

Commercial Fertilizers

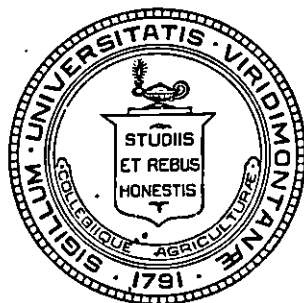
University of Vermont and State College

Vermont Agricultural Experiment Station

BURLINGTON, VERMONT

COMMERCIAL FERTILIZERS

By L. S. WALKER *and* E. F. BOYCE



Manufacturers have met the requirements of the Vermont law well during 1937. Twenty-three brands of mixed goods and five of crude stock failed to furnish all the plant food that was promised; however, shortage in the total amount of plant food guaranteed occurred in only 13 of the 172 brands analyzed and exceeded two percent in only three cases.

The sheep, cattle and goat manures, 16 in number, on the whole were as good as they were said to be. One brand was slightly low in nitrogen and another very low in potash but the shortages were made up by overages in other plant nutrients. Two brands contained altogether too much sand.

Most of the limes and limestones, 18 in number, were well above guaranty; however, three were low in calcium oxide.

Fertilizer usage in 1937, grouped on the tonnage basis by grades, is shown on page 19. The 1935 usage was 15,295 tons, a 17 percent increase over 1934, that of 1936, 16,421 tons, a 7 percent increase over 1935 and that of 1937, 25,260 tons, a 54 percent increase over 1936, the largest tonnage by far ever sold in Vermont.

The usage of superphosphate has increased very greatly of late, the 1935 tonnage being more than half as large again as the average 1931-1934 usage, that in 1936 approximately two and one-half times as great, and that of 1937 six and one-half times as great. Four-sevenths of this year's purchase of commercial fertilizer consisted of crude stocks whereas in 1931-1934 only one-fifth of the total tonnage consisted of crude stocks.

A summary of data secured as to the acidity or non-acidity of the several brands is found on page 23. It would require an application to Vermont soils of 720 tons of limestone to neutralize the acidity developed by the 10,400 tons of complete fertilizer which were sold here this year. More than 13,500 tons of superphosphates were sold, but this material, contrary to the impression naturally conveyed by the name commonly applied to it, "acid phosphate," is practically neutral in reaction.

Mixed fertilizer cost on the average \$41 per ton, or one dollar more than in 1936.

BULLETIN 426: COMMERCIAL FERTILIZERS

By L. S. WALKER AND E. F. BOYCE

The results of the 1937 inspection are set forth herewith in condensed form. The licenses cover: Complete mixed fertilizers, 147; crude stocks, 53; sheep, cattle and goat manures, 16; incomplete fertilizer, 1; limes, 23; total, 240.

The station sampling agents visited many Vermont cities, towns, villages and farms in the spring of 1937 and drew 417 samples from dealers' stocks representing 206 of the 240 brands licensed for sale. No samples were secured of 34 brands (24 complete fertilizers, 5 crude stocks and 5 limes and limestones) named below.

ACME GUANO Co., Baltimore, Md.

Acme 4-8-7; Acme 3-10-4; Acme 3-8-4; Acme 2-12-5.

AMERICAN AGRICULTURAL CHEMICAL Co., North Weymouth, Mass.

AA 4-12-4 Fertilizer; Agrico for Potatoes & Vegetables 5-8-7.

APOTHECARIES HALL Co., Waterbury, Conn.

Liberty Potato & General Crops 4-8-10; Liberty Fish, Bone & Potash 3-10-4; Liberty Corn 2-10-2; Superphosphate 16%.

ARMOUR FERTILIZER WORKS, New York, N. Y.

Armour's Big Crop Orchard Special 7-8-6; Armour's Big Crop Fertilizer 2-8-5; Armour's Big Crop 3-10-4; Armour's Fertilizer 8-24-8.

CONSOLIDATED RENDERING Co., Boston, Mass.

Lowell 7-6-6 Complete Fruit & Top Dressing; Lowell 4-8-10 Potato Grower; Lowell 4-8-7 Old General Crop Manure for Potatoes & Market Garden Crops; Lowell 4-8-4 Corn & Vegetable; Lowell 3-10-4 Animal Brand; Lowell 2-8-10 Vegetable & Grain; Superphosphate 40%.

EASTERN STATES FARMERS' EXCHANGE, Springfield, Mass.

Eastern States Sulphate of Ammonia 20.5%; Eastern States Nitrate of Potash 13-44; Eastern States Magnesian Hydrated Lime; Eastern States Ground Limestone.

FORD MOTOR Co., Dearborn, Mich.

Ford Ammonium Sulphate 20.8%.

INTERNATIONAL AGRICULTURAL CORP., Boston, Mass.

International 3-12-4.

MASTER MEAT PRODUCTS Co., Detroit, Mich.

Master Fertilizer 4-12-2.

SOLVAY PROCESS Co., Syracuse, N. Y.

Solvay Pulverized Limestone.

STANDARD WHOLESALE PHOSPHATE & ACID WORKS, INC., Baltimore, Md.

Standard 5-8-10; Standard 4-12-4.

SWIFT & Co. FERTILIZER WORKS, Baltimore, Md.

Swift Special Golf Fertilizer 12-6-4.

UNITED STATES GYPSUM Co., Chicago, Ill.

USG General Purpose Lime Farnams.

VERMONT ASSOCIATED LIME INDUSTRIES, INC., Leicester Junction, Vt.

Gro-Mor Agricultural Lime.

The 34 brands of complete fertilizer and crude stock not sampled represented a very small part of the total tonnage sold. It often happens that a car arrives at a railroad station and its contents are hauled away within 24 hours and sown upon the land within a day or two. Moreover fertilizers are frequently delivered nowadays by truck direct from the factory or the jobber's warehouse to the very farms and onto the very fields to which they are promptly applied. Under such circumstances it is obvious that the station's sampling agents can not obtain samples. During recent years the unsampled brands have represented not more than 3 to 4 percent of the entire tonnage and often much less than this.

BRANDS SAMPLED AND ANALYZED

The condensed statements on the following pages indicate:

(1) Those brands of mixed goods which have fulfilled their guaranties (table I, pages 5 to 7). (2) Those brands of crude stock which conform to promise (table II, pages 8 and 9). (3) The 20 brands which contained less plant food than guaranteed (table III, pages 10 and 11). (4) Sheep, goat and cattle manures and limes and limestones (tables IV and V, pages 12 to 14).

Table I (pages 5 to 8) shows:

1. The names and addresses of licensees.
2. The brand names.
3. The "grades"—nitrogen, available phosphoric acid¹ and water-soluble potash.
4. The percentage of the total nitrogen in each brand present as nitrate, in ammoniacal form, in soluble and in insoluble organic forms.
5. The percentage of total phosphoric acid in each brand present in so-called available form.
6. The facts as to the quality of the organic nitrogen contents (by footnotes).
7. The source of potash, whether muriate, sulphate or nitrate (by footnotes).

Table II (pages 8 and 9) shows the analyses of the sundry crude stocks which were found to be equivalent to their guaranties.

Table III (pages 10 and 11) sets forth the facts as to 28 brands which failed to meet their guaranties. In 15 cases no actual shortage in total plant food occurred, due to the fact that the overruns more than offset the underruns. The shortages occurring in 13 brands are recorded in terms of percentage in the last column, ranging from 1 to 6 percent.

