Beloeil, Que., Hamilton, Ont., and New Westminster, B.C.
m.o.; e.	Canadian Packing Co., Ltd.	Peterborough, Ont.
m.m.f.; d.; i.	Chase, Geo. A.	Port Williams, N.S.
m.o.	City Renderers Ltd.	Montreal, Que.
d.	Clarkson Dixie Fruit Growers' Assn.	Clarkson, Ont.
m.m.f.; i.; e.	Colonial Fertilizer Works	Windsor, N.S.
m.m.f.; a.p.; s.p.; s.a.; e.	Consolidated Mining & Smelting Co. of Canada, Ltd.	Trail, B.C.
m.o.; e.	Consolidated Whaling Corp.	Victoria, B.C.
d.; i	Co-operative Fédérée de Quebec	130 St. Paul St. E., Montreal, Que.
m.s.a.	Dominion Steel & Coal Corp., Ltd.	Sydney, N.S.
m.o.; e.	Dumart's Limited	Kitchener, Ont.
d.	The T. Eaton Co., Ltd.	Winnipeg, Man.
m.o.	Fearman Co., Ltd.	226 Rebecca St., Hamilton, Ont.
m.o.	Gainers Limited	South Edmonton, Alta.
m.o.; i.	The Globe Fertilizer Co.	Vancouver, B.C.
d.; i.	The Earle M. Grose Fertilizers	West Toronto, 9, Ont.
m.s.a.; e.	Hamilton By-Product Coke Ovens, Ltd.	Hamilton, Ont.
m.o.	Harris, W. Co., Limited	200 Keating St., Toronto, Ont.
	International Agricultural Corp.	708 Stock Exchange Bldg., Buffalo, N.Y., U.S.A.
m.m.f.; i.	International Fertilizers Ltd.	71 St. Peter St., Quebec, Que.
m.m.f.; i.; e.	International Fertilizers Ltd.	Saint John, N.B.
d.i.; e.	Island Fertilizer Co., Ltd.	Charlottetown, P.E.I.
m.o.; i.	Marquis (Estate F. Canac Marquis)	3 rue Courcelette, Quebec, Que.
	Milwaukee Sewerage Commission	Milwaukee, Wis., U.S.A.
m.s.a.	Montreal Coke Manufacturing Co.	P.O. Box 1660, Montreal, Que.
d.	Mount MacKay Feed Co.	Fort William, Ont.
m.o.	Nelson Bros. Fisheries, Ltd.	Vancouver, B.C.
d.; i.	New Brunswick Agricultural Societies	East Centreville, N.B.
m.e.; e.; i.	North American Cyanamid Co.	Niagara Falls, Ont.
d.; e.	Paterson, R. Downing	89 Water St., Saint John, N.B.
d.; i.	P.E.I. Potato Growers' Assoc., Inc.	Charlottetown, P.E.I.
i.	Potash Company of Canada	814 Royal Bank Bldg., Montreal, Que.
i.	Pulverized Manure Co.	Chicago, U.S.A.
d.; i.	Riendeau, H.	St. Rémi, Que.
m.o.	Rupert Marine Products Ltd.	P.O. Box 1694, Prince Rupert, B.C.
m.m.f.; i.	Saguenay Fertilizer Company	Chicoutimi, Que.
d.	St. Catharines Cold Storage & Forwarding Co., Ltd.	Davidson St., St. Catharines, Ont.
m.m.f.	Sayer and Son, Ltd.	509 Richards St., Vancouver, B.C.
m.o.	Schneiders Limited, J. M.	321 Courtland Ave. E., Kitchener, Ont.
m.m.f.; i.	Scottish Fertilizers, Ltd.	Welland, Ont.
i.	Standard Trading Company Ltd.	604 Dominion Square Building, Montreal, Que.
m.s.a.	Steel Company of Canada, Ltd.	Hamilton, Ont.
m.m.f.; i.	Stone, Wm. and Sons, Limited	Ingersoll, Ont.
m.m.f.; i.; e.	Summers Fertilizer Co., Ltd.	St. Stephen, N.B.
m.m.f.; o.; e.	Swift Canadian Company, Limited	Keele & St. Clair, West Toronto, Ont.
m.m.f.	Toronto Chemical & Fertilizer Co.	248 Keele St., Toronto, Ont.
d.; i.	United Farmers' Cooperative Co., Limited	Toronto, Ont.

