

Commercial Fertilizers.

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BULLETIN 361

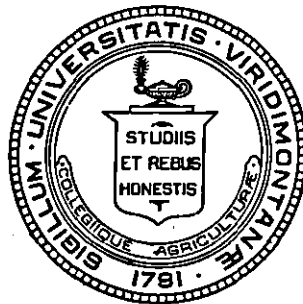
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University of Vermont and State Agricultural College  
Vermont Agricultural Experiment Station  
BURLINGTON, VERMONT

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COMMERCIAL FERTILIZERS

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



Manufacturers have met the requirements of the Vermont law well during 1933, as is evidenced by the results reported in this bulletin. Only 15 brands of mixed goods and three of crude stock failed to furnish all the plant food that was promised, in only seven instances did a shortage occur in the total amount of plant food guaranteed, and in but two cases did this shortage exceed three percent. Safe overruns were the rule. This is an excellent showing.

The sheep manures were much improved as compared with the material sold in 1932. They carried only normal amounts of sand, whereas last year several brands were heavily loaded with sand. The lime products were well above the guaranty with one exception, which was too coarsely ground.

Three brands of mixed goods contained organic nitrogen of inferior activity. A trifle less organic nitrogen was used in this year's goods than in last year's brands.

Every brand licensed was in the so-called "high analysis" class, carrying 14 percent or more of plant food. The low grades are gone, let us trust forever.

Fertilizer usage reports will appear in next year's bulletin. The reports from manufacturers come in very slowly nowadays; hence their omission. There seems reason to believe that the total usage in Vermont this season is not far from 10,000 tons, a shrinkage from the high usage of 16,900 tons in 1928 of more than 40 percent.

The average cost (\$34 per ton) is the lowest for many years.

# BULLETIN 361: COMMERCIAL FERTILIZERS

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

## THE 1933 INSPECTION

The results of the 1933 inspection are set forth herewith in condensed form. The licenses for the current year cover: Complete mixed fertilizers 120; crude stock 41; cow, sheep, goat and hen manures 7; florist goods 5; limes 15; total 188.

The station sampling agents visited some 90 Vermont cities, towns and villages in the spring of 1933 and drew 408 samples from dealers' stocks representing 159 of the 188 commercial fertilizers and limes licensed for sale. No samples of the 29 brands named below were secured.

AMERICAN CYANAMID Co., New York, N. Y.  
Ammo-Phos 11-48-0; Ammo-Phos 16-20-0.

APOTHECARIES HALL Co., Waterbury, Conn.  
Liberty 8-13-11.

ARMOUR FERTILIZER WORKS, New York, N. Y.  
Armour's Big Crop Fertilizers 20% Superphosphate; Armour's Big Crop Fertilizers 2-8-10; Armour's Big Crop Fertilizers 2-12-4; Armour's Big Crop Fertilizers 7-6-6; Armour's Big Crop Fertilizers 6-11-10; Armour's Big Crop Fertilizers 8-20-20.

BARRETT Co., New York, N. Y.  
Arcadian Sulphate of Ammonia; Sulphate of Ammonia.

CHILEAN NITRATE SALES CORP., New York, N. Y.  
Standard Chilean Nitrate of Soda.

EASTERN STATES FARMERS' EXCHANGE, Springfield, Mass.  
Eastern States 0-20-20; Eastern States 4-16-20; Eastern States Nitrate of Potash.

FORD MOTOR Co., Dearborn, Mich.  
Ford Ammonium Sulphate.

HUDSON VALLEY FUEL CORP., Troy, N. Y.  
Nusoil Sulphate of Ammonia-Grade "A."

LOWELL FERTILIZER Co., Boston, Mass.  
Lowell 2-8-10 Vegetable & Grain; Lowell 5-8-10 Aroostook Special for Potatoes.

ROGERS & HUBBARD Co., Portland, Conn.  
Hubbard's "Bone Base" Fertilizer for Seeding Down; Hubbard's "Bone Base" Soluble Corn Manure; Hubbard's "Bone Base" Soluble Potato Manure.

SYNTHETIC NITROGEN PRODUCTS CORP., New York, N. Y.  
Calcium Nitrate (Nitrate of Lime); Cal-Nitro 16%.

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

DOMINION LIME Co., Lime Ridge, P. Q.  
Dudswell Brand Ground Limestone.

HOOSAC VALLEY LIME Co., INC., Adams, Mass.  
Adams Land Lime.

LAWRENCE PORTLAND CEMENT Co., Thomaston, Me.  
Dragon Mainrok Agricultural Hydrated Lime.

