

Commercial Fertilizers.

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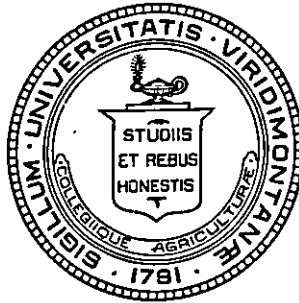
BURLINGTON VERMONT

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COMMERCIAL FERTILIZERS

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



Manufacturers have met the requirements of the Vermont law well during 1935. Twenty 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 nine of 114 brands, and this exceeded three percent in only two cases.

Ten brands of sheep and goat manures were as good as they were said to be. Two brands were pilloried in last year's fertilizer bulletin because they contained relatively large amounts of sand and low organic matter contents. They carry excessive amounts of sand again this year, but in other respects are distinctly better.

The lime products were well above guaranty save one brand which was low in calcium oxid.

Five brands of mixed goods contained organic nitrogen of inferior activity. About the same amounts of organic nitrogen were used this year as last year.

Every brand licensed (with one exception which, furthermore, contained organic nitrogen of low activity) was in the so-called "high analysis" class, carrying 14 percent or more of plant food.

Fertilizer usage in 1934 is reported and the grades grouped by tonnages on page 17. The brands most commonly used are indicated by grade not by name. The 1934 tonnage, 13,087 tons, was 37 percent greater than that of 1933. The data for 1935 are not in hand at the time when this bulletin goes to press, but there seems reason to believe that at least as large a tonnage was sold as in 1934.

Mixed fertilizers cost on the average \$36 per ton, or three dollars less than in 1934.

## BULLETIN 397: COMMERCIAL FERTILIZERS

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

The results of the 1935 inspection are set forth herewith in condensed form. The licenses cover: Complete mixed fertilizers 128; crude stocks 51; sheep and goat manures 10; limes 17; total 206.

The station sampling agents visited many Vermont cities, towns and villages in the spring of 1935 and drew 442 samples from dealers' stocks representing 178 of the 206 brands licensed for sale. No samples of the 28 brands named below were secured.

ACME GUANO, Co., Baltimore, Md.

Acme 8-16-14; Acme 4-16-14; Acme 10-16-14; Acme Muriate of Potash.

AMERICAN AGRICULTURAL CHEMICAL Co., North Weymouth, Mass.

Bowker's Market Garden Fertilizer 4-8-4; Cal-Nitro 20.5.

APOTHECARIES HALL Co., Waterbury, Conn.

Sulphate of Ammonia.

ARMOUR FERTILIZER WORKS, New York, N. Y.

Armours Big Crop Fertilizer 5-8-7; Armour's Bone Meal Fertilizer.

BARRETT Co., New York, N. Y.

Arcadian Sulphate of Ammonia.

CHILEAN NITRATE SALES CORP., New York, N. Y.

Standard Chilean Nitrate of Soda.

JACOB DOLD PACKING Co., Buffalo, N. Y.

Dold Special 5-12-6 Fertilizer.

EASTERN STATES FARMERS' EXCHANGE, Springfield, Mass.

Eastern States Sulphate of Ammonia.

MILLER FERTILIZER Co., Baltimore, Md.

Miller Harvest Brand 8-16-14; Miller Harvest Brand 5-8-10.

OLD DEERFIELD FERTILIZER Co., South Deerfield, Mass.

Old Deerfield 8-16-14.

ROGERS & HUBBARD Co., Portland, Conn.

Hubbard's "Bone Base" Soluble Corn and Market Garden Manure 4-8-7; Red H 4-8-7.

STANDARD WHOLESAL PHOSPHATE & ACID WORKS, Inc., Baltimore, Md.

Standard United States Superphosphate 16%; Standard United States 5-8-7.

SWIFT & Co., Baltimore, Md.

Swift's Special Gold Fertilizer 12-6-4.

VIRGINIA-CAROLINA CHEMICAL CORP., Carteret, N. J.

V-C Eureka Brand 3-8-10.

L. B. ANDREWS & SON, Wilmington, Vt.

Agricultural Lime.

HOOSAC VALLEY LIME Co., Inc., Adams, Mass.

Adams Land Lime; Hoosac Agricultural Limestone.

PEOPLES TRUST Co., St. Albans, Vt.

Lime Kiln Waste.

SOLVAY PROCESS Co., Syracuse, N. Y.

Solvay Pulverized Limestone.

EDWARD VIVIE, Perkinsville, Vt.

Agricultural Lime.

Several of the brands which were not sampled as a matter of fact were not sold in Vermont this year. There appears to have been no demand for them. This situation has prevailed more or less every year. Then, again, some brands were shipped in very small quantities. Furthermore it often happens, under the modern conditions of the fertilizer trade, that a car is received at a railroad station and its contents are hauled away within 24 hours and, not infrequently, sown upon the land within a day or two. Moreover fertilizers are often delivered by truck direct from the factory or the jobber's warehouse to the very farms and onto the very fields on which they are to be used and are sown immediately. Under such circumstances the station's sampling agents can not obtain samples. During recent years this group has represented not more than four percent of the entire tonnage.

#### 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 7 and 8). (3) The 25 brands which contained less plant food than guaranteed (table III, pages 9 and 10). (4) Sheep, etc., manures and limes (tables IV and V, pages 11 and 12).

Table I (pages 5 to 7) shows:

1. The names and addresses of licensees. 2. The brand names. 3. The "grades"—nitrogen, available phosphoric acid<sup>1</sup> and water-soluble potash. 4. The percentage of the total nitrogen in each brand present in water-soluble form. 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. 7. The source of potash, whether muriate, sulphate or nitrate.

Table II (pages 7 and 8) shows the analyses of the sundry crude stocks which were found to be equivalent to their guaranties.

Table III (pages 9 and 10) sets forth the facts as to 25 brands which failed to meet their guaranties. In 16 cases no actual shortage occurred, due to the fact that the overruns more than offset the underruns. The shortages occurring in 9 brands are recorded in the last column. They range from 1 to 4 percent.