VI.—Reporting Companies—concluded

Nature of Trade*	Names	Addresses
d.; i.	United Fruit Companies of Nova Scotia, Ltd...	Kentville, N.S.
d.; i.	Witts Fertilizer Works.....	Norwich, Ont.
m.m.f.; o.; e.	Young and Company.....	166 Keating St., Toronto, Ont.
d.; i.	Ed. Webb & Sons.....	93 King St. E., Toronto.

*m.—Manufacturing.
m.a.p.—Manufacturing ammonium phosphate.
m.c.—Manufacturing cyanamide.
m.m.f.—Manufacturing mixed fertilizers.
m.o.—Manufacturing organics.
m.s.a.—Manufacturing sulphate of ammonia.
m.s.p.—Manufacturing superphosphate.
e.—Exports.
i.—Imports.
d.—Dealer.

The Use of Fertilizers in Canada

By C. H. Robinson, B.A., Dominion Agricultural Chemist

Experimental work and field trials conducted over a long period of years have demonstrated clearly that fertilizers may be used to advantage on many soils and for most crops. Even if the soil is naturally fertile the application of one or more of the elements of fertility often results in an economic increase in the value of the crop produced. The increased value is usually accounted for by an increase in yield and improved quality of the crop.

The Dominion Experimental Farms Branch of the Department of Agriculture conducts yearly a large number of field and laboratory experiments to study the plant food content of different types of soil and to determine the plant food requirements of various crops. The ultimate object of this investigatory work is to furnish the producer with information in regard to the profitable use of fertilizers.

The primary function of commercial fertilizers is to furnish in available form one or more of the three elements of fertility, nitrogen, phosphoric acid and potash. To predict with a fair degree of precision the amount of these elements that it is necessary to apply to the soil to produce maximum yields is an extremely difficult matter. Factors such as the texture of the soil, available plant food already present in the soil, previous manurial and cropping treatment, soil reaction, climatic conditions, drainage, etc., may affect the results obtained from the application of the added fertilizing constituents. While it has been customary to give particular attention to the nature of the crop in deciding on the fertilizer, it is being recognized more and more that a knowledge of the amounts of available fertilizing constituents present in the soil is of importance. With such data on hand the effect of an abnormal deficiency or over abundance of either nitrogen, phosphoric acid or potash may be overcome to a very considerable extent by an adjustment of the ratio between the plant food elements furnished in the fertilizer. For example, the 4-8-10 mixture is considered to be an excellent one for market garden and potato crops but if it is known that the soil is exceptionally well supplied with nitrogen, it is possible that a fertilizer containing less nitrogen would prove more profitable.

Further, an insufficient supply in an available form of elements other than those supplied by the commercial fertilizer may seriously affect crop yields. If the soil is strongly acid and low in lime content, this condition must be corrected for best returns from the application of fertilizers, particularly in the case of legume crops. In certain of the potato growing districts of New Brunswick it has been found that the addition to the fertilizer applied of a small amount

of a magnesium compound such as ground dolomite or keiserite overcomes poor crop development thought to be brought about by an insufficient supply of available magnesium in the soil. A certain measure of success in the control of physiological disorders of crops has been obtained by the application of trace elements such as boron, manganese, etc. Particular attention is being given to the use of small dressings of borax as a means of control of brown heart in turnips and crown rot of sugar beets and mangels.