SOLVAY PROCESS Co., Syracuse, N. Y.  
Solvay Pulverized Limestone.

Several of the brands which were not sampled as a matter of fact were not sold in Vermont this year, notwithstanding the fact that their manufacturers had licensed their sales. There appears to have been no demand for them. This situation has obtained 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 drawn away within 24 hours and, not infrequently, sown upon the land within a day or two. It sometimes happens that fertilizers are 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. Under such circumstances the station's sampling agents can not obtain samples. During the past six years this group of unsampled brands has represented on the average 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 6 to 8).
- (2) Those brands of crude stock which conform to promise (table II, page 9).
- (3) The 18 brands which contained less plant food than guaranteed (table III, page 10).
- (4) Sheep, etc., manures and limes (tables IV and V, pages 11, 12).

Table I (pages 6 to 8), shows:

1. The names and addresses of licensees.
2. The brand names, including therein—with two exceptions—the grade.
3. The "grades"—nitrogen,<sup>1</sup> available phosphoric acid<sup>2</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 (as indicated in black face footnote on each page).
7. The source of potash, whether muriate or sulphate (as indicated in black face footnote on each page).

<sup>1</sup>This year all "grades" are expressed in terms of "nitrogen" instead of "ammonia," the "available phosphoric acid" and "water-soluble potash" statements remaining as usual. This is in accordance with "new fertilizer requirements for 1932" explained on page 5 of the 1931 bulletin (No. 334).

Nitrogen  $\times$  1.2143 = Ammonia, i.e., 2.46 or 2.47 percent nitrogen = 3 percent ammonia. To convert ammonia into nitrogen, multiply by 0.823.

<sup>2</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.

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

Table III (page 10) sets forth the facts as to 18 brands which failed to meet their guaranties. In 11 cases no actual shortage occurred due to the fact that the overruns more than offset the underruns. The shortages occurring in seven brands are recorded in the last column, with two exceptions these are few and small. They range from one to seven percent, an excellent showing. Special mention should be made, however, of the Acme Guano Co.'s Superphosphate 16%, which is 1.18 percent below its available phosphoric acid guaranty, representing a total plant food shortage of seven percent; and of the Standard Wholesale Phosphate & Acid Works' U. S. 8/16/14, which is below guaranty in available phosphoric acid and potash, a plant food shortage of six percent. All shortages beyond tolerance limits are printed in bold face type.

## I. MIXED FERTILIZERS SUBSTANTIALLY COMPLYING WITH GUARANTIES

Brand name	Grade	Percentage of nitrogen which is water-soluble	*(See title-in footnote)
<b>Acme Guano Company, 311 Marine Bank Bldg., Baltimore, Md.</b>			
Acme 4/8/7§ .....	4-8-7§	88	96
Acme 4/8/4§ .....	4-8-4§	88	98
Ideal Fertilizer 2/8/5 .....	2-8-5	89	98
<b>American Agricultural Chemical Co., 285 River St., North Weymouth, Mass.</b>			
A A Double Strength Fertilizer 8/16/14..	8-16-14	98	97
A A Top Dresser 7/6/6 .....	7-6-6	95	93
A A Aroostook Potato Manure 5/8/7....	5-8-7	95	97
A A Complete Manure with 10% Potash 4/8/10 .....	4-8-10	95	98
A A Peerless Fertilizer 4/8/7 .....	4-8-7	93	99
A A Monarch Fertilizer 4/8/4 .....	4-8-4	92	99
A A Corn Favorite 3/10/4 .....	3-10-4	93	99
A A Prolific 10% Potash Fertilizer 2/8/10	2-8-10	95	99
A A General Crop Fertilizer 2/10/2 .....	2-10-2	100	95
Agrico for Lawns, Trees & Shrubs 7/6/6	7-6-6	96	97
Agrico for Aroostook with 10% Potash 5/8/10 .....	5-8-10	95	96
Agrico for New England 4/8/10 .....	4-8-10	92	95
Agrico for Truck 4/10/5 .....	4-10-5	92	95
Agrico for Corn 3/10/6 .....	3-10-6	93	97
Agrico for Grain 2/12/4 .....	2-12-4	99	90
Bradley's Complete Manure with 10% Potash 4/8/10 .....	4-8-10	93	97
Bradley's XL Fertilizer 3/10/4.....	3-10-4	92	96
Bradley's Eclipse Fertilizer 2/10/2 .....	2-10-2	99	96
<b>American Soda Products Company, Moorestown, N. J.</b>			
Grogreen 3/8/3 .....	3-8-3	69	94
<b>Apothecaries Hall Company, Box 1009, Waterbury, Conn.</b>			
Liberty Top Dresser for Grass & Grain 8/8/8 .....	8-8-8	78	98
Liberty Special Fertilizer for Fruit 7/8/6	7-8-6	98	95
Liberty High Grade Market Gardeners 5/8/7 .....	5-8-7	81	96
Liberty Potato and General Crops 4/8/10..	4-8-10	74	95
Liberty Market Gardeners Special 4/8/4..	4-8-4	77	94
Liberty Potato and Vegetable 2/8/10.....	2-8-10	55	98
<b>Armour Fertilizer Works, 10 East 40th St., New York, N. Y.</b>			
Armour's Big Crop Fertilizers 5/8/7.....	5-8-7	93	98
Armour's Big Crop Fertilizers 4/8/7.....	4-8-7	88	98
Armour's Big Crop Fertilizers 3/10/4.....	3-10-4	91	97
<b>Burlington Rendering Company, North Ave., Burlington, Vt.</b>			
Burlington 7/6/6 .....	7-6-6	97	99
Burlington 4/8/10 .....	4-8-10	90	98
Burlington 4/12/4 .....	4-12-4	92	98
Burlington 4/8/7 .....	4-8-7	93	97
Burlington 3/10/4 .....	3-10-4	94	98
Burlington 2/8/10 .....	2-8-10	90	98