¹ Total phosphoric acid guaranty is usually 0.5 percent or 1.0 percent greater than is that of the available phosphoric acid and sometimes is identical with it.

I. MIXED FERTILIZERS SUBSTANTIALLY COMPLYING WITH GUARANTIES

Brand name	Percentage of total nitrogen				Percentage of total phosphoric acid in available form
	As nitrate	As ammonia	As soluble organic	As insoluble organic	
Acme Guano Co., 311 Marine Bank Bldg., Baltimore, Md.					
Acme 5/8/7	1	83	11	5	98.
Acme 4/8/10	0	86	7	7	94
Acme 4/8/4 ¹	0	86	8	6	99
Acme 2/12/2	0	82	10	8	97
American Agricultural Chemical Co., 285 River St., North Weymouth, Mass.					
AA 8/16/16 Fertilizer	8	90	0	2	97
AA Double Strength Fertilizer 8/16/14	11	85	4	0	98
AA Top Dresser 7/6/6	4	81	10	5	91
AA Potato & Vegetable 5/8/7	14	80	2	4	100
AA Complete Manure 4/8/10	14	72	10	4	100
AA 4/8/8 Fertilizer	10	69	13	8	96
AA Peerless Fertilizer 4/8/7	19	76	0	5	91
AA Monarch Fertilizer 4/8/4	4	80	10	6	86
AA Corn Favorite 3/10/4	0	85	8	7	89
AA Prolific 10% Potash Fertilizer 2/8/10	0	87	4	9	93
Agrico for Fruit 9/6/6	9	84	2	5	96
Agrico for Lawns, Trees & Shrubs 7/7/5	14	67	3	16	98
Agrico for Pastures & Top Dressing 7/6/6	8	84	3	5	95
Agrico for Aroostook with 10% Potash 5/8/10...	15	75	7	3	93
Agrico for Corn 4/12/6	14	60	19	7	98
Agrico for Gardens 4/10/4	1	76	4	19	96
Agrico for New England 4/8/10	13	78	3	6	92
Agrico for Corn 3/10/6	0	90	6	4	89
Bradley's Complete Manure for Potatoes & Vegetables 4/8/7	6	68	18	8	95
Bradley's XL 3/10/4 Fertilizer	2	71	18	9	100
Apothecaries Hall Co., Box 1009, Waterbury, Conn.					
Liberty Top Dressing for Grass & Grain 8/8/8 ...	77	22	0	1	100
Liberty Special Fertilizer for Fruit 7/8/6	44	41	11	4	99
Liberty High Grade Market Gardener 5/8/7	43	50	0	7	96
Liberty Market Gardeners' Special 4/8/4	12	68	13	7	96
Armour Fertilizer Works, 120 Broadway, New York, N. Y.					
Armour's Big Crop 8/16/20 Fertilizer	13	87	0	0	97
Armour's Big Crop 8/16/16 Fertilizer	13	87	0	0	100
Armour's Big Crop 7/6/6 Fertilizer	16	74	0	10	95
Armour's 6/8/6 Fertilizer	11	75	2	12	92
Armour's Big Crop Fertilizer 5/8/7	13	68	5	14	100
Armour's Big Crop Fertilizer 4/16/4	7	81	6	6	93
Armour's 4/12/4 Fertilizer	10	74	4	12	94
Armour's Big Crop Fertilizer 4/8/10	26	58	2	14	93
Armour's Big Crop Fertilizer 4/8/7	13	63	11	13	94
Armour's Garden & Lawn Fertilizer 4/8/6	15	61	9	15	96
Armour's Big Crop Fertilizer 4/8/4	15	71	4	10	96
Armour's Big Crop Fertilizer 2/12/4	12	68	10	10	97

All brands listed above "passed" in respect to the quality of their organic nitrogen contents and, save in one case, carried potash in the form of muriate.

¹ Three-fourths as muriate; remainder as sulphate.

I. MIXED FERTILIZERS SUBSTANTIALLY COMPLYING WITH GUARANTIES

—continued

Brand name	Percentage of total nitrogen				Percentage of total phosphoric acid in available form
	As nitrate	As ammonia	As soluble organic	As insoluble organic	
Berkshire Chemical Co., 92 Howard Ave., Bridgeport, Conn.					
Berkshire Long Island Special 4/8/7	12	71	13	4	94
Berkshire Market Garden 4/8/4 Fertilizer	5	76	15	4	95
Consolidated Rendering Co., 178 Atlantic Ave., Boston, Mass.					
Competitive Brand 4/12/4	25	54	16	5	96
Corenco Two-In-One 8/16/20	16	72	6	6	100
Corenco Complete Fruit & Top Dressing 7/6/6... ..	17	70	9	4	100
Corenco General Crop Manure 5/8/7	19	63	13	5	97
Corenco 4/12/4 Complete Manure	22	54	20	4	97
Corenco Market Garden Fertilizer 4/8/7	26	56	13	5	96
Corenco Corn & Vegetable 4/8/4	26	51	20	3	96
Corenco 3/10/4 Animal Brand	30	41	26	3	100
Corenco Potato & Oat Special 2/8/10	44	11	38	7	93
Eastern States Farmers' Exchange, Box 1482, Springfield, Mass.					
Eastern States 12/16/12 ¹	27	70	2	1	100
Eastern States 12/4/4	23	69	6	2	100
Eastern States 8/24/8	36	61	0	3	96
Eastern States 6/8/6	27	62	8	3	97
Eastern States 4/16/20	22	69	5	4	98
Eastern States 4/12/4	23	66	6	5	92
Eastern States 4/8/8	23	70	0	7	94
Eastern States 0/20/20	0	0	0	0	100
Hoffman, A. H., Inc., Landisville, Pa.					
Hoffman's Plant Food for Lawns, Gardens & Plants 5/8/6 ²	32	44	6	18	67
Howard Hardware Co., Bellows Falls, Vt.					
Howard's Special Flower, Lawn & Garden Fertilizer 4/7/8	46	5	12	37	81
International Agricultural Corp., 38 Chauncey St., Boston, Mass.					
International 7/6/6 Fertilizer	12	69	11	8	96
International 6/8/6 Fertilizer	14	62	17	7	95
International Caribie Market Garden Fertilizer 5/10/10 ³	38	33	6	23	93
International 5/8/10 Fertilizer	11	69	15	5	100
International 5/8/7 Fertilizer	22	63	11	4	96
International 4/8/10 Fertilizer	14	65	17	4	99
International 4/8/4 Fertilizer	13	65	18	4	98
Middlebrook, J. O., & Sons, 190 College St., Burlington, Vt.					
Midco Special Lawn & Garden Fertilizer 7/6/6....	6	78	9	7	98

All brands listed above "passed" in respect to their organic nitrogen contents and, save in three cases, carried potash in the form of muriate.

¹ One-fourth potash as muriate; remainder as nitrate.

² One-sixth potash as muriate; remainder as sulphate.

³ Two-fifths potash as muriate; remainder as sulphate.