Co-operation between federal and provincial agricultural institutions and manufacturers has become much closer in recent years, since it has been recognized that the final goal of the investigator and the purveyor of fertilizers is one and the same, viz. to furnish the grower with fertilizer mixtures which are best suited to the growth of the farm crops produced under specific soil and climatic conditions. As an outcome of this co-operation there have been established provincial fertilizer councils or advisory boards which meet periodically to review results of experimental work and to discuss and revise recommendations to the farmer in regard to fertilizer applications. These councils or boards are composed of representatives of the scientific agricultural institutions of the province and prominent manufacturing concerns. An important result of this co-operative effort has been a marked reduction in the tonnage sold of unnecessary brands not recommended by the fertilizer councils and an improvement in fertilizer mixtures with respect to quality and adaptability to crop and soil conditions. The recommendations of the councils may be obtained from the provincial departments of agriculture.

The placement of fertilizers has received much attention in recent years, particularly in the United States and also at the Dominion Experimental Farms and Provincial Experimental Stations and by educational departments of one or two of the larger manufacturers. More and more it is being realized that the economic use of commercial fertilizers, i.e., profits from the use of fertilizers, depends greatly on the placement of the fertilizers with respect to the seed and plant roots. For cereal crops where low rates of application are used it is generally conceded that drilling in the fertilizer with the seed is good practice. For this purpose inexpensive special attachments for seed drills may now be obtained or combination seed and fertilizer drills may be used. With hoed crops the best results may be expected when the fertilizer is placed in a narrow band along each side of the drill row at a distance of 2 to 4 inches from the seed and at about the same depth as the seed or slightly lower. Drills which place the fertilizer in this position are also obtainable. It is usually a dangerous practice to place the fertilizer in direct contact with garden or other hoed crop seeds, including potatoes.

The uniform distribution of the fertilizer is also of importance in obtaining evenness of stand and best yields from the crop. The modern fertilizer machinery mentioned previously is designed to distribute the fertilizer evenly. Also where applied broadcast the fertilizer should be spread as uniformly as possible. It is more difficult to distribute uniformly the higher analysis fertilizers such as 4-24-12 or ammonium phosphate (11-48 grade) than the more bulky lower grade materials, but modern fertilizer applying machinery gives satisfactory distribution of such materials.

There has been much improvement in the physical condition of fertilizers in recent years and the trend in this respect is towards the manufacture of fertilizers in granular form. These granular forms lend themselves to a more uniform application than the dust forms, as they run more freely in most drills.

The whole question of the use of fertilizers continues to receive a great deal of study by soil and crop technicians in this country, and throughout the world. It is realized that a great deal is yet to be learned from experimental work and that recommendations in regard to the use of fertilizers may change materially in years to come. A number of basic facts have already been determined, however, and these are centred around the proven three essential elements

of plant food—nitrogen, phosphoric acid and potash. Further truths learned in regard to the relationship between fertilizer treatment and the physical, chemical and biological composition of the soil may assume an important role in directing the use of fertilizers in the future.

The Fertilizers Act

By G. S. Peart, Chief, Fertilizer Division, Department of Agriculture

The Fertilizers Act is a Dominion law and applies to all the provinces. Its purpose is to protect farmers and other buyers against fraud by regulating and controlling the sale of fertilizer. The Act is enforced by the inspectors under the Dominion Seed Branch whose duty it is to see that vendors meet their guarantees as made under the Act.

A review of the reports of analyses of official samples taken by the inspectors shows a gradual improvement in respect to meeting guaranteed analyses over the years. Failure to meet guaranteed analysis in 1934 was much less common than the overages in plant food, which is of satisfactory significance. This is to be expected, however, for the manufacturing of fertilizers is now done more efficiently and thoroughly due to improvements in the machinery for the purpose. Modern fertilizers are more uniform in analysis and of better physical condition than a few years ago.