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

§ Contains organic nitrogen of inferior quality.

All brands listed, with two exceptions, "passed" in respect to the quality of their organic nitrogen contents and carried potash as 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 Company, 178 Atlantic Ave., Boston, Mass.</b>			
Corenco 7/13/11 "It Cuts the Cost" .....	7-13-11	96	98
<b>Eastern States Farmers' Exchange, Box 1482, Springfield, Mass.</b>			
Eastern States 18/6/6 .....	18- 6- 6 <sup>a</sup>	99	100
Eastern States 15/20/15 .....	15-20-15 <sup>a</sup>	99	100
Eastern States 10/20/20 .....	10-20-20 <sup>a</sup>	99	100
Eastern States 8/24/8 .....	8-24- 8 <sup>a</sup>	95	100
Eastern States 6/15/9 .....	6-15-9 <sup>a</sup>	96	98
Eastern States 6/8/6 .....	6- 8- 6 <sup>a</sup>	96	94
Eastern States 4/12/4 .....	4-12- 4 <sup>a</sup>	94	95
Eastern States 4/10/6 .....	4-10- 6 <sup>a</sup>	95	98
Eastern States 4/8/8 .....	4- 8- 8	96	96
Eastern States 0/14/6 .....	0-14- 6	..	100
Nitrophosko 15/30/15 .....	15-30-15	97	100
Nitrophoska 10/20/20 .....	10-20-20	98	100
<b>Essex Fertilizer Company, 178 Atlantic Ave., Boston, Mass.</b>			
Essex 7/6/6 Top Dressing .....	7- 6- 6	95	94
Essex 5/8/10 Aroostook Special for Potatoes .....	5- 8-10	95	98
Essex 5/8/7 Complete Manure .....	5- 8- 7	95	96
Essex 4/8/7 Old General Crop Manure for Potatoes and Market Garden Crops...	4- 8- 7	92	93
Essex 4/8/4 Market Garden .....	4- 8- 4	94	94
Essex 3/10/4 Fish Brand Fertilizer for all Crops .....	3-10- 4	92	95
Essex 2/8/10 Vegetable & Grain .....	2- 8-10	94	96
Essex 2/10/2 A-1 Super .....	2-10- 2	91	97
<b>International Agricultural Corp., 39 Chauncy St., Boston, Mass.</b>			
International 4/8/10 .....	4- 8-10	99	99
International 4/8/4 .....	4- 8- 4	99	98
<b>Lowell Fertilizer Company, 178 Atlantic Ave., Boston, Mass.</b>			
Lowell 7/6/6 Top Dressing .....	7- 6- 6	94	95
Lowell 5/8/7 Market Garden Manure.....	5- 8- 7	95	96
Lowell 4/8/10 Potato Grower .....	4- 8-10	93	96
Lowell 4/8/7 Old General Crop Manure for Potatoes and Market Garden Crops	4- 8- 7	93	96
Lowell 4/8/4 Corn & Vegetable .....	4- 8- 4	93	96
Lowell 3/10/4 Animal Brand .....	3-10- 4	87	98
Lowell 2/10/2 Bone Brand .....	2-10- 2	85	97

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

<sup>a</sup> One-third of potash as nitrate; remainder as muriate.