<sup>1</sup> 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	Grade	Percentage of nitrogen which is water-soluble	*(See title-in footnote)
<b>Acme Guano Co., 311 Marine Bank Bldg., Baltimore, Md.</b>			
Acme 4/12/4 .....	4-12- 4	94	96
Acme 4/8/7 .....	4- 8- 7	93	95
Acme 4/8/4 .....	4- 8- 4	92	94
Acme Vitaflor 4/8†/5 .....	4- 8†-5	20	68
Acme 3/10/4 .....	3-10- 4	90	95
Acme 3/8/4 .....	3- 8- 4	91	97
Acme 2/8/10 .....	2- 8-10	93	97
Acme 2/10/2 .....	2-10- 2	92	95
<b>American Agricultural Chemical Co., 285 River St., North Weymouth, Mass.</b>			
AA Double Strength Fertilizer 8/16/14...	8-16-14	99	99
AA Top Dresser 7/6/6 .....	7- 6- 6	97	98
AA Potato & Vegetable Fertilizer 5/8/7..	5- 8- 7	98	97
AA Complete Manure with 10% Potash 4/8/10 .....	4- 8-10	91	98
AA Peerless Fertilizer 4/8/7 .....	4- 8- 7	90	96
AA Monarch Fertilizer 4/8/4 .....	4- 8- 4	95	95
AA Corn Favorite 3/10/4 .....	3-10- 4	90	100
AA Prolific 10% Potash Fertilizer 2/8/10	2- 8-10	91	96
Agrico for Lawns, Trees & Shrubs 7/6/6.	7- 6- 6	96	100
Agrico for Aroostook with 10% Potash 5/8/10 .....	5- 8-10	93	98
Agrico for Potatoes & Vegetables 5/8/7..	5- 8- 7	92	100
Agrico for New England 4/8/10.....	4- 8-10	93	96
Agrico for Corn 3/10/6 .....	3-10- 6	92	96
Bowker's Stockbridge Potato & Vegetable Manure 4/8/10 .....	4- 8-10	91	98
Bradley's Complete Manure with 10% Potash 4/8/10 .....	4- 8-10	90	96
Bradley's XL Fertilizer 3/10/4.....	3-10- 4	88	95
Netco Greens Formula 8/6/2.....	8- 6- 2	65	97
<b>Apothecaries Hall Co., Box 1009, Waterbury, Conn.</b>			
Liberty High Grade Market Gardeners 5/8/7 .....	5- 8- 7	86	93
Liberty Potato & General Crops 4/8/10...	4- 8-10	90	90
Liberty Market Gardeners Special 4/8/4..	4- 8- 4	90	99
Liberty Fertilizer 4/6/10 .....	4- 6-10	88	88
Liberty Fertilizer 3/8/4 .....	3- 8- 4	88	97
<b>Armour Fertilizer Works, 10 East 40th St., New York, N. Y.</b>			
Armours Big Crop Fertilizer 8/16/14.....	8-16-14	99	98
Armours Big Crop Fertilizer 7/6/6.....	7- 6- 6	100	100
Armours Big Crop Fertilizer 4/8/4.....	4- 8- 4	90	95
Armours Big Crop Fertilizer 3/10/4.....	3-10- 4	87	92
Armours Big Crop Fertilizer 2/8/10.....	2- 8-10	93	93
Armours Big Crop Fertilizer 2/12/4.....	2-12- 4	86	92
Armours Big Crop Fertilizer 2/10/2.....	2-10- 2	84	90
<b>Berkshire Chemical Co., Bridgeport, Conn.</b>			
Berkshire Long Island Special Fertilizer 4/8/7 .....	4- 8- 7	86	100
Berkshire Market Garden Fertilizer 4/8/4	4- 8- 4	81	95

\* Percentage of total phosphoric acid present in so-called available form.

† Total phosphoric acid

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

## I. MIXED FERTILIZERS SUBSTANTIALLY COMPLYING WITH GUARANTIES

—continued

Brand name	Grade	Percentage of nitrogen which is water-soluble	*(See title-in footnote)
<b>Consolidated Rendering Co., 178 Atlantic Ave., Boston, Mass.</b>			
Corenco 8/16/14 Two in One.....	8-16-14	99	99
Corenco 7/6/6 Complete Fruit & Top Dressing .....	7- 6- 6	100	96
Corenco 5/8/7 General Crop Manure.....	5- 8- 7	93	95
Corenco 4/8/10 Potato Grower .....	4- 8-10	100	95
Corenco 4/12/4 Complete Manure .....	4-12- 4	99	94
Corenco 4/8/7 Market Garden .....	4- 8- 7	100	97
Corenco 4/8/4 Corn & Vegetable.....	4- 8- 4	100	96
Corenco 3/10/4 Animal Brand .....	3-10- 4	100	95
Corenco 2/8/10 Potato & Oat Special.....	2- 8-10	94	91
<b>Eastern States Farmers' Exchange, Box 1482, Springfield, Mass.</b>			
Eastern States 12/16/12 .....	12-16-12 <sup>1</sup>	99	100
Eastern States 12/4/4 .....	12- 4- 4	99	100
Eastern States 8/20/12 .....	8-20-12	98	99
Eastern States 8/12/20 .....	8-12-20 <sup>2</sup>	98	100
Eastern States 6/8/6 .....	6- 8- 6	97	99
Eastern States 4/12/4 .....	4-12- 4	98	98
Eastern States 4/8/8 .....	4- 8- 8	94	97
Eastern States 0/14/6 .....	0-14- 6	..	95
<b>International Agricultural Corp., 38 Chauncy St., Boston, Mass.</b>			
International 7/6/6§ .....	7- 6- 6§	93	99
International Caribee Market Garden 5/10/10 .....	5-10-10 <sup>3</sup>	77	96
International 5/8/7 .....	5- 8- 7	96	100
International 4/8/10 .....	4- 8-10	97	99
International 4/8/4 .....	4- 8- 4	99	99
<b>Lowell Fertilizer Co., 178 Atlantic Ave., Boston, Mass.</b>			
Lowell 7/6/6 Complete Fruit & Top Dressing .....	7- 6- 6	100	91
Lowell 5/8/7 Market Garden Manure.....	5- 8- 7	96	95
Lowell 4/8/10 Potato Grower .....	4- 8-10	100	98
Lowell 4/8/7 Old General Crop Manure for Potatoes & Market Garden Crops .....	4- 8- 7	100	98
Lowell 4/8/4 Corn & Vegetable.....	4- 8- 4	100	96
Lowell 3/10/4 Animal Brand A High Grade Manure for all Crops.....	3-10- 4	100	93
Lowell 2/8/10 Vegetable and Grain.....	2- 8-10	97	95
<b>J. O. Middlebrook &amp; Sons, 190 College St., Burlington, Vt.</b>			
Midco 7/6/6 .....	7- 6- 6	95	97
<b>Miller Fertilizer Co., Baltimore Trust Co. Bldg., Baltimore, Md.</b>			
Miller Harvest Brand 5/8/7.....	5- 8- 7	94	93
Miller Harvest Brand 4/8/4.....	4- 8- 4	99	97
Miller Harvest Brand 3/8/4§.....	3- 8- 4§	88	89

\* Percentage of total phosphoric acid present in so-called available form.

<sup>1</sup> All of potash as nitrate.<sup>2</sup> Four-fifths of potash as muriate; remainder as sulphate.<sup>3</sup> One-half of potash as muriate; remainder as sulphate.

§ Contains organic nitrogen of inferior quality.

All brands listed, with one exception, "passed" in respect to the quality of their organic nitrogen contents and, save in three cases, carried potash as muriate.