The fertilizer business of to-day is essentially one of selling the three plant foods, nitrogen, phosphoric acid and potash, instead of just fertilizer under some brand name as was once the practice. This trend, of course, is natural and sensible and has come as a result of increased knowledge amongst farmers as to the purposes and values of fertilizers in crop production. The fertilizer trade has adapted itself accordingly. The Fertilizers Act by virtue of requiring that fertilizers be sold subject to an honest guaranteed analysis has made it possible for Canadian farmers to select their plant food requirements as actually needed for the different crops and soils. It is evident that each year more farmers are studying fertilizers in relation to crop requirements, which augurs well for the future use of fertilizers in Canada.

It should not be inferred, however, that there are never any bad fertilizers on the market. The inspectors sometimes find an inferior lot which does not meet guarantee due to careless or inefficient manufacture, and in rarer instances, to adulteration or the skimping of plant food. Such offences must always be regarded as serious and be penalized accordingly. Some nineteen seizures of such fertilizers were made throughout Canada by inspectors in 1934.

The inspection records show quite clearly that it is the casual vendor who most often violates the Fertilizers Act in not meeting guarantee and in other ways. As a rule the manufacturers and other vendors in the business to stay do not deliberately impair their reputation by failing to meet guaranteed analyses or by selling poorly conditioned fertilizers and, therefore, are dependable sources from which to buy. For their own protection, however, farmers and others are advised to buy subject always to guaranteed analysis and then scrutinize carefully the information on the labels and bags when delivery is made. The law requires that each bag be labelled with the guaranteed analysis and delivery should not be accepted when the bags are improperly labelled or when the guarantee stated is lower than that ordered.

The inspectors are unable sometimes during the rush season of fertilizer deliveries in the spring to inspect more than a small percentage of the shipments, so that buyers should help to protect themselves by proceeding as above and whenever they have good reason to have doubts of a fertilizer they should communicate at once with the local inspector. When so doing, the registration number which the Act requires with the guaranteed analysis should be mentioned as it is

the key to the legal sale of the fertilizer. Any complete or mixed fertilizer delivered without the official registration number on the label or bag is being sold illegally (unless under prescription) and should be guarded against at all times.

During the year ending July 1, 1934, the inspectors sampled some 1,089 lots of fertilizer, representative of all those on the market. The results of analyses of these samples were tabulated and published by the Fertilizer Division in the 1934-35 Annual Report of Analyses. In this report the guaranteed analysis of each brand is placed above the official analysis so as to permit of comparisons. The record of each manufacturer, importer and vendor in respect to meeting guaranteed analyses is thus made available for the information and guidance of the public and as a penalty against those who have not met their guarantees.

Fertilizer Production in Canada

By G. S. Fraser, Chief, Fertilizer Division, Department of Agriculture

Fertilizers are manufactured on a much larger scale in Canada than might be supposed. Sulphate of ammonia, ammonium phosphate, superphosphate, cyanamide, organics, and mixed fertilizers are all made in large volume. The capacity of Canadian plants for the manufacture of these products is much greater than prospective domestic requirements for some time; consequently, the export as well as the domestic market must be developed if these plants are to operate on the scale intended. Moreover, these Canadian-made fertilizers are second to none in quality for the industry is comparatively new in this country and the latest equipment and processes of manufacture are in use, resulting in high quality products.

Sulphate of Ammonia.—The sulphate of ammonia made in Canada is of the standard 20% and 21% nitrogen analysis and mainly of the neutral type i.e., free from an excess of sulphuric acid, and possessing the dry and granular physical condition desirable for uniform application and mixing with other materials. It is mainly a by-product of the smelting and gas industries. The ammonia gas liberated from the coal during the coking process in these industries is recovered and combined chemically with sulphuric acid to make the sulphate of ammonia ($(NH_4)_2SO_4$). Synthetic ammonia gas is made and used at one Canadian plant for the same purpose.