<sup>b</sup> Five-sixths of potash as nitrate; remainder as muriate.

<sup>c</sup> Potash as nitrate.

<sup>d</sup> One-half of potash as nitrate; remainder as muriate.

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



I. MIXED FERTILIZERS SUBSTANTIALLY COMPLYING WITH GUARANTIES  
—concluded

Brand name	Grade	Percentage of nitrogen which is water-soluble	*(See title-in footnote)
<b>New England Fertilizer Co., 178 Atlantic Ave., Boston, Mass.</b>			
New England 7/6/6 Top Dressing .....	7- 6- 6	97	98
New England 5/8/7 Market Garden Manure .....	5- 8- 7	94	97
New England 4/8/4 Potato & Vegetable Manure .....	4- 8- 4	94	95
New England 3/10/4 Super .....	3-10- 4	84	96
<b>Old Deerfield Fertilizer Co., Inc., 28 Sugarloaf St., South Deerfield, Mass.</b>			
Valley Brand 4/8/4 .....	4- 8- 4	98	98
Old Deerfield 3/10/6 .....	3-10- 6	83	93
<b>Olds &amp; Whipple, Inc., 164-168 State St., Hartford, Conn.</b>			
Olds & Whipple 8/16/14 Double Strength Potato Fertilizer .....	8-16-14	88	99
<b>Rogers &amp; Hubbard Company, Portland, Conn.</b>			
Hubbard's "Bone Base" Oats & Top Dressing .....	8- 5- 8	100	79
Hubbard's Potato Fertilizer 5/8/7 .....	5- 8- 7	88	91
Hubbard's All Soils-All Crops Fertilizer 4/8/4 .....	4- 8- 4	95	94
Hubbard's High Potash Fertilizer 2/8/10..	2- 8-10	89	97
Hubbard's Corn & Grain Fertilizer 2/12/4	2-12- 4	88	94
Red H Brand 8/16/14 Fertilizer .....	8-16-14	98	99
Red H Brand 7/6/6 Fertilizer .....	7- 6- 6	100	95
Red H Brand 5/8/7 Fertilizer .....	5- 8- 7	89	88
Red H Brand 4/8/10 Fertilizer .....	4- 8-10	100	97
Red H Brand 4/8/7 Fertilizer .....	4- 8- 7	99	96
Red H Brand 4/8/4 Fertilizer .....	4- 8- 4	98	96
<b>Standard Wholesale Phosphate &amp; Acid Works, Inc., 1600 Continental Bldg., Baltimore, Md.</b>			
Standard U. S. 5/8/7 .....	5- 8- 7	93	94
Standard U. S. 4/6/10 .....	4- 6-10	92	91
Standard U. S. 4/8/4 .....	4- 8- 4	90	93
Standard U. S. 3/8/4 .....	3- 8- 4	88	92
<b>Swift &amp; Company, Court Square Bldg., Baltimore, Md.</b>			
Vigoro 4/12/4 .....	4-12- 4	90	98
<b>Tennessee Corp., Lockland, Ohio</b>			
Loma 5/10/4 .....	5-10- 4	95	96
Soil-Prep 4/2/2§ .....	4- 2- 2§	68	87
<b>Virginia-Carolina Chemical Corp., 20 Exchange Place, New York, N. Y.</b>			
V-C Aroostook Potato Grower 5/8/7 ....	5- 8- 7	98	96
V-C National Brand 4/8/10 .....	4- 8-10	99	97
V-C Owl Brand 2/12/4 .....	2-12- 4	94	95

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

§ Contains organic nitrogen of inferior quality.

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

II. CRUDE STOCKS SUBSTANTIALLY COMPLYING WITH GUARANTIES

Nitrogenous materials	Nitrogen	
	Found	Guaranteed
<i>Nitrate of Soda</i>		
Barrett Co., New York, N. Y., "Arcadian".....	16.29	16.
Chilean Nitrate Sales Corp., New York, N. Y., "Champion Brand" .....	16.07	16.
<i>Sulphate of Ammonia</i>		
American Agricultural Chemical Co. ....	21.14	20.56
Consolidated Rendering Co. ....	21.08	20.5
Eastern States Farmers' Exchange, "Eastern States"....	21.05	20.5
<i>Air-nitrogen Products</i>		
American Cyanamid Co., New York, N. Y., Aero Cyanamid .....	22.38	22.