I. MIXED FERTILIZERS SUBSTANTIALLY COMPLYING WITH GUARANTIES  
—concluded

Brand name	Grade	Percentage of nitrogen which is water-soluble	*(See title-in footnote)
<b>Old Deerfield Fertilizer Co., Inc., 28 Sugarloaf St., South Deerfield, Mass.</b>			
Old Deerfield Grass Top Dressing 7/6/6.	7- 6- 6	100	99
Old Deerfield 4/8/7 .....	4- 8- 7	88	90
Valley 5/8/7 .....	5- 8- 7	99	99
Valley 4/8/4 .....	4- 8- 4	98	98
Valley 4/8/10 .....	4- 8-10	100	99
Valley 4/8/7 .....	4- 8- 7	99	98
Valley 3/10/4 .....	3-10- 4	100	98
Valley 2/8/10 .....	2- 8-10	98	99
Valley 2/10/2 .....	2-10- 2	98	98
<b>Rogers &amp; Hubbard Co., Portland, Conn.</b>			
Hubbard's "Bone Base" Oats & Top Dressing .....	8- 5- 8	87	71
Hubbard's Potato Fertilizer 5/8/7 .....	5- 8- 7	82	83
Hubbard's Corn & Grain Fertilizer 2/12/4 .....	2-12- 4	90	94
Red H 7/6/6 .....	7- 6- 6	94	93
Red H 5/8/7 .....	5- 8- 7	95	93
Red H 4/8/4 .....	4- 8- 4	96	93
<b>Standard Wholesale Phosphate &amp; Acid Works, Inc., 1600 Continental Bldg., Baltimore, Md.</b>			
Pinkerton Bell Brand 4/8/4.....	4- 8- 4	89	94
Standard United States 4/8/4 .....	4- 8- 4	89	94
Standard United States 3/10/4.....	3-10- 4	88	93
Standard United States 2/8/10.....	2- 8-10	92	92
<b>Swift &amp; Co., 1305 Standard Oil Bldg., Baltimore, Md.</b>			
Vigoro .....	4-12- 4	94	95
<b>Tennessee Corp., Lockland, Ohio</b>			
Loma .....	5-10- 4	92	95
Soil-Prep§ .....	4- 2- 2§	69	85

II. CRUDE STOCKS SUBSTANTIALLY COMPLYING WITH GUARANTIES

Nitrogenous materials	Nitrogen	
	Found	Guaranteed
<i>Nitrate of Soda</i>		
Barrett Co., New York, N. Y., "Arcadian".....	16.12	16
Chilean Nitrate Sales Corp., New York, N. Y., "Champion" .....	15.92	16
<i>Sulphate of Ammonia</i>		
American Agricultural Chemical Co.....	21.04	20.56
Barrett Co. ....	20.74	20.56
Ford Motor Co., Dearborn, Mich., "Ford".....	21.12	20.8
Old Deerfield Fertilizer Co., "Old Deerfield".....	21.04	20.5
<i>Air-nitrogen Products</i>		
Eastern States Farmers' Exchange, "Eastern States Cal-nitro" .....	20.94	20.5

§ Contains organic nitrogen of inferior quality.  
All brands with two exceptions, "passed" in respect to the quality of their organic nitrogen contents and carried potash as muriate.



Nitrogenous and phosphatic material	Nitrogen		Total phosphoric acid	
	Found	Guar.	Found	Guar.
<i>Ammo-Phos</i>				
American Cyanamid Co., New York, N. Y., Ammo-Phos 11/48/0*	11.69	11	51.6	*
<i>Ground Bone and Tankage</i>				
Acme Guano Co. ....	3.08	2.47	24.46	23
American Agricultural Chemical Co., "Fine"	2.67	2.47	25.40	23
Apothecaries Hall Co. ....	3.80	2.47	23.82	22
Joseph Breck & Sons Corp., Boston, Mass...	2.97	2.47	25.04	22.5
Consolidated Rendering Co., "Corenco"†....	2.37	2.47	26.58	23
Consolidated Rendering Co., Ground Tankage	7.39	7.41	13.40	9.15
Eastern States Farmers' Exchange, "Eastern States Steamed" .....	2.93	2.5	23.56	23
Dr. Heinz Co., Cincinnati, Ohio, "Heinz Odor- less" .....	.97	1	31.40	29
Old Deerfield Fertilizer Co., "Old Deerfield Steamed" .....	2.51	2.47	26	22
Rogers & Hubbard Co., "Hubbard's Pure Raw" .....	4.09	3.7	24.28	21.5
Rogers & Hubbard Co., "Hubbard's".....	4.08	2.47	23	22.85
F. Rynveld & Sons, New York, N. Y., "Ryn- veld's" .....	3.29	2.47	23.50	22
Swift & Co. ....	2.92	2.47	24.80	23

Phosphatic materials	Phosphoric Acid			
	Found	Total Guar.	Available Found	Available Guar.
<i>Superphosphate (Acid Phosphate)</i>				
Acme Guano Co., "Acme".....	17.28	..	16.76	16
American Agricultural Chemical Co., "AA 16%" .....	17.68	..	17.38	16
Apothecaries Hall Co. ....	17.88	..	17.88	16
Armour Fertilizer Co., "Armours Big Crop 16%" .....	17.64	..	17.04	16
Berkshire Chemical Co., "Berkshire".....	17.28	..	16.78	16
Consolidated Rendering Co., "16%".....	17.96	..	16.92	16
Davison Chemical Co., Baltimore, Md., "Davi- son 16%" .....	18.20	..	17.24	16
Eastern States Farmers' Exchange, "Eastern States 32% Double".....	32.64	..	32.38	32
Eastern States Farmers' Exchange, "Eastern States 16%" .....	17.48	16.5	16.76	16
International Agricultural Corp., "Interna- tional 20%" .....	22.08	..	22.08	20
International Agricultural Corp., "Interna- tional 16%" .....	17.04	..	17.04	16
Old Deerfield Fertilizer Co., "Old Deerfield 16%" .....	17.52	..	16.44	16
Rogers & Hubbard Co. ....	17.88	..	17.60	16

Potassic materials	Potash	
	Found	Guaranteed
<i>Muriate of Potash</i>		
Consolidated Rendering Co. ....	52.24	50
Eastern States Farmers' Exchange, "Eastern States"....	61.02	60
International Agricultural Corp., "International" .....	52.08	50
Old Deerfield Fertilizer Co., "Old Deerfield".....	50.22	50

\* Available phosphoric acid guaranteed 48%; found 50.9%.

† Analysis represents average of two samples.