Manufacturers of sulphate of ammonia in Canada are the Dominion Steel and Coal Corporation, Ltd., Sydney, N.S.; Montreal Coke and Manufacturing Co., Montreal, Que.; Ottawa Gas Co., Ottawa, Ont.; Steel Co. of Canada, Hamilton, Ont.; Hamilton By-Products Coke Ovens Limited, Hamilton, Ont.; Algoma Steel Corporation, Sault Ste. Marie, Ont.; Consolidated Mining and Smelting Co., Trail, B.C.; the B.C. Electric Co., Vancouver, B.C. Production is therefore well located from the standpoint of distribution for national use. Total production from these plants in 1934 amounted to some 81,000 tons of which only about 11,000 tons were used in Canada and the balance exported to the United States, the Orient and other countries.

Sulphate of ammonia is the principal source of nitrogen in ready-mixed fertilizers, as it sells at a relatively low cost per unit of nitrogen and has fine blending qualities. Its use is increasing also for single application in orchards and on meadows and lawns, replacing nitrate of soda to a large extent for these purposes.

The total quantity of sulphate of ammonia used in Canada in 1934 for the manufacture of mixed fertilizers and for single application, imports included, was approximately 20,000 tons as against about 6,000 tons of nitrate of soda.

Ammonium Phosphate—There is only one ammonium phosphate fertilizer plant in Canada, that of the Consolidated Mining and Smelting Company at Trail, B.C The ammonium phosphate is made there in different grades. The

first is the mono-ammonium phosphate containing 10% nitrogen and 48% available phosphoric acid. Other grades are obtained by using the mono-ammonium phosphate as a base and adding by chemical process further ammonia which increases the nitrogen content and reduces the phosphoric acid. The principal grade made of this series contains 16% nitrogen and 20% phosphoric acid.

The nitrogen and phosphoric acid of these ammonium phosphates are highly available and in chemical combination, not in mechanical mixture as are some other competitive fertilizers. Moreover, they are the highest analysis fertilizers produced in Canada. One ton of the 16-20 grade is equivalent in plant food to one ton of nitrate of soda plus one ton of 20% superphosphate, while the 10-48 grade contains 10 units of nitrogen in addition to three times as much phosphoric acid per ton as standard 16% superphosphate.

The process of manufacture of ammonium phosphate is exceedingly complicated and extensive. Those who visit the plant at Trail are astonished at its magnitude. It is regarded as one of the greatest triumphs of modern chemical engineering on this continent. Briefly, the steps of manufacture are these: Ammonia gas is made synthetically from air and water, and phosphoric acid is made by acidulating natural rock phosphate with sulphuric acid; these two products are then combined chemically. The different grades of ammonium phosphate are produced according to the proportions of ammonia gas and phosphoric acid used in the process. Many thousands of tons are now being produced annually for the domestic and export markets.

Since the Trail plant came into production in 1930 the use of ammonium phosphate has grown rapidly in the Prairie Provinces in the production of wheat and other grains. The 10-48 grade in granular form is most popular for the purpose. Its use is increasing also for grain growing in the eastern provinces. The 16-20 grade is finding favour, particularly for orchard application, truck gardening, and for the manufacture of mixed fertilizers.

Superphosphate—Large quantities of superphosphate are produced in this country. It is manufactured by the Consolidated Mining and Smelting Co., at Trail, B.C., as triple superphosphate containing 43% available phosphoric acid. This concentrated form is made by combining together the filtered phosphoric acid from several batches of single superphosphate. It is then ammoniated to neutralize any free sulphuric acid and to improve the physical condition. This triple superphosphate is being used in the Prairie Provinces on the heavier soils for grain growing and where the application of nitrogen might be wasted. It is not used much, as yet, in the eastern provinces, except perhaps for the building up of 16% superphosphate to the 20% grade.