I. MIXED FERTILIZERS SUBSTANTIALLY COMPLYING WITH GUARANTIES

—concluded

Brand name	Percentage of total nitrogen				Percentage of total phosphoric acid in available form
	As nitrate	As ammonia	As soluble organic	As insoluble organic	
Old Deerfield Fertilizer Co., Inc., 28 Sugarloaf St., South Deerfield, Mass.					
Old Deerfield 8/16/20 ¹	13	46	22	19	99
Old Deerfield 8/16/14 ²	3	52	29	16	100
Old Deerfield 7/6/6 ³	40	44	13	3	100
Old Deerfield 4/8/10 ⁴	12	36	37	15	93
Old Deerfield 4/8/8 ⁵	29	47	24	0	100
Old Deerfield 3/10/6	0	62	34	4	95
Valley Brand 4/8/10	41	43	15	1	100
Valley Brand 4/8/7 ⁶	35	47	18	0	100
Valley Brand 4/8/4	31	46	20	3	100
Plantabbs Corp., 1 West Biddle St., Baltimore, Md.					
Fulton's Plantabbs 11/15/20 ⁷	69	31	0	0	100
Rogers & Hubbard Co., Portland, Conn.					
Hubbard's Oats & Top Dressing, Bone Base, 8/5/8 ⁸	96	2	0	2	85
Hubbard's Potato Fertilizer 5/8/7	5	47	34	14	88
Hubbard's Corn & Grain Fertilizer 2/12/4	9	48	15	28	92
Hubbard's High Potash Fertilizer 2/8/10	13	46	29	12	92
Red H Brand 8/16/14	10	79	2	9	98
Red H Brand 7/6/6	5	90	3	2	97
Red H Brand 5/8/7	10	68	17	5	91
Red H Brand 4/8/10	17	63	13	7	89
Red H Brand 4/8/7	18	66	11	5	90
Red H Brand 4/8/4	19	60	8	13	90
Red H Brand 3/10/6	19	65	12	4	95
Standard Wholesale Phosphate & Acid Works, Inc., 1600 Continental Bldg., Baltimore, Md.					
Standard 7/6/6	4	77	12	7	91
Standard 4/8/10 ⁹	2	77	12	9	90
Standard 4/8/8	2	84	9	5	97
Standard 4/8/7 ¹⁰	0	80	12	8	97
Standard 4/8/4	2	70	19	9	92
Standard 4/6/10	5	70	19	6	96
Standard 3/10/4	4	75	12	9	95
Standard 2/8/10 ¹¹	3	81	8	8	94
Standard 1/10/5 ¹²	0	81	11	8	94
Swift & Co. Fertilizer Works, 1305 Standard Oil Bldg., Baltimore, Md.					
Roselawn Special Plant Food 5/8/7	16	69	3	11	93
Vigoro 4/12/4	11	84	0	5	92
Tennessee Corp., Lockland, Ohio					
Loma 5/10/4	7	85	0	8	99

All brands listed above "passed" in respect to their organic nitrogen contents and, save in 12 cases, carried potash in the form of muriate.

Footnotes 1-6, 8-12. The following fractions as muriate of potash: 1, eleven-twentieths; 2, six-sevenths; 3, two-thirds; 4, nine-tenths; 5, seven-eighths; 6, six-sevenths; 8, three-eighths; 9, nine-tenths; 10, four-sevenths; 11, four-fifths; 12, four-fifths; the remainder in all cases as sulphate.

Footnote 7. Potash all as nitrate.

II. CRUDE STOCKS SUBSTANTIALLY COMPLYING WITH GUARANTIES

Nitrogenous materials	Nitrogen	
	Found	Guaranteed
<i>Nitrate of Soda</i>		
Barrett Co., New York, N. Y., "Arcadian American"...	16.08	16
Chilean Nitrate Sales Corp., New York, N. Y., "Champion"	16.14	16
"Old Style"	15.86	15.50
<i>Sulphate of Ammonia</i>		
American Agricultural Chemical Co., North Weymouth, Mass.	20.66	20.50
Consolidated Rendering Co., Boston, Mass.	20.66	20.50
Old Deerfield Fertilizer Co., Inc., South Deerfield, Mass., "Old Deerfield"	20.94	20.50
<i>Air-nitrogen Products</i>		
American Cyanamid Co., New York, N. Y., "21% Aero-Cyanamid Granular"	21.18	21
Eastern States Farmers' Exchange, Springfield, Mass., "Eastern States Calnitro"	20.46	20.50

Nitrogenous and phosphatic materials	Nitrogen		Total phosphoric acid	
	Found	Guar.	Found	Guar.
<i>Ground Bone and Tankage</i>				
American Agricultural Chemical Co., North Weymouth, Mass., "Fine"	2.59	2.47	24.94	23
"Ground Tankage"	8.44	7.4	9.52	9.15
Armour Fertilizer Works, New York, N. Y., "Armour's"	2.76	2.47	25.32	23
Breck, Joseph, & Sons Corp., Boston, Mass., "Breck's"	2.38	2.47	25.38	22.88
Consolidated Rendering Co., Boston, Mass., "Corenco"	2.83	2.47	25.74	23
Dr. Heinz Co., Cincinnati, Ohio, "Heinz Odorless"	1.36	1	29.60	29
Eastern States Farmers' Exchange, Springfield, Mass., "Eastern States Steamed"	2.97	2.5	23.94	23
International Agricultural Corp., Boston, Mass.	2.66	2.47	26.18	22
Old Deerfield Fertilizer Co., Inc., South Deerfield, Mass., "Old Deerfield 3 + 50 Steamed"	2.48	2.47	28.47	22
Rogers & Hubbard Co., Portland, Conn., "Hubbard's Bone Base"	2.69	2.47	27.97	22.85
Standard Wholesale Phosphate & Acid Works, Inc., Baltimore, Md., "Standard Steamed"	2.45	2.47	26.63	23
Swift & Co., Fertilizer Works, Baltimore, Md.	2.43	2.47	24.37	23

II. CRUDE STOCKS SUBSTANTIALLY COMPLYING WITH GUARANTIES—
concluded

Phosphatic materials	Phosphoric Acid			
	Total		Available	
	Found	Guar.	Found	Guar.
<i>Superphosphate (Acid Phosphate)</i>				
American Agricultural Chemical Co., North Weymouth, Mass., "AA 16%"	18.70	....	17.58	16
"AA 20%"	22.08	....	21.78	20
Apothecaries Hall Co., Waterbury, Conn., "20% Granular"	21.74	....	20.78	20
Armour Fertilizer Works, New York, N. Y., "Armour's Big Crop 16%"	17.30	....	16.60	16
"Armour's Big Crop 20%"	21.10	....	20.46	20
Berkshire Chemical Co., Bridgeport, Conn., "Berkshire 20%"	22.84	....	21.86	20
"Davco Granulated 20%"	21.70	....	20.90	20
Consolidated Rendering Co., Boston, Mass., "16%"	17.82	....	17.36	16
"Granular 20%"	21.76	....	21.14	20
Eastern States Farmers' Exchange, Springfield, Mass., "Eastern States 20% Granular"	21.64	....	21.52	20
"Eastern States 40% Double Granular"...	43.24	....	41.38	40
International Agricultural Corp., Boston, Mass., "International 16%"	16.82	....	16.62	16
"International 20%"	22.36	....	22.02	20
Old Deerfield Fertilizer Co., Inc., South Deerfield, Mass., "Old Deerfield 16%"	17.90	....	17.84	16
Rogers & Hubbard Co., Portland, Conn., "Hubbard's 16%"	17.90	....	17.74	16
"Hubbard's 20%"	21.86	....	21.70	20
Standard Wholesale Phosphate & Acid Works, Inc., "Standard 16%"	17.40	....	17.40	16
"Standard 20%"	20.58	....	20.45	20