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

Manufacturer and Brand	Grade	Nitrogen			Phosphoric Acid				Potash		
		Water-soluble	Found	Guaranteed	Total		Available		Found	Guaranteed	Shortage
					Found	Guaranteed	Found	Guaranteed			
Acme Guano Co., Acme 7/6/6.....	7/6/6	5.86	<b>6.08</b>	7	7.78	...	7.32	6	6.24	6	None
Acme Guano Co., Acme 5/8/10.....	5/8/10	4.80	5.09	5	9.16	...	8.74	8	<b>9.75</b>	10	None
Acme Guano Co., Acme 5/8/7†.....	5/8/7	3.97	<b>4.22</b>	5	9.50	...	8.95	8	<b>6.53</b>	7	2%
Acme Guano Co., Acme 4/8/10†.....	4/8/10	3.52	<b>3.80</b>	4	10.10	...	9.48	8	<b>8.99</b>	10	None
Amer. Agr. Chem. Co., AA High Test Fertilizer 10/20/20†.....	10/20/20	10.28	10.43	10	20.22	...	19.80	20	<b>18.10</b>	20	3%
Amer. Agr. Chem. Co., AA Double Strength Fertilizer with 20% Potash 8/16/20.....	8/16/20	8.05	8.10	8	15.00	...	<b>14.76</b>	16	20.10	20	2%
Amer. Agr. Chem. Co., Agrico for Potatoes Double Strength 8/16/14.....	8/16/14	7.34	<b>7.41</b>	8	19.52	...	19.32	16	15.22	14	None
Amer. Agr. Chem. Co., Muriate of Potash†.....	0/0/50	...	...	...	...	...	...	...	<b>49.56</b>	50	1%
American Cyanamid Co., Aero Cyanamid†.....	22/0/0	...	<b>21.10</b>	22	...	...	...	...	...	...	4%
Armour Fertilizer Works, Armours Big Crop Fertilizer 4/8/10§.....	4/8/10	3.09	<b>3.62</b>	4	8.50	...	8.06	8	<b>9.41</b>	10	4%
Armour Fertilizer Works, Armours Big Crop Fertilizer 4/8/7§.....	4/8/7	3.36	4.07	4	8.60	...	8.08	8	<b>6.78</b>	7	None
Consolidated Rendering Co., Corenco 8/16/20 Two In One.....	8/16/20	8.08	8.16	8	18.86	...	18.46	16	<b>17.81</b>	20	None
Consolidated Rendering Co., Corenco 7/13/11 "It Cuts the Cost"†.....	7/13/11	6.57	<b>6.64</b>	7	13.86	...	13.61	13	11.53	11	None
Consolidated Rendering Co., Sulphate of Ammonia†.....	20.5/0/0	...	<b>20.37</b>	20.5	...	...	...	...	...	...	1%

† Analysis represents average of two samples.

‡ Nine-tenths as muriate; remainder as sulphate.

§ Contains organic nitrogen of inferior quality.

III. TWENTY BRANDS OF MIXED GOODS AND FIVE OF CRUDE STOCK FAILING TO MAKE GOOD THEIR GUARANTEES—*concluded*

Manufacturer and Brand	Grade	Nitrogen			Phosphoric Acid				Potash		
		Water-soluble	Found	Guaranteed	Total		Available		Found	Guaranteed	Shortage
					Found	Guaranteed	Found	Guaranteed			
Eastern States Farmers' Exchange, Eastern States 8/16/16†	8/16/16	9.16	9.31	8	17.65	...	17.65	16	14.50	16	None
Eastern States Farmers' Exchange, Eastern States 8/24/8†	8/24/8	7.86	8.25	8	29.60	...	29.33	24	6.76	8	None
Eastern States Farmers' Exchange, Eastern States 4/16/20†	4/16/20	4.21	4.54	4	18.20	...	17.81	16	19.29	20	None
Howard Hardware Co., Special Flower, Lawn & Garden 4/7/8	4/7/8	4.20	5.42	4	7.40	9.00	6.34	7	8.41	8	None
International Agricultural Corp., Sulphate of Ammonia	20.56/0/0	...	20.38	20.56	...	...	...	...	...	...	1%
Master Meat Products Co., Detroit, Mich., Master Bone Meal†	4/25/0	...	4.08	4	24.72	25.00	...	...	...	...	1%
Old Deerfield Fertilizer Co., Valley 8/16/14†	8/16/14	7.71	7.92	8	15.89	...	15.55	16	14.95	14	None
Old Deerfield Fertilizer Co., Old Deerfield 4/8/10	4/8/10	3.91	4.30	4	9.64	...	8.88	8	9.11	10	None
Rogers & Hubbard Co., Red H 8/16/14	8/16/14	7.52	8.02	8	19.64	...	19.20	16	13.16	14	None
Rogers & Hubbard Co., Hubbard's All Soils-All Crops 4/8/4	4/8/4	3.32	4.08	4	10.70	...	8.84	8	3.71	4	None
Rogers & Hubbard Co., Hubbard's High Pot-ash Fertilizer 2/8/10	2/8/10	2.73	3.04	2	10.20	...	9.30	8	9.77	10	None

† Analysis represents average of two samples.

‡ All as nitrate.

§ Eight-tenths as muriate; remainder as nitrate.

## IV. SHEEP AND GOAT MANURES

Manufacturer and Brand	Moisture	Organic volatile matter	Insoluble matter (sand)	Nitrogen		Phosphoric acid		Potash	
				Found	Guaranteed	Found	Guaranteed	Found	Guaranteed
American Agricultural Chemical Co. Pulverized Sheep & Goat Manure..	4.83	38.86	30.21	1.36	1.23	1.38	1	5.06	2
Armour Fertilizer Works Sheep & Goat Manure .....	6.99	41.30	18.48	1.60	1.25	1.78	1	5.00	2
Atkins & Durbrow, Inc. Driconure† .....	6.84	82.55	2.88	1.98	1	0.91	1	2.17	1
Joseph Breck & Sons Ramshead Brand Pulverized Sheep Manure .....	7.77	47.55	22.78	1.43	1	0.54	1	3.62	2
Consolidated Rendering Co. Corenco Sheep Manure .....	7.39	38.81	28.47	1.47	1.23	1.30	0.50	4.43	2
Thos. W. Emerson Co. Sheep Manure .....	10.19	67.52	12.16	1.96	2	0.98	1	2.55	2
Emporia Elevator & Feeding Co. Big Sheep Pulverized Sheep Man- ure .....	4.26	61.93	19.35	1.96	2	1.50	1	3.80	2
Old Deerfield Fertilizer Co. Pulverized Sheep Manure† .....	9.05	58.17	19.18	2.05	1.5	1.03	1	4.01	2
Pulverized Manure Co. Wizard Brand Pulverized Sheep Manure .....	7.95	67.93	8.05	1.92	2	1.76	1	5.21	2
Rogers & Hubbard Co. Sheep & Goat Manure .....	7.54	49.12	17.60	1.78	1.25	1.14	0.75	5.29	2

† Analysis represents average of two samples.

The sheep and goat manures as a whole contained somewhat more organic matter than in 1934—averaging 55 percent—and somewhat less insoluble matter. No material differences were found in their plant food contents. It is well recognized that this class of goods is inevitably of very uneven composition, one year or one lot as compared with another. Every brand afforded as much total plant food as was promised. The American Agricultural Chemical Co's and the Consolidated Rendering Co.'s goods, which last year were found to contain excessive amounts of insoluble matter (sand), are still open to the same criticism, but otherwise they are better than they were last year.

Sheep and goat manures are especially prized by florists, home flower gardeners and some market gardeners. Being dry they spread, decompose readily, and their organic matter improves soil texture. They are costly if one considers only their plant food content, but they are not bought as a rule because of this but because of their physical effect on the soil. Their average cost as sold in Vermont was about \$46 per ton.