Canadian Industries Limited, Montreal, have superphosphate plants at Beloeil, Que., Hamilton, Ont., and New Westminster, B.C. The Ober process of manufacture is used at Beloeil and Hamilton. This consists, essentially, in charging the ground tri-calcic phosphate rock with a correct quantity of sulphuric acid, and digesting the mixture in a superheated revolving drum. Under this process complete acidulation of the rock is accomplished in about an hour as compared with four weeks or more when the Den process is used. The product is dry when removed from the drum and ready for grinding and screening into the granular and dust forms. This superphosphate is superior in physical and chemical qualities to many of the imported superphosphates. It is especially adapted in its granular form for single application and home mixing. The dust as well as the granular form is used in the manufacture of mixed fertilizers. The regular analysis of this superphosphate is 20% available phosphoric acid, but 16 and 18% grades are made also, as competition requires, by breaking down the 20% grade with ground rock phosphate or other filler.

These superphosphate plants at Beloeil and Hamilton are of the latest design for the economic manufacture of high grade superphosphate and are a notable contribution of applied chemistry to industry in Canada.

Canadian Industries Limited employ the Den process at their New Westminster, B.C. plant. This consists of placing the ground rock and an equal quantity, by weight, of sulphuric acid in a mixing unit, and af er agitat ng thoroughly, placing the mixture in a specially constructed den or chamber for acidulating and curing. Some Den superphosphates contain an excess of free sulphuric acid, which makes them more or less sticky and corrosive and, while quite suitable for use in the manufacture of mixed fertilizers are less desirable for single application. However, this difficulty at the New Westminster plant has been overcome largely by careful weighing of the sulphuric acid so as to avoid an excess, with the result that a superior Den process superphosphate is produced there.

The total production of all grades of superphosphates in Canada in 1934 was about 50,000 tons, of which some 3,000 tons were exported to the United States and other countries and the balance used in Canada. Superphosphate is used in much larger tonnage than any other fertilizer material, owing to its being the main source of available phosphoric acid, perhaps the most essential plant food in crop production. The total quantity sold in Canada in 1934,i.e., domestic production plus imports, was estimated at 60,000 tons for single application and home-mixing and 50,000 tons as the main ingredient in mixed fertilizers, some 110,000 tons as against a total consumption of all kinds of fertilizers of about 200,000 tons.

Calcium Cyanamide.—Canada has the only cyanamide plant on this continent and the largest in the world, with an estimated capacity of 350,000 tons per year. It is located at Niagara Falls, Ont., and operated by the North American Cyanamid Company, Limited. The product is calcium cyanamide $CaCN_2$, a synthetic organic material containing 22% nitrogen when in the pulverized form and 21% in the granular form. Recent annual production has approximated 100,000 tons, although prior to 1930 when markets were better, some 150,000 were produced. The main market for the product has been in the United States. Canadian consumption thus far has been comparatively small except for the manufacture of mixed fertilizers. Most of the mixed fertilizer manufacturers in both Canada and the United States use about 50 pounds of pulverized cyanamide per ton to improve the physical condition of their mixtures, in addition to contributing some nitrogen.

The use of cyanamide for single application has gained headway recently in Canada as competitive with nitrate of soda and sulphate of ammonia. This is particularly true since the granular cyanamide came on the market in 1932. This granular form is made by wetting the dust cyanamide and rolling it into pellets in a revolving cylinder, then drying and screening the pellets.

The process of manufacturing cyanamide consists essentially of bringing nitrogen gas, which is obtained from the air, into contact with calcium carbide at a high enough temperature (about 2000° F.) to make them unite. It is a complicated and expensive process. The nitrogen is first separated from the oxygen and other gases of the air and the calcium carbide is prepared separately by burning lime and coke together at a very high temperature (about 4000°F.) The third step is the bringing together of the nitrogen gas and the calcium carbide to form the calcium cyanamide. A cheap and ample supply of electric power is required for the electric furnaces and liquid air plant, which accounts for the location of the industry at Niagara Falls. It is reputed to be the largest consumer of hydro power in Ontario. One cannot visit this plant without being impressed with the magnitude of its chemical and mechanical processes. It is regarded as a monument to the skill of man in applied chemistry and physics.