Potassic materials	Potash	
	Found	Guaranteed
<i>Muriate of Potash</i>		
American Agricultural Chemical Co., North Weymouth, Mass.	52.76	50
Consolidated Rendering Co., Boston, Mass.	50.40	50
Eastern States Farmers' Exchange, Springfield, Mass., "Eastern States"	60.52	50
N. V. Potash Export My., Inc., New York, N. Y., "N. V. Genuine German"	51.40	50
	59.84	60

III. TWENTY-THREE BRANDS OF MIXED GOODS AND FIVE OF CRUDE STOCK FAILING TO MAKE GOOD THEIR GUARANTIES

Manufacturers and Brands	Nitrogen found					Phosphoric acid found		Potash found			Shortage
	As nitrates	As ammonia	Soluble organic	Insoluble organic	Total	Total	Available	Total	As muriate	In other forms	
Acme Guano Co., Acme 7/6/6 .....	...	3.56	1.88	0.45	5.89	7.04	6.76	6.28	6.28	...	None
Agricultural Laboratories, Inc., Stimulant 11/12/15 Tablets	10.38	2.07	...	...	12.45	10.16	10.16	22.00	3.59	18.41	None
American Agricultural Chemical Co., Agrico for Potatoes 8/16/20	1.04	6.25	0.55	0.07	7.91	17.39	16.93	18.73	18.73	...	1%
Agrico for Potatoes Double Strength 8/16/14	0.59	7.12	0.33	...	8.04	17.18	16.96	13.71	13.71	...	None
Agrico for Lawns, Trees & Shrubs, 7/6/6... ..	0.23	5.49	0.68	0.26	6.66	6.40	6.18	6.55	6.55	...	None
Agrico for Seeding Down 4/16/20	0.75	2.96	0.32	...	4.03	16.65	16.37	18.87	18.87	...	2%
Bradley's Complete Manure with 10% Potash 4/8/10	0.19	2.73	0.82	0.38	4.12	9.14	8.24	9.70	9.70	...	None
Nitrate of Potash 13/44	13.26	...	...	...	13.26	...	...	43.40	...	43.40	1%
Apothecaries Hall Co., Liberty 8/13/11	5.10	2.61	0.01	0.19	7.91	13.24	12.70	13.46	13.46	...	None
Armour Fertilizer Works, Armour's Big Crop Tobacco Special 6/3/6... ..	1.14	0.28	1.42	3.45	6.29	3.40	3.18	5.50	1.80	3.70	None
Armour's 4/8/8	0.66	2.47	0.28	0.54	3.95	8.53	8.06	7.33	7.33	...	3%
Consolidated Rendering Co., Competitive Brand 8/16/16	0.86	7.23	...	0.07	8.16	16.83	16.49	14.38	14.38	...	2%
Corenco 8/16/14 Two in One	1.04	6.11	0.44	0.52	8.11	16.20	16.09	13.36	13.36	...	1%
Corenco Potato Grower 4/8/10	0.82	1.99	0.77	0.19	3.77	9.48	9.31	9.36	9.36	...	None
Competitive Brand 4/8/8	0.30	3.11	0.38	0.18	3.97	9.96	9.54	7.34	7.34	...	None
Ground Tankage 7.41/9.15 .....	...	...	...	...	7.11	14.18	...	...	...	...	None

III. TWENTY-THREE BRANDS OF MIXED GOODS AND FIVE OF CRUDE STOCK FAILING TO MAKE GOOD THEIR GUARANTIES

—concluded—

Manufacturers and Brands	Nitrogen found					Phosphoric acid found		Potash found			Shortage
	As nitrates	As ammonia	Soluble organic	Insoluble organic	Total	Total	Available	Total	As muriate	In other forms	
Eastern States Farmers' Exchange,											
Eastern States 8/20/12	1.75	5.23	0.57	0.21	7.76	21.12	20.86	12.12	9.57	2.55	None
Eastern States 8/16/16	1.77	5.76	0.54	0.18	8.25	17.80	17.46	15.19	12.00	3.19	None
Eastern States 8/12/20	1.97	6.12	0.11	0.10	8.30	11.66	11.66	20.80	16.10	4.70	None
Hoffman, A. H., Inc.,											
Hoffman's Bone Meal 3.70/20 .....	...	...	...	...	5.03	18.37	...	...	...	...	1%
International Agricultural Corp.,											
International 8/16/16	0.32	6.15	1.10	0.14	7.71	16.17	15.83	15.50	15.50	...	2%
International 8/16/14	0.84	6.19	0.69	0.10	7.82	16.93	16.61	13.36	13.36	...	1%
Old Deerfield Fertilizer Co., Inc.,											
Old Deerfield 8/16/16	0.81	5.86	1.54	0.03	8.24	15.90	15.90	15.54	15.54	...	1%
Standard Wholesale Phosphate & Acid Works, Inc.,											
Standard 8/16/16	1.63	5.46	0.22	0.15	7.46	17.36	17.20	15.38	15.38	...	None
Standard 8/16/14	0.04	4.19	3.09	0.11	7.43	18.56	18.12	14.38	14.38	...	None
Standard 5/8/7	0.29	3.33	0.73	0.35	4.70	8.65	8.24	6.94	5.98	0.96	1%
Sulphate of Ammonia 20.50 .....	...	...	...	...	19.96	...	...	...	...	...	3%
Standard 43% Superphosphate .....	...	...	...	...	...	40.72	40.61	...	...	...	6%

COMMERCIAL FERTILIZERS

IV. SHEEP, GOAT, CATTLE AND POULTRY MANURES

Manufacturers and Brands	Moisture	Organic and volatile matter	Insoluble matter (sand)	Nitrogen		Phosphoric acid		Potash	
				Found	Guaranteed	Found	Guaranteed	Found	Guaranteed
American Agricultural Chemical Co., Pulverized Sheep and Goat Manure	7.85	38.39	4.03	1.47	1.25	1.54	1	3.00	2
Armour Fertilizer Works, Sheep and Goat Manure.....	8.90	43.70	14.73	1.59	1.25	1.90	1	2.86	2
Atkins & Durbrow, Inc., Henure	8.40	62.87	21.73	2.78	3	3.32	1	1.10	1
Driconure	6.62	79.25	3.05	2.01	1	1.24	1	1.45	1
Breck, Joseph, & Sons Corp., Breck's Ram's Head Brand Sheep Manure	8.15	46.58	23.64	1.89	1.46	0.68	0.75	2.48	2
Consolidated Rendering Co., Corenco Sheep Manure.....	8.42	43.03	22.15	1.53	1.25	1.14	1	2.85	2
Hoffman, A. H., Inc., Hoffman's Cow Manure.....	5.76	75.65	2.85	2.11	2	2.50	2	2.21	2
Hoffman's Sheep Manure.....	5.77	56.48	25.58	1.91	1.85	1.12	1	2.09	2
Natural Guano Co., Sheepshead Pulverized Sheep Manure	5.89	59.76	23.09	1.92	2	1.14	1	2.09	2
Old Deerfield Fertilizer Co., Inc., Pulverized Sheep and Goat Manure	5.80	47.93	40.00	1.57	1.25	1.32	1	2.00	2
Premier Poultry Manure Div., North American Car Corp., Premier Brand Pulverized Sheep Manure	5.16	55.56	26.22	2.01	1.65	1.10	1	1.99	2
Pulverized Manure Co., Wizard Brand Pulverized Sheep Manure	6.54	76.95	6.92	2.13	2	1.32	1	2.51	2
Rocky Mountain Sheep Fertilizer Co., Sheepex 100% Montana Sheep Manure	6.45	56.50	26.64	2.01	2	1.00	1	2.16	2
Rogers & Hubbard Co., Sheep and Goat Manure.....	10.63	46.01	16.43	1.57	1.25	1.36	1	2.83	2
Standard Wholesale Phosphate & Acid Works, Inc., Activated Sheep Manure.....	4.00	44.81	35.59	2.54	1.25	1.32	1	0.62	2
Swift & Co. Fertilizer Works, Swift's Sheep Manure.....	5.09	63.22	18.95	1.84	1.75	0.88	1	2.22	1.8