V. LIMES AND LIMESTONES

Manufacturer and Brand	Lime (CaO) found	Lime (CaO) guaranteed	Magnesia (MgO) found	Magnesia (MgO) guaranteed	Total carbonates (CaCO <sub>3</sub> + MgCO <sub>3</sub> ) found	Total carbonates (CaCO <sub>3</sub> + MgCO <sub>3</sub> ) guaranteed	Insoluble matter SiO <sub>2</sub>	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
<b>Hydrated Limes</b>												
Brewer & Co., Inc., Worcester, Mass.												
Brewers' Sure Crop Agricultural Hydrated Lime	73.48	60	0.97	1	3.64	..	0.53	..	..	..	..	..
Producto Agricultural Lime .....	77.70	60	5.03	1	1.41	..	1.96	..	..	..	..	..
Fonda Lime Kilns, St. Albans, Vt.												
Fonda Agricultural Lime .....	64.55	60	2.27	0.5	46.02	..	0.49	..	..	..	..	..
H. E. Millard, Annville, Pa.												
Sweet-Arrow Hydrated Lime .....	62.41	70	2.22	1.5	52.30	1	0.69	..	..	..	..	..
Swanton Lime Works, Swanton, Vt.												
Agricultural Lime .....	59.80	60	1.74	0.3	68.24	30	0.67	..	..	..	..	..
Vermarco Lime Co., West Rutland, Vt.												
Vermarco Agricultural Hydrated Lime .....	68.22	68	0.88	1	29.57	..	0.54	..	..	..	..	..
<b>Ground Limestones</b>												
American Agricultural Chemical Co., North Weymouth, Mass.												
Pownal Agricultural Limestone .....	46.11	45	6.16	5	95.16	90	4.84	100	89	82	78	76
Brewer & Co., Inc., Worcester, Mass.												
Producto Agricultural Limestone .....	52.76	40	2.75	1	79.57*	90	4.54	100	93	79	70	68
Dominion Lime Co., Lime Ridge, Can.												
Dudswell Brand Ground Limestone .....	52.65	52	1.09	1	96.24	94	3.76	99	83	75	70	68
Vermarco Lime Co., West Rutland, Vt.												
Vermarco Agricultural Limestone .....	54.75	54	0.44	1	98.62	96	1.38	100	100	99	93	92
<b>Lime Ashes</b>												
Brewer & Co., Inc., Worcester, Mass.												
Lime Kiln Ashes .....	48.22	42	2.67	2	48.13	..	7.96	..	..	..	..	..

\* Note explanation in text of apparent anomaly.

Eleven of the 17 limes and limestones for sale were analyzed. Attention is called to the results secured with two brands.

H. E. Millard's Sweet-Arrow Hydrated Lime failed to meet its calcium oxid guaranty. This is a package goods, sold at chain stores. It was found thus incorrectly guaranteed last year.

Brewer Co.'s Producto Agricultural Limestone is low in combined carbonates but well above guaranty in calcium oxid. Strictly speaking this material is not a pure ground limestone. It contains some ground "core" which carries hydrated lime. It is a mixture of calcium and magnesium oxids (from limestone) and hydroxids (from burned lime). However the buyer secures a sufficient neutralizing value.

## RESULTS OF FERTILIZER INSPECTION

### (a) AS TO QUANTITY OF PLANT FOOD

The 114 brands of mixed goods analyzed in 1935 taken as a whole were hardly as good as was the case last year (tables I and II, pages 5 to 10. Twenty-three of the 341 guaranties (6.7 percent) were not maintained, whereas the comparable figure in 1934 was 4.7 percent. Four of these shortages amounted to less than 0.25 percent, five were between 0.25 and 0.50 percent, eight were above 0.50 but less than one percent and six exceeded one percent. The distribution was as follows: Nitrogen 6, total phosphoric acid 2, available phosphoric acid 3 and potash 14. Twenty brands failed to meet guaranties, but total plant food shortages of from 2 to 4 percent were found in only four cases.

Eight brands should be mentioned: Acme 5/8/7 made by the Acme Guano Co., AA High Test Fertilizer 10/20/20, and AA Double Strength 8/16/20 made by the American Agricultural Chemical Co., and Armours Big Crop Fertilizer 4/8/10 made by Armour Fertilizer Works. These were slightly deficient in total plant food. The potash contents of Acme 4/8/10 made by the Acme Guano Co., Corenco 8/16/20 made by the Consolidated Rendering Co. and Eastern States 8/16/16 and Eastern States 8/24/8 made by the Eastern States Farmers' Exchange were lacking by more than one percent; however, in all cases their available phosphoric acid contents, and in three of the four their nitrogen contents, were high enough to compensate for the deficiency, indicating uneven mixing or mechanical separation in the bag. These four brands are all very high analysis goods and such are especially prone to mechanical separation. The full total amount of guaranteed plant food was furnished in these four brands.

Five crude stock materials failed to meet guaranties. Only the Aero Cyanamid made by the American Cyanamid Co. was seriously short (four percent); the others one percent.

Taking each brand of mixed fertilizer analyzed as a unit in the computation, regardless of the amount sold, 4.76 percent nitrogen was guaranteed and 4.99 percent furnished; 9.36 percent available phosphoric acid was guaranteed and 10.09 percent furnished; 7.59 percent potash was guaranteed and 7.77 percent furnished; 0.23 percent more nitrogen, 0.73 percent more available phosphoric acid and 0.18 percent more potash being furnished than was guaranteed. For each 100 pounds of plant food guaranteed 105 pounds were furnished. The 53 brands of crude stock, with five exceptions, equalled or exceeded the guaranties made in their behalf. The following efficiency table shows average overruns and underruns.

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.....	12	8	36	30	6	2	1	2	1	0.09	1.10	0.28
American Agricultural Chemical Co.	20	17	60	57	3	..	..	1	2	0.08	0.21	0.15
Apothecaries Hall Co.....	5	5	15	15	..	..	..	..	..	0.20	1.00	0.67
Armour Fertilizer Works.....	9	7	27	24	3	1	1	1	..	0.08	0.29	0.00
Berkshire Chemical Co.....	2	2	6	6	..	..	..	..	..	0.23	0.80	0.39
Consolidated Rendering Co. and subsidiary .....	18	16	54	52	2	..	1	..	1	0.14	0.60	0.05
Eastern States Farmers' Exchange.	11	8	32	29	3	..	..	1	2	0.75	1.67	0.00
Howard Hardware Co. ....	1	..	3	2	1	..	..	1	..	1.42	-0.66	0.41
International Agricultural Corp.....	5	5	15	15	..	..	..	..	..	0.18	0.78	-0.02
J. O. Middlebrook & Sons.....	1	1	3	3	..	..	..	..	..	0.33	1.04	0.31
Miller Fertilizer Co.....	3	3	9	9	..	..	..	..	..	-0.04	0.06	0.19
Old Deerfield Fertilizer Co., Inc....	11	9	33	31	2	..	1	1	..	0.32	0.55	0.17
Rogers & Hubbard Co.....	9	6	27	24	3	1	1	1	..	0.33	1.31	0.01
Standard Wholesale Phosphate & Acid Works .....	4	4	12	12	..	..	..	..	..	0.44	0.55	1.08
Swift & Co.....	1	1	3	3	..	..	..	..	..	-0.10	1.14	0.16
Tennessee Corp. ....	2	2	6	6	..	..	..	..	..	0.05	0.80	-0.16
Totals and averages (16 companies, each a unit).....	114	94	341	318	23	4	5	8	6	0.28	0.70	0.23
Averages (114 brands, each a unit) ..	..	..	..	..	..	..	..	..	..	0.23	0.73	0.16