Organic Fertilizers.—There are about thirty manufacturers of organic fertilizer materials in Canada. These include packing houses, abattoirs, glue factories, rendering plants and fish meal plants. The products are mainly bone meal, dried blood, tankage, fish meal, whale organics, and bone phosphate.

The total production of these for fertilizer purposes in 1934 (i.e., not including large quantities produced for feeding stuffs) approximated 4,184 tons, and of this, some 1,800 tons were exported to the United States and other countries. These organic fertilizers are used largely for single application by florists and market gardeners and in the suburban trade. Few mixed fertilizers now contain organics, due mainly to their compratively higher cost per unit of nitrogen and phosphoric acid.

The process of manufacturing these organic materials for fertilizer purposes consists, essentially, of cooking with live steam in suitable tanks, extracting the grease, then drying artificially and grinding to a desired fineness.

Mixed Fertilizers.—There were 23 plants manufacturing mixed fertilizers in Canada in 1934 and these produced about 110,000 tons. Most of this production was sold in the domestic market, with a small tonnage going to Newfoundland, the British West Indies and the States of Maine and Washington. The manufacture of mixed fertilizers has declined about 30% in the depression years.

The process of manufacture consists of mixing uniformly, with efficient machinery, the standard fertilizer materials containing nitrogen, phosphoric acid and potash, then curing the mix in a pile and regrinding so as to prevent further chemical action and to obtain the desired physical condition for use on the farm.

The main source of nitrogen, used nowadays in these mixed fertilizers, is sulphate of ammonia with a little cyanamide, the latter largely for conditioning purposes. Some contain, in addition, a little nitrate of soda. Organic nitrogen is now seldom used. The phosphoric acid is almost wholly derived from superphosphate, and the potash is mainly muriate. Sufficient sulphate of potash is usually added to the muriate or used alone, in the case of tobacco fertilizers, so that the chlorine content will not exceed 2%.

There is a tendency nowadays to incorporate in mixtures for special crops such as tobacco, turnips and potatoes, small quantities of the lesser fertilizing elements such as manganese, magnesium, boron, etc. This is not yet a practice, but is rather in the experimental stage. The time may come, however, when mixed fertilizers generally will contain, in addition to prescribed amounts of nitrogen, phosphoric acid and potash, some or all of the lesser plant foods which science may indicate necessary for maximum fertilization.

The tonnage of ready-mixed fertilizers sold in Canada in recent years has about equalled the tonnage of materials used in home-mixing and for single application. The figures for 1934 were 98,955 and 95,896 tons, respectively.

Potash.—Potash is the one major plant food which is neither indigenous to nor manufactured in Canada. Until recently we have obtained our potash solely from France and Germany, but a new supply is now to be had from the United States, Spain, Mexico, Palestine and Russia, the result of recent discoveries. Potash from each of these sources was used in Canada in 1934.

The annual domestic consumption of potash approximates 25,000 tons of muriate, 800 to 1,000 tons of sulphate, and a small quantity of manure salts which are a natural mixture of potassium and sodium chlorides. These manure salts are used largely in breaking down high analysis muriate (60% K_2O) to the lowest legal competitive grade for that product which is 50%K_2O.

Consumption in Canada.—As Canadian crop production becomes more intensified and diversified, more fertilizers will likely be used, but we still have a long way to go before equalling some other countries in the consumption of fertilizers. Our present total annual requirement of some 200,000 tons is impressively small when compared with: 3,750,000 tons in the United States; 1,500,000 tons in Great Britain; 3,500,000 tons in France and 6,000,000 tons in Germany. These represent the 1934 figures from the above countries as compiled by the International Institute of Agriculture, Rome.