There were six more brands of this type of material registered this year than last, and, with two exceptions, the prices run slightly higher. Guaranties have been well maintained. One lot was quite low in potash and another low in nitrogen; however, the latter contained three times as much phosphoric acid as was guaranteed and in the former case equivalent averages were furnished.

This class of goods has its place, but the cost of a pound of plant food is high. Dried manures carrying an insoluble matter (sand) content of more than 20 percent are not apt to be desirable purchases unless sold at corresponding low prices.

V. AGRICULTURAL LIME PRODUCTS

Manufacturers and Brands	Lime (CaO) found	Lime (CaO) guaranteed	Magnesia (MgO) found	Magnesia (MgO) guaranteed	Total carbonates (CaCO ₃ + MgCO ₃) found	Total carbonates (CaCO ₃ + MgCO ₃) guaranteed	Insoluble matter SiO ₂	Mechanical analysis				
								Percentage passing 20-mesh sieve	Percentage passing 40-mesh sieve	Percentage passing 60-mesh sieve	Percentage passing 80-mesh sieve	Percentage passing 100-mesh sieve
Hydrated Limes												
Brewer & Co., Inc., Worcester, Mass., Brewer's Sure Crop Agricultural Hydrated Lime	66.27	60	1.32	1	24.84	...	1.11	...	...	...	...	...
Producto Agricultural Lime	59.31	60	6.26	1	39.17	...	2.33	...	...	...	...	...
Fonda Lime Works, Fonda Junction, Vt., Fonda Agricultural Lime—Pulverized	68.25	60	1.83	0.5	9.23	...	0.98	...	...	...	...	...
Hoffman, A. H., Inc., Landisville, Pa., Hoffman's Hydrated Lime	67.72	70	2.23	1.5	6.41	1.5	2.05	...	...	...	...	...
Hoosac Valley Lime Co., Adams, Mass., Adams Land Lime	62.45	60	2.00	0.5	24.52	30	3.47	...	...	...	...	...
Millard, H. E., Annville, Pa., Sweet-Arrow Hydrated Lime	61.13	70	1.93	1.5	34.49	1.0	0.44	...	...	...	...	...
Swanton Lime Works, Swanton, Vt., Agricultural Lime	59.62	50	5.27	0.3	14.06	...	0.42	...	...	...	...	...
Vermarco Lime Co., West Rutland, Vt., Agricultural Hydrated Lime	71.12	68	1.13	1	4.69	...	0.72	...	...	...	...	...
Ground Limestones												
Aiken, Herrick, Amsden, Vt., Amlico Land Limestone	31.00	30.02	19.76	18.90	96.64	93.06	3.10	94	72	55	44	40
Brewer & Co., Inc., Worcester, Mass., Producto Agricultural Limestone	52.03	40	2.64	1	98.32	...	1.00	92	79	73	69	67

V. AGRICULTURAL LIME PRODUCTS—concluded

Manufacturers and Brands	Lime (CaO) found	Lime (CaO) guaranteed	Magnesia (MgO) found	Magnesia (MgO) guaranteed	Total carbonates (CaCO ₃ + MgCO ₃) found	Total carbonates (CaCO ₃ + MgCO ₃) guaranteed	Insoluble matter SiO ₂	Mechanical analysis				
								Percentage passing 20-mesh sieve	Percentage passing 40-mesh sieve	Percentage passing 60-mesh sieve	Percentage passing 80-mesh sieve	Percentage passing 100-mesh sieve
Ground Limestones—concluded												
Dominion Lime Co., Lime Ridge, Que., Dudswell Brand Ground Limestone	53.25	52	1.41	1	97.95	94	2.00	99	87	79	73	71
Eastern States Farmers' Exchange, Springfield, Mass., Eastern States Magnesian Limestone	30.40	29	20.64	20	97.41	93.5	1.68	100	91	73	58	57
Hoosac Valley Lime Co., Adams, Mass., Agricultural Limestone	52.96	50	0.88	0.5	96.34	97	2.22	100	74	57	45	43
New England Lime Co., Adams, Mass., Agricultural Limestone	31.44	30	20.32	20	97.13	. .	1.82	99	96	92	87	85
Unity Lime Co., East Charlotte, Vt., Agricultural Limestone	54.21	45	0.23	10	97.23	94	2.38	76	47	40	36	35
Vermarco Lime Co., West Rutland, Vt., Vermarco Pulverized Agricultural Limestone	54.56	54	0.27	1	97.92	96	1.63	100	100	97	89	85
Vivie, Edward, Plymouth-Union, Vt., Plymouth-Union Land Limestone	31.50	35	18.77	12	95.47	95	3.38	90	80	76	73	71
Lime Ashes												
Brewer & Co., Inc., Worcester, Mass., Producto Lime Kiln Ashes	46.60	42	3.08	2	43.27	78	14.05	...	...	...	...	...

Eighteen of the 23 lime products licensed for sale were analyzed.

A. H. Hoffman's and H. E. Millard's hydrated lime and Edward Vivie's limestone were low in calcium oxide. The latter carried a high magnesium oxide and combined carbonate content which offsets its low calcium oxide percentage.

Five of the nine limestones were in excellent mechanical condition, two-thirds or more of each sample passing a 100-mesh sieve. Four were too coarsely ground.

There has been much demand for liming materials this spring from farmers wishing to comply with federal regulations concerning soil conservation. In order to buy efficiently the cost of 100 pounds of effective oxides should be determined. Hydrated lime: Divide the pounds of lime and magnesia in a ton by the ton cost and multiply by 100. Example: 82 percent lime, 7 percent magnesia, cost \$6 per ton.

$$\frac{600 \text{ (cents)}}{89 \times 20 \text{ (pounds)}} \times 100 = 34 \text{ cents, the cost of 100 pounds of effective}$$

oxides. Ground limestone: The degree of fineness should be considered, that portion which fails to pass a 20-mesh sieve being assumed to be only half as effective as finely ground material. Example: A limestone containing 900 pounds of lime and magnesia per ton; 10 percent failing to pass a 20-mesh sieve, cost \$5 per ton. $900 - 90 = 810$. $90 \times$

$$.5 = 45. \quad 810 + 45 = 855. \quad \frac{500 \text{ (cents)}}{855 \text{ (pounds)}} \times 100 = 59 \text{ cents, cost of}$$

100 pounds of effective oxides.