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

BRANDS OF MIXED FERTILIZER LICENSED AND ANALYZED 1926-1935

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
Licensed .....	116	140	115	137	138	152	160	125	111	128
Collected .....	103	118	98	108	116	131	134	110	91	114
Not found on sale.....	13	23	17	29	22	21	26	15	20	14

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

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
Nitrogen .....	3 $\frac{1}{8}$	3 $\frac{1}{8}$	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 $\frac{3}{4}$
Available phosphoric acid ....	8 $\frac{1}{2}$	8 $\frac{1}{2}$	8 $\frac{3}{4}$	8 $\frac{3}{4}$	10	10	10	9 $\frac{4}{8}$	9 $\frac{1}{8}$	9 $\frac{1}{4}$
Potash .....	5 $\frac{7}{8}$	6	6 $\frac{1}{8}$	6	6 $\frac{7}{8}$	7 $\frac{1}{2}$	7	7 $\frac{1}{2}$	7 $\frac{1}{4}$	7 $\frac{3}{8}$
Total plant food*..	17 $\frac{1}{2}$	17 $\frac{5}{8}$	18 $\frac{1}{4}$	18	21 $\frac{1}{4}$	21 $\frac{5}{8}$	21 $\frac{3}{8}$	22 $\frac{3}{8}$	21 $\frac{1}{4}$	21 $\frac{3}{8}$

\* Nitrogen, available phosphoric acid, potash.

The guaranteed composition of the average mixed fertilizer (each brand taken as a unit) is slightly higher than that sold in 1934. The average total plant food content as thus calculated has held about the same since 1930. Low grades have almost disappeared and many double strength formulas are now on sale. The percentage of deficiencies is two percent greater than last year but, on the whole, the mixed goods were quite as good as they have been of late years.

DEFICIENCIES (MIXED FERTILIZERS)

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
Analyzed .....	103	118	98	108	116	131	134	110	91	114
Up to guaranty.....	82	96	77	91	106	107	116	95	82	94
Deficient .....	21	22	21	17	10	24	18	15	9	20
Percentage of deficiency....	20	19	22	16	9	18	13	14	10	18

(b) AS TO QUALITY OF PLANT FOOD

*Organic Nitrogen Availability.*—When the activity of insoluble organic nitrogen is 50 percent or more by the alkaline permanganate and 80 percent or more by the neutral permanganate method it is deemed to be of good quality. These dicta are applicable only to mixed goods containing at least 0.3 percent of water-insoluble nitrogen. Sixty-eight brands carried less than this and their organic nitrogen contents were



held to be of good quality. The remaining 45 brands are grouped as follows:

5 brands, below 50 percent activity  
3 brands, between 50-55 percent activity  
20 brands, between 55-65 percent activity  
17 brands, between 65-80 percent activity

Of the 113 brands of mixed fertilizer which contained nitrogen, 68 (60 percent) carried less than 0.3 percent of insoluble organic nitrogen against 58 (64 percent) last year. Three percent were in the 50-55 percent class, 18 percent in the 55-65 percent class, 15 percent in the 65-80 percent class. The comparable figures in 1934 were 7, 12 and 14 percents.

The organic nitrogen contents of five brands was found to be below 50 percent activity by the alkaline permanganate method and 80 percent by the neutral permanganate method. These brands are:

Armours Big Crop Fertilizers 4/8/10 and 4/8/7, International 7/6/6, Miller's Harvest Brand 3/8/4 and Tennessee Soil Prep 4/2/2.

#### FERTILIZER USAGE IN VERMONT

The following table shows the total tonnage of the several crude stocks and different grades sold during the years 1927-1934. Complete returns for 1935 have not as yet been received. The 1935 data as to usage will be set forth in the 1936 fertilizer bulletin.\*

There were 3,567 more tons sold in 1934 than 1933. The percentages of the various grades do not vary greatly from year to year. About one-fifth of the total tonnage sold in Vermont consists of crude stock, one percent of sheep manures, five percent of double strength goods. One-half of the mixed goods nowadays consists of 3/10-12/3-6, 4/8/4, 4/8/10 and 5/8/7 grades.

\* The 1933 tonnage report as shown in Bulletin 381 was slightly incorrect for the reason that some 1933 tonnages were reported more than 12 months late.

	1927	1928	1929	1930	1931	1932	1933	1934	1934
Total tonnages .....	15,663	16,911	14,905	16,069	15,031	11,767	9,520	13,087	%
Superphosphate .....	3,298	3,819	2,935	3,571	2,368	1,838	1,701	2,363	18.
Nitrate of soda.....	248	222	253	258	226	180	103	119	0.9
Sulphate of ammonia	215	221	154	140	64	105	63	44	0.3
Bone and tankage...	189	179	120	158	65	103	110	99	0.8
Muriate of potash...	126	127	82	227	92	98	32	38	0.3
Sheep, goat and poultry .....	167	135	202	227	181	160	115	92	0.7
1/9-10/3-4 .....	565	721	700	517	419	...	...	...	..
2/8/2 .....	796	158	503	437	358	...	...	...	..
2/9-10/2-4 .....	963	765	373	179	275	534	330	476	3.6
2/12/2-4 .....	171	224	436	426	320	290	196	67	0.5
2/8/10 .....	1,479	1,446	1,188	1,279	1,102	769	556	549	4.2
3/8/4 .....	1,251	1,092	1,227	1,296	1,407	...	...	...	..
3/10-12/3-6 .....	724	688	546	676	587	1,364	1,075	1,461	11.2
4/8/4 .....	674	706	765	900	691	606	716	1,376	10.5
4/8/7 .....	601	403	130	63	337	624	653	780	6.
4/6/10 .....	1,023	1,700	1,105	1,404	1,683	...	...	...	..
4/10-12/4-6 .....	...	9	639	799	585	1,227	414	479	3.7
4/8/10 .....	303	326	...	...	...	1,156	904	1,351	10.3
5/8/7 .....	793	779	1,024	1,005	1,575	590	697	1,093	8.4
6/6-8/4-6 .....	150	114	222	201	121	36	37	...	..
7/6-8/5-6 .....	138	210	238	249	268	291	278	333	2.5
8/6/6 .....	148	200	153	139	116	...	...	...	..
8-10/16-30/14-20 .....	730	1,043	456	587	635	499	477	700	5.4
Miscellaneous .....	911	1,624	1,454	1,331	1,556	1,297	1,063	1,667	12.7

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

	1930	1931	1932	1933	1934
Brands carrying 14-15% plant food.....	16.9%	16.4%	5.6%	3.5%	4. %
Brands carrying 16-18% plant food.....	19.7	18.8	17.7	19.	19.7
Brands carrying 19-24% plant food.....	28.6	37.	47.3	42.6	44.5
Brands carrying 25-31% plant food.....	0.2	0.2	1.1	0.7	0.9
Brands carrying 32-44% plant food.....	5.9	6.9	4.4	7.9	6.4
Brands carrying 45% plant food.....	0.1	1.4	1.7	0.4	0.1
Superphosphate .....	22.3	15.8	15.6	18.	18.1
Crude stocks (other than superphosphate)..	4.9	2.3	5.4	6.7	5.6
Sheep and goat manures.....	1.4	1.2	1.2	1.2	0.7

The trend of the trade in Vermont is still towards the use of higher grades. The brands guaranteed to carry between 16 and 18 percent and from 19 to 24 percent plant food have increased somewhat in numbers and in apparent popularity, constituting a little over 64 percent of the total mixed fertilizers and crude stock sold. Crude stock usage remains about the same. A 37 percent tonnage increase in fertilizer sales occurred in 1934 as compared to 1933.

## FERTILIZER GRADES

The figures in the subjoined table show that the grades carrying 20, 19, 16, and 22-24 units were the most numerous among those found on sale. Only four of the 114 brands analyzed carried less than 15 units. There is an increase this year in brands guaranteed to contain more than 38 percent plant food. Nine brands contain over 38 percent, whereas last year there was only one such brand.

## DISTRIBUTION OF GRADES AMONG MANUFACTURERS

	Total	14% and +	47-53%	38-44%	26-32%	22-24%	21%	20%	19%	18%	17%	16%	15%	14%	8%
Acme Guano Co. ....	12	12	.	.	.	2	.	3	2	.	2	1	1	1	.
American Agricultural Chemical Co. ....	20	20	1	3	.	5	.	3	4	.	2	2	.	.	.
Apothecaries Hall Co. ....	5	5	.	.	.	1	.	2	.	.	.	1	1	.	.
Armour Fertilizer Works. ....	9	9	.	1	.	1	.	1	2	1	1	1	.	1	.
Berkshire Chemical Co. ....	2	2	.	.	.	.	.	.	1	.	.	1	.	.	.
Consolidated Rendering Co. and subsidiary ....	18	18	.	1	2	2	.	5	4	.	2	2	.	.	.
Eastern States Farmers' Exchange ....	11	11	.	6	.	.	.	5	.	.	.	.	.	.	.
Howard Hardware Co. ....	1	1	.	.	.	.	.	.	1	.	.	.	.	.	.
International Agricultural Corp. ....	5	5	.	.	1	1	.	1	1	.	.	1	.	.	.
J. O. Middlebrook & Sons. ....	1	1	.	.	.	.	.	.	1	.	.	.	.	.	.
Miller Fertilizer Co. ....	3	3	.	.	.	.	.	1	.	.	.	1	1	.	.
Old Deerfield Fertilizer Co., Inc. ....	11	11	.	1	.	2	.	2	3	.	1	1	.	1	.
Rogers & Hubbard Co. ....	9	9	.	1	.	.	1	3	1	1	.	2	.	.	.
Standard Wholesale Phosphate & Acid Works. ....	4	4	.	.	.	.	.	1	.	.	1	2	.	.	.
Swift & Co. ....	1	1	.	.	.	.	.	1	.	.	.	.	.	.	.
Tennessee Corp. ....	2	1	.	.	.	.	.	.	1	.	.	.	.	.	1*
Totals .....	114	113	1	13	3	14	1	28	21	2	9	15	3	3	1

\* Soil-Prep. 4/2/2.

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

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
	%	%	%	%	%	%	%	%	%	%
8-11 percent total plant food..	0	0	0	0	0	0	0	1	1	1
12-13 percent total plant food..	12	6	4	4	4	4	0	0	0	0
14-15 percent total plant food..	19	23	21	21	18	16	10	7	7	5
16-17 percent total plant food..	14	12	13	13	12	12	17	17	17	21
18-19 percent total plant food..	16	16	16	14	11	11	19	21	21	20
20 or more percent total plant food .....	39	43	46	48	55	57	54	54	54	53

COST OF A POUND OF PLANT FOOD IN THE VARIOUS GRADES IN 1935

High analysis .....	14	280	\$28	10.0 cts.
High analysis .....	16	320	31	9.6 "
High analysis .....	18	360	39	10.8 "
High analysis .....	20	400	31	7.8 "
High analysis .....	22	440	35	8.0 "
High analysis .....	40	800	48	6.0 "

PRICE DATA

COMPARISONS BETWEEN 1934 AND 1935 TON PRICES

Grade	'34	'35	Grade	'34	'35	Grade	'34	'35
2/10/ 2	\$31	\$28	4/ 8/ 7	\$39	\$33	8/16/14	\$59	\$51
2/ 8/10	35	34	4/ 8/ 8		29	8/16/16	52	47
2/12/ 4	40	39	4/ 8/10	39	35	12/13/12		55
3/ 8/ 4		30	4/12/ 4	30	31			
3/10/ 4	37	30	5/ 8/ 7	41	37			
3/10/ 6	35	34	5/ 8/10	41	39			
4/ 8/ 4	34	31	6/ 8/ 6	32	30			
			7/ 6/ 6	42	37			

TEN-YEAR AVERAGES

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
Approximate average re-tail prices .....	\$47	\$42	\$42	\$44	\$44	\$45	\$36	\$34	\$39	\$36
Approximate average pounds plant food per ton .....	350	353	365	360	435	433	432	453	424	444
Approximate average price per pound of plant food .....	13.4c	11.9c	11.5c	12.2c	10.1c	10.4c	8.4c	7.5c	9.2c	8.1c
Percentage of pre-war prices .....	132	117	113	120	100	102	86	77	94	83
Percentage of 1916 prices	96	85	82	87	72	73	60	54	66	58

In the last three tables the writers have tried to set forth as accurately as might be the present cost of fertilizers to Vermont consumers. Prices are obtained by sampling agents during April and May directly from local selling agents. It is fair to assume that they represent the condition of the market. The average cost per pound of total plant food in the different grades ranges from 10 to 6 cents. Those carrying from 14 to 18 pounds cost nearly 40 percent more per pound of plant food than those which carried larger amounts.

The second table compares the cost of the various grades in 1934 and 1935. In all but one case the 1935 price was lower than that of last season.

The average 1935 ton price is about three dollars lower than last year. Since there was fully as much plant food furnished in this year's goods as was the case last year, it follows that the average cost of a pound of plant food was lower in 1935 than it was last year.