The chemical and mechanical analyses of most of the limestones and the chemical analyses of the hydrated limes sold in the state appear in the preceding table. With this data, in hand, together with the costs per ton, the lime users may well make use of these formulas in determining how they may buy to the best advantage.

RESULTS OF FERTILIZER INSPECTION

(a) AS TO QUANTITY OF PLANT FOOD

The 121 brands of mixed goods analyzed in 1937 taken as a whole were not as good in respect to guaranty maintenance as were last year's goods (tables I and III, pages 5 to 11). Twenty-six of the 371 guaranties (7.2 percent) were not maintained, whereas the comparable figures in 1936 were 13, 330, 3.9 percent. Three shortages amounted to less than 0.25 percent, eight were between 0.26 and 0.50 percent; eleven above 0.50 but less than one percent; and four exceeded one

percent. The distribution was as follows: Nitrogen, 9, available phosphoric acid, 3 and potash, 15. Twenty-three brands failed to meet guaranties, but total plant food shortages in excess of two percent were found in only one case.

Forty-three of 48 brands of crude stock met their guaranties. A 43 percent superphosphate was 6 percent short, a sulphate of ammonia 3 percent short of guaranty.

Taking each brand of mixed fertilizer analyzed as a unit in the computation regardless of the amount sold, 5.17 percent nitrogen was guaranteed and 5.44 percent furnished; 9.91 percent available phosphoric acid was guaranteed and 10.38 percent, furnished; 8.47 percent potash was guaranteed and 8.72 percent furnished; 0.27 percent more nitrogen, 0.47 percent more available phosphoric acid and 0.25 percent more potash being furnished than was guaranteed. For each 100 pounds of plant food guaranteed 104 pounds were furnished.

The following efficiency table shows average overruns and under-runs.

EFFICIENCY TABLE

	Brands	Brands meeting guaranty in all respects	Total guaranties	Guaranties made good	Guaranties not fulfilled	0.11-0.25% below	0.25-0.50% below	0.50-1% below	More than 1% below	Average overrun over guaranty		
										Nitrogen	Available phosphoric acid	Potash
Acme Guano Co.	5	4	15	14	1	..	..	..	1	-0.01	0.42	0.40
American Agricultural Chemical Co. 25	20	75	70	5	..	3	..	..	2	0.68	0.48	0.03
Apothecaries Hall Co.	5	4	15	14	1	..	1	..	..	0.20	0.02	0.80
Armour Fertilizer Works	14	12	42	40	2	..	..	2	..	0.09	0.09	0.10
Berkshire Chemical Co.	2	2	6	6	..	..	..	..	..	0.21	-0.06	0.57
Consolidated Rendering Co.	13	9	39	34	5	1	..	3	1	0.14	0.44	-0.15
Eastern States Farmers' Exchange.. 10	7	30	27	3	1	1	1	..	..	0.46	0.82	1.05
Howard Hardware Co.	1	1	3	3	..	..	..	..	..	0.23	0.56	0.62
International Agricultural Corp.... 9	7	27	23	4	1	1	2	..	..	-0.01	0.45	0.15
Middlebrook, J. O., & Sons	1	1	3	3	..	..	..	..	..	1.31	1.52	-0.06
Old Deerfield Fertilizer Co., Inc.... 10	9	30	29	1	..	1	..	..	..	0.26	0.78	0.22
Rogers & Hubbard Co.	11	11	33	33	..	..	..	..	..	0.38	0.33	0.49
Standard Wholesale Phosphate & Acid Works, Inc.	12	9	36	32	4	..	1	3	..	0.03	0.69	0.11
Swift & Co. Fertilizer Works	2	2	6	6	..	..	..	..	..	0.15	0.87	0.58
Tennessee Corp.	1	1	3	3	..	..	..	..	..	0.31	0.28	0.44
Totals and averages (15 companies, each a unit)	121	99	363	337	26	3	8	11	4	0.30	0.51	0.36
Averages (121 brands, each taken as a unit) .....	..	..	..	..	..	..	..	..	..	0.27	0.47	0.25

Note.—Three fertilizers sold only in small packages and one incomplete mixed goods omitted.

A review of the trade for the past 10 years in mixed fertilizers seems worth while.

BRANDS OF MIXED FERTILIZER LICENSED AND ANALYZED 1928-1937

	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
Licensed	115	137	138	152	160	125	111	128	117	148
Collected	98	108	116	131	134	110	91	114	110	124
Not found on sale	17	29	22	21	26	15	20	14	1	24

The approximate average guaranteed composition of fertilizers sold during the 10 years—each brand taken as a unit—is shown below.

	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
Nitrogen	3 $\frac{1}{3}$	3 $\frac{1}{4}$	3 $\frac{7}{8}$	4 $\frac{1}{8}$	4 $\frac{3}{8}$	5 $\frac{1}{3}$	4 $\frac{7}{8}$	4 $\frac{3}{4}$	4 $\frac{4}{10}$	5 $\frac{1}{10}$
Available phosphoric acid	8 $\frac{3}{4}$	8 $\frac{3}{4}$	10	10	10	9 $\frac{4}{8}$	9 $\frac{1}{8}$	9 $\frac{1}{3}$	9 $\frac{3}{5}$	9 $\frac{9}{10}$
Potash	6 $\frac{1}{8}$	6	6 $\frac{7}{8}$	7 $\frac{1}{2}$	7	7 $\frac{1}{2}$	7 $\frac{1}{4}$	7 $\frac{3}{5}$	7 $\frac{3}{5}$	8 $\frac{5}{10}$
Total plant food*.	18 $\frac{1}{4}$	18	20 $\frac{3}{4}$	21 $\frac{5}{8}$	21 $\frac{3}{8}$	22 $\frac{5}{8}$	21 $\frac{1}{4}$	21 $\frac{3}{8}$	21 $\frac{9}{10}$	23 $\frac{1}{10}$

* Nitrogen, available phosphoric acid, potash.

The guaranteed composition of the average mixed fertilizer (each brand taken as a unit) is eight percent higher than that sold in 1936, much the highest ever sold in Vermont. Low grades have disappeared from our markets, and many double strength formulas are now on sale. The percentage of deficiencies is rather high this year. The mixed goods were on the whole about as good as they have been of late years; and, as has been pointed out, the shortages are usually very small ones.

DEFICIENCIES (MIXED FERTILIZERS)

	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
Analyzed	98	108	116	131	134	110	91	114	110	124
Up to guaranty	77	91	106	107	116	95	82	94	97	101
Deficient	21	17	10	24	18	15	9	20	13	23
Percentage of deficiency	22	16	9	18	13	14	10	18	12	19

(b) AS TO QUALITY OF PLANT FOOD

Nitrogen.—The following table shows the quality of nitrogen used by the various manufacturers, the figures representing averages for their several brands.