#### RELATION OF NITROGEN SOURCE TO SOIL ACIDITY

Several types of nitrogen-bearing chemicals and materials are used in the formulation of complete fertilizers, more especially nitrate of soda, nitrate of potash, sulphate of ammonia, phosphate of ammonia, nitrate of calcium (Cal-nitro), nitrate of ammonia, anhydrous or liquid ammonia, urea-ammonia liquor, urea, calcium cyanamid, cottonseed meal, castor pomace, guano and manures as well as such rendering company by-products as dried blood, tankage, bones, hoof meal, horn meal, etc. Agronomists have studied the relation of these materials to croppage and manufacturers have used them in the construction of their formulas for various types of soil and kinds of crops. The farmer has a large variety from which to choose.

Six brands of complete fertilizers, about 2,000 tons of which were sold in Vermont last year, were analyzed as to the nature of their nitrogen contents.

PERCENTAGE OF NITROGEN IN VARIOUS FORMS

Name	Grade	In nitrate form		In ammoniacal form		In organic form		Total nitrogen		Net equivalent acidity lbs. CaCO <sub>3</sub> per ton
		%	%	%	%	%	%	%	%	
A .....	2/ 8/10	0.05	2	1.42	65	0.70	33	2.17	100	138
B .....	3/10/ 4	0.05	2	2.10	71	0.79	27	2.94	100	345
C .....	4/ 8/ 4	1.14	29	2.01	51	0.79	20	3.94	100	251
D .....	5/ 8/ 7	0.62	12	3.42	68	1.03	20	5.07	100	401
E .....	7/ 6/ 6	0.47	6	6.22	86	0.58	8	7.27	100	774
F .....	8/16/16	1.36	17	6.17	77	0.53	6	8.06	100	648

Clearly ammonia salts were most freely used. These sell nowadays at low prices and their use enables the manufacturer to make a relatively low cost fertilizer.

Time was when it was said that the best practice in the formulation of a complete fertilizer was to use one-third nitrogen from organic sources, one-third from nitrate and one-third from ammonium salts.

Thirty years ago much more organic and nitrate and much less ammoniacal nitrogen were used than is the case today. The average of these six brands probably represents fairly well the average modern usage in this section, 20 percent organic, 10 percent nitrate and 70 percent ammonia salts.

Mehring and Peterson<sup>1</sup> state that "calculations show that from 1880 to 1906 the average equivalent physiological effect of mixed fertilizer on soil reaction was basic; from 1907 to 1924 it was slightly acid; and since then the acidity has increased rapidly until in 1932 it was equivalent to 150 pounds of calcium carbonate per ton of fertilizer. At the present time the upward trend appears to have been checked." This is largely caused by the increased use of ammonium salts in formulation. The use of this nitrogen carrier is not to be gainsaid, but its effect on soil conditions should be clearly understood. The acidity thus developed in the soil should be corrected by the use of lime. As was pointed out above, about 2,000 tons of these six fertilizers were sold in Vermont last year. Their combined equivalent acidity, that is to say their acidifying effect on the soils on which they were sown, stated as pounds as ground limestone per ton, represents over 400 tons. In other words, in order to neutralize the acid developed in the soil by the use of these 2,000 tons in 1934, over 400 tons of limestone should have been sown.

Soil acidity is a serious matter. Vermont soils as a whole tend to be somewhat acid and they are getting more so as the years pass by. Speaking in general terms, acid soils are less productive than those which 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 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 remedied. Presumably fertilizer manufacturers, if asked, will indicate how much acid-forming material they are using in any given brand. Many now use ground 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.

<sup>1</sup> Jour. Assoc. Offic. Agl. Chem., February, 1934 (1934).

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 so be it they lime their soils occasionally. County agents will determine soil lime requirements for their constituents without charge if they are asked to do so.

#### METHODS OF FERTILIZER APPLICATION

Highly concentrated forms of plant food are now being used in fertilizers more often than in the past and organic forms less frequently. Furthermore the available phosphoric acid content of superphosphate is greater than formerly. Because of these changes, so-called "double strength" brands are now quite common. These changes have resulted in a marked increase in the water soluble plant food contents of the average fertilizer and, of course, of the double strength goods.

Many fertilizer application trials have been carried on at various points under various auspices. A recent pamphlet issued by the National Fertilizer Association, entitled "How to Apply Fertilizer," excellently summarizes the results secured at a number of the American experiment stations and points out some of the dangers incident to the indiscriminate use of the modern fertilizer by the uninformed farmer.

Of course fertilizer manufacturers are anxious that the goods they make should not be misapplied, for under such circumstances the farmer is apt to blame the fertilizer rather than his failure to use it properly. He sees the mote in the other's eye but does not discern the beam in his own eye. It is in the interests of both maker and user to see to it that these dangers are understood and that proper precautions are taken.

It is also a matter of concern to the manufacturers of agricultural machinery that their mechanisms handle modern forms of fertilizer effectively. They have been in close consultation and cooperation with the National Fertilizer Association officials and their findings and they are altering and constructing machines in order safely and efficiently to apply high analysis fertilizers.

The following brief statement is based on material issued by the Association in the pamphlet above cited.

When a fertilizer is sown, its soluble portions begin to dissolve at once and to come in more or less close contact with the seed or with

the rootlets. The concentration of this solution depends largely on soil moisture and soil type. Water penetrates light, sandy soils more readily than heavy soils. If the soil is wet and a heavy rain falls soon after the fertilizer is sown, the solution is not apt to be concentrated and there is less likelihood of damage. However, if the soil is only slightly moist and if rain does not fall, the concentration of the solution is greater. If then it comes in close contact with the seed, the crop may be slow in starting or, indeed, may not grow at all.

*Corn.*—Fertilizers are usually best applied to hilled corn at the level of or slightly below the seed in two bands six to eight inches long on each side of the hill, with a half to three-quarters of an inch separating the fertilizer from the seed. When 200 pounds per acre are used, these bands may be about an inch wide, when larger amounts are sown about two inches wide.

Fertilizers are best applied in continuous bands to drilled corn. A V-shaped deflector attached to the corn planter will conduct the fertilizer in streams on either side of the seed. The planter's shoe should have a hood attached to it so that the fertilizer will not come into contact with the seed.

*Potatoes.*—Fertilizers are best applied in bands at the side of rows about two inches away from the seed and about two inches below the seed level. When thus applied crop yields have been increased from 20 to 50 bushels per acre as compared with those secured when the usual methods of fertilizer application are employed. Potato planters which do not permit this side application should be readjusted. New parts can usually be procured at a reasonable price which will cause the old planter to deliver the fertilizer on both sides of the seed.

*Beans, Peas.*—Side application is also recommended for these crops and, indeed, for crops in general. Better results are thus obtained than by broadcasting, by mixing with the soil, or by placing the fertilizer under the seed. Supplemental applications can be broadcasted between the rows as the season advances.

Both experience and experiment have indicated that, as a rule, crop yields have been materially increased when the procedures above outlined have been followed.

Fertilizer application trials are being continued at several experiment stations. It well may be that as a result present practice may be more or less modified.