Manufacturer	Nitrogen				
	Total	In nitrate form	In ammonia form	In soluble organic form	In insoluble organic form
Acme Guano Co.	4.39	0.01	3.43	0.66	0.29
American Agricultural Chemical Co.	5.30	0.48	4.14	0.41	0.27
Apothecaries Hall Co.	6.60	3.48	2.58	0.27	0.27
Armour Fertilizer Works.....	5.09	0.72	3.45	0.27	0.65
Berkshire Chemical Co.	4.21	0.37	3.09	0.56	0.19
Consolidated Rendering Co....	5.14	0.97	3.32	0.62	0.23
Eastern States Farmers' Exchange	7.86	1.98	5.28	0.38	0.22
Hoffman, A. H., Inc.,	5.12	1.65	2.26	0.31	0.90
Howard Hardware Co.....	4.23	1.94	0.22	0.49	1.58
International Agricultural Corp.	5.77	0.84	3.83	0.75	0.35
Middlebrook, J. O., & Sons....	8.31	0.50	6.47	0.77	0.57
Old Deerfield Fertilizer Co., Inc.	5.66	1.14	2.85	1.25	0.42
Rogers & Hubbard Co.....	5.11	1.28	2.90	0.54	0.39
Standard Wholesale Phosphate & Acid Works, Inc.....	4.53	0.25	3.30	0.71	0.27
Swift & Co. Fertilizer Works..	4.65	0.66	3.54	0.06	0.39
Tennessee Corp.	5.31	0.38	4.47	0.04	0.42
Averages	5.44	0.98	3.57	0.53	0.36
Percentages of total.....	100	18	66	10	7

On the average, two-thirds of the total nitrogen was derived from sulphate or phosphate of ammonia, undoubtedly mostly from sulphate; one-sixth from nitrates of soda or potash, undoubtedly mostly from the former; one-tenth from water-soluble organic and 7 percent from water-insoluble organic sources. In other words, 93 percent of the total nitrogen of the available fertilizer was water soluble. All brands containing organic nitrogen were tested in the laboratory as to their activity. Every brand "passed" in respect to the quality of its organic nitrogen content.

Phosphoric Acid.—On the average, 95 percent of the total phosphoric acid found in the complete fertilizers was in the so-called available form. With few exceptions its source is superphosphate, a standard product long and successfully used. A few brands contained bone or ammonium phosphate, both excellent materials.

Potash.—Nineteen of the complete fertilizers contained potash in forms other than muriate. Four of these 19 contained some nitrate of potash as well as muriate, while 15 carried both muriate and sulphate of potash. All three of these potash salts are standard materials.

FERTILIZER USAGE

The total tonnages sold from 1932 to 1937 inclusive are shown below. The 1937 usage was nearly 8,850 tons greater than that of the previous year, four-sevenths of it consisting of crude stocks. Superphosphate usage increased 8,600 tons, being 2¾ times greater than that of 1936.

Two-thirds of the mixed fertilizer tonnage consisted of brands guaranteed 3/10-12/3-6, 4/8/4, 4/8/10, 5/8/7 and 8-10/16-30/14-20. More than twice as many tons of double-strength goods was sold this year as were sold last year. The sale of other grades dropped or, in two or three cases, barely held their own. The relatively low grades are not now as popular as they were at one time, less than 400 tons of brands carrying two or less percent of nitrogen being sold.

Nearly 9,000 tons more of fertilizer were sold in 1937 than in 1936, 98 percent of the increase consisting of superphosphate. Total sales, 25,260 tons, are more than twice the average of those of 1932-1935 inclusive, representing a 60 percent increase over 1936. Of course this great change is due to federal activities along soil conservation lines.

	1932	1933	1934	1935	1936	1936	1937	1937
Total tonnages	11,767	9,520	13,087	15,295	16,421	%	25,260	100.
Superphosphate	1,838	1,701	2,363	3,181	4,904	30.	13,512	53.5
Nitrate of soda	180	103	119	276	238	1.5	242	1.
Sulphate of ammonia	105	63	44	83	162	1.	51	0.2
Bone and tankage	103	110	99	95	145	1.	87	0.3
Muriate of potash	98	32	38	42	66	0.5	216	0.8
Sheep, goat, cattle and poultry	160	115	92	131	111	0.7	94	0.4
2/9-10/2-5	534	330	476	81	27	0.1	....	....
2/12/2-4	290	196	67	58	46	0.2	45	0.2
2/8/10	769	556	549	517	419	2.6	335	1.3
3/10-12/3-6	1,364	1,075	1,461	1,962	1,574	9.6	1,292	5.1
4/8/4	606	716	1,376	1,737	1,585	10.	1,057	4.2
4/8/7	624	653	780	833	557	3.4	379	1.5
4/10-12/4-6	1,227	414	479	569	560	3.4	604	2.4
4/8/8 .....	....	....	....	....	....	....	319	1.3
4/8/10	1,156	904	1,351	1,387	1,476	9.	1,521	6.
5/8/7	590	697	1,093	1,078	959	5.7	770	3.
7/6-8/5-6	291	278	333	557	461	2.8	307	1.2
8-10/16-30/14-20	499	477	700	870	1,149	7.	2,718	10.8
Miscellaneous	1,333	1,100	1,667	1,838	1,982	11.5	1,711	6.8

The low grades 1/9-10/3-4 and 2/8/2 so popular—but unjustly so—in bygone years were withdrawn in 1932. They are not missed. The 3/8/4 and 4/6/10 grades, constituting one-fifth of the total tonnage sold in 1931, have also disappeared.

Vermont farmers have greatly increased their superphosphate purchases. Doubtless the stress laid by educational and governmental agen-

cies on the advisability of using it in the stable as well as on the land, is largely responsible for this very considerable change. Whereas in 1931-34 approximately four of every five tons were complete fertilizers, in 1935 the figures were three of four, in 1936 two of three, while in 1937 four tons out of seven were crude stocks.

The percentages of the different classes of fertilizers sold, based on tonnage sales during the past six years, are set forth below.

	1932	1933	1934	1935	1936	1937
	%	%	%	%	%	%
Brands carrying 14-15% plant food	5.6	3.5	4.	0.9	0.1	0.2
Brands carrying 16-18% plant food	17.7	19.	19.7	21.8	16.2	7.3
Brands carrying 19-24% plant food	47.3	42.6	44.5	43.2	28.7	21.9
Brands carrying 32-44% plant food	4.4	7.9	6.4	7.6	19.6	13.2
Superphosphate	15.5	18.	18.1	21.4	30.7	53.5
Crude stocks (other than superphosphate)	4.1	3.2	2.3	3.3	3.8	3.5
Sheep, poultry, etc., manures.....	1.4	1.2	0.7	0.9	0.7	0.4

FERTILIZER GRADES

The figures below show the distribution of each manufacturer's goods by grades. Nearly one-half of the brands contained 19 and 20 percent of plant food and over one-third carry 22 percent or more.

DISTRIBUTION OF GRADES AMONG MANUFACTURERS

	Total	14% and +	46-63%	38-44%	26-32%	22-25%	21%	20%	19%	18%	17%	16%	15%	14%
Agricultural Laboratories, Inc.....	1	1	1											
Acme Guano Co.	5	5			1	1	1					2		
American Agricultural Chemical Co.	25	25	5	5	1	3	7	3			1			
Apothecaries Hall Co.	5	5		1	1	1					1			
Armour Fertilizer Works	14	14	2	2		4	2	2			1	1		
Berkshire Chemical Co.	2	2					1				1			
Consolidated Rendering Co.	13	13	3	1		5	2		1	1				
Eastern States Farmers' Exchange	11	11	7			4								
Hoffman, A. H., Inc.	1	1					1							
Howard Hardware Co.	1	1					1							
International Agricultural Corp...	9	9	2	3		2	1				1			
Middlebrook, J. O., & Sons.....	1	1					1							
Old Deerfield Fertilizer Co., Inc...	10	10	3	2		1	3				1			
Plantabbs Corp.	1	1	1											
Rogers & Hubbard Co.....	11	11	1	1	1	3	3	1		1				
Standard Wholesale Phosphate & Acid Works, Inc.	12	12	2			5	2		1	2				
Swift & Co. Fertilizer Works....	2	2				2								
Tennessee Corp.	1	1					1							
Totals	125	125	1 26	1 16	3 31	26	6	2 12	1	.	.	.	.	.

The following table sets forth on a percentage basis the situation as to grades during the past 10 years:

	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
	%	%	%	%	%	%	%	%	%	%
12-13 percent total plant food.	4	4	4	4	0	0	0	0	0	0
14-15 percent total plant food.	21	21	18	16	10	7	7	5	4	1
16-17 percent total plant food.	13	13	12	12	17	17	17	21	17	10
18-19 percent total plant food.	16	14	11	11	19	21	21	20	21	26
20 or more percent total plant food	46	48	55	57	54	54	54	53	57	73

Percentage	Brands	Approximate pounds per ton	Approximate average price	Cost per pound plant food
15-17	15	320	\$33	10.3 cts.
18-19	32	380	31	8.2 cts.
20-21	34	400	32	8.0 cts.
22-32	17	480	37	7.7 cts.
38-44	26	800	50	6.3 cts.

PRICE DATA

COMPARISONS BETWEEN 1936 AND 1937 TON PRICES

Grade	'36	'37	Grade	'36	'37	Grade	'36	'37
2/ 8/10	\$32	\$32	4/ 8/10	\$36	\$37	8/12/20	\$54	\$45
2/10/ 2	30	32	4/12/ 4	31	29	8/16/14	45	48
2/12/ 4	38	31	4/16/20	41	50	8/16/16	53	55
3/ 8/ 4	..	30	5/ 8/ 7	36	38	8/16/20	56	60
3/10/ 4	31	33	5/ 8/10	37	41	8/24/ 8	45	46
4/ 8/ 4	32	33	6/ 8/ 6	28	31	9/ 6/ 6	43	47
4/ 8/ 7	32	36	7/ 6/ 6	38	40	10/ 8/ 6	55	50
4/ 8/ 8	28	29	7/13/11	45	52	12/16/12	53	55
			8/ 5/ 8	54	45			

TEN-YEAR AVERAGES

	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
Approximate average retail prices	\$42	\$44	\$44	\$45	\$36	\$34	\$39	\$36	\$40	\$41
Approximate average pounds plant food per ton	365	360	435	433	432	458	424	434	438	491
Approximate average price per pound of plant food (cents)...	11.5	12.2	10.1	10.4	8.4	7.5	9.2	8.3	9.1	8.4

In the above three tables the cost of a pound of plant food in various grades is set forth, as well as a comparison between 1936 and 1937 prices per ton by grades and a ten-year average. The ton price data are obtained by the sampling agents during the spring directly

from local selling agents, and they probably represent fairly well the prevailing prices. It is now, as it has always been, cheaper to purchase a high-grade than a low-grade fertilizer, pound for pound of plant food.

The ten-year average table gives a cross-section of the market during that time.

In 1928 and 1929, one bought 360 pounds of plant food for \$43, paying 12 cents a pounds for it; in 1937 490 pounds for \$41, paying 8.4 cents a pound. Since 1931 the per pound price has been below 10 cents, averaging in six years 8.5 cents.

ACID AND NON-ACID FERTILIZERS

For several years interest has been shown throughout the Northeast in respect to the acid or non-acid characteristics of fertilizers. Definitions of these two types were proposed at the last meeting of the Association of Official Agricultural Chemists, and the following statements have been adopted.

"An acid forming fertilizer is one that is capable of increasing the residual acidity of the soil.

"A non-acid forming fertilizer is one that is not capable of increasing the residual acidity of the soil."

A method for determining the relative acidity or basicity of a fertilizer has been developed by Dr. W. H. Pierre, Associate Agronomist of West Virginia Station, widely used and tentatively adopted as a reasonably accurate means of determining fertilizer reactions in the soil. The final result is stated as the net acid- or base-balance of the fertilizer expressed as pounds of calcium carbonate equivalent per ton.

All of the complete brands analyzed this year have been tested by the Pierre method, which is based on the assumption that if, for example, a ton of fertilizer having a net acidity of 400 pounds of calcium carbonate is sown upon an acre of land, 400 pounds of ground limestone must be applied in order to counteract the acidity thus developed. The calcium carbonate equivalents per ton range from 460 to 0 pounds per ton for those in the acid-grade class and from zero to 627 pounds for those which are listed as non-acid or basic.

The following table summarizes the data showing both acid and non-acid results, calculated on the basis of total tonnage of the different brands of complete fertilizers sold in Vermont in 1936 and 1937.

SUMMARY OF DATA ON ACID AND NON-ACID MIXED FERTILIZERS

Tonnage of acid and non-acid fertilizer sold in Vermont		Effect of acid and non-acid fertilizer expressed in tons of calcium carbonate (CaCO ₂) based on tonnage sold			
	1936	1937			
Acid	8,433	8,296	Acid	949	829
Non-acid	1,819	2,087	Non-acid	66	109
Total	10,252	10,383	Net acidity	883	720

There were 51 tons of sulphate of ammonia, as such, sold in Vermont in 1937. About 64 tons of ground limestone would counteract the acidity these 51 tons would induce.

The warning set forth in the fertilizer bulletins of 1935 and 1936 may well be repeated for 1937.

Soil acidity is a serious matter. Vermont soils as a whole tend to be somewhat acid and they are becoming more so as the years pass by. Speaking in general terms, acid soils are usually less productive than those who are neutral or nearly neutral in reaction. The dangers incident to the continued use of acid-producing and acid-increasing fertilizers is a matter of concern which every fertilizer user should take to heart.

"Lime in some form, usually ground limestone, should be sown with a free hand and at frequent intervals in order to correct the acidity which is developed by the use of many of the present-day commercial fertilizers. In practice when a pound of sulphate of ammonia is sown on the soil as such or as an ingredient of a fertilizer, 1.2 pounds of ground limestone are needed if the acidity it develops is to be neutralized. Presumably fertilizer manufacturers, if asked, will indicate how much acid-forming material they are using in any given brand. Many now use ground dolomitic limestone as a filler in order in part to counteract this undesirable tendency of an otherwise admirable form of plant food which, despite its one fault, manufacturers are thoroughly justified in using and are not to be condemned for using.

"Many Vermont soils are fairly well stocked with lime, since they are of a calcareous origin; however, some sandy soils may need lime especially those which have been exposed to the leaching effect of rain and which have been heavily cropped, especially when heavy applications of acid-forming fertilizers have been made for some years. Farmers may use such fertilizers freely and safely if they lime their soils occasionally. County agents will determine soil lime requirements for their constituents without charge if they are asked to do so."