Nitrogenous and phosphatic material	Nitrogen		Total phosphoric acid	
	Found	Guar.	Found	Guar.
<i>Ground Bone</i>				
Acme Guano Co., "Acme" .....	2.27	2.	23.34	22.
American Agricultural Chemical Co., "Fine" ..	3.25	2.47	22.50	23.
Armour Fertilizer Works, "Armour's" .....	3.46	2.47	22.44	22.
Burlington Rendering Co., "Raw" .....	3.85	3.76	20.80	22.
Consolidated Rendering Co. ....	3.18	2.05	24.64	22.9
Eastern States Farmers' Exchange, "Eastern States" .....	3.18	2.50	23.14	23.
Old Deerfield Fertilizer Co., Inc., "Old Deerfield" .....	3.18	2.47	28.42	22.
Rogers & Hubbard Co., "Hubbard's Strictly Pure Fine" .....	4.13	3.29	21.62	20.5
F. Rynveld & Sons, New York, N. Y., "Rynveld's Bone Meal Fertilizer" .....	2.11	1.85	27.07	22.88
<i>Tankage</i>				
Eastern States Farmers' Exchange, "Eastern States Ground Animal" .....	7.42	7.50	10.04	9.

Phosphatic materials	Total Phosphoric Acid		Available	
	Found	Guar.	Found	Guar.
<i>Superphosphate (Acid Phosphate)</i>				
American Agricultural Chemical Co. ....	18.26	16	17.82	16
Apothecaries Hall Co. ....	17.96	16	17.40	16
Armour Fertilizer Works, 16% .....	17.44	16	17.18	16
Consolidated Rendering Co., 20% .....	21.66	20	21.22	20
Consolidated Rendering Co., 16% .....	17.56	16	17.20	16
Eastern States Farmers' Exchange, 32% ....	33.26	32	33.26	32
Eastern States Farmers' Exchange, 16% ....	17.70	16	17.16	16
International Agricultural Corp., 16% .....	17.14	16	17.04	16
Old Deerfield Fertilizer Co. ....	17.70	17	17.30	16
Rogers & Hubbard Co. ....	17.08	16	16.44	16

Potassic materials	Potash	
	Found	Guaranteed
<i>Muriate of Potash</i>		
American Agricultural Chemical Co. ....	49.84	50
Eastern States Farmers' Exchange .....	51.84	50
N. V. Potash Export My. Corp., New York, N. Y.....	50.48	48

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

Manufacturer and Brand	Grade	Nitrogen			Phosphoric Acid				Potash		
		Water-soluble	Found	Guaranteed	Total		Available		Found	Guaranteed	Shortage
					Found	Guaranteed	Found	Guaranteed			
Acme Guano Co., Superphosphate.....	0/16/0	...	...	...	15.06	16	14.82	16	...	..	7%
Amer. Agr. Chem. Co., Agrico for Aroostook 5/8/7†	5/8/7	4.35	4.69	5	9.18	8	9.05	8	6.67	7	None
Apothecaries Hall Co., Liberty, 10/16/14.....	10/16/14	8.87	9.60	10	17.36	16	17.16	16	13.99	14	None
Armour Fert. Works, Big Crop Ferts. 4/8/10	4/8/10	3.78	4.16	4	8.90	8	8.48	8	9.28	10	None
Armour Fert. Works, Big Crop Ferts. 4/8/4†	4/8/4	3.60	3.87	4	8.31	8	8.09	8	4.00	4	None
Burlington Rendering Co., Burlington 2/10/2†	2/10/2	2.14	2.41	2	9.57	10	9.24	10	2.03	2	2%
Consolidated Rendering Co., Corenco 8/16/14†	8/16/14	7.39	7.91	8	15.52	16	15.24	16	13.57	14	3%
Consolidated Rendering Co., Ground Tankage†	7.41/9.15/0	...	9.06	7.41	8.40	9.15	...	...	...	..	None
Eastern States Farmers Exchange, Eastern States 8/16/16†	8/16/16	7.96	8.30	8	15.94	16	15.68	16	16.23§	16	None
Essex Fertilizer Co., Essex 4/8/10†	4/8/10	3.86	4.20	4	8.05	8	7.58	8	9.82	10	2%
J. O. Middlebrook & Sons, Midco.....	7/6/6	6.34	6.86	7	6.84	6	6.46	6	6.27	6	None
Rogers & Hubbard Co., Ground Bone.....	2.47/22.85/0	...	3.22	2.47	21.66	22.85	...	...	...	..	2%
Standard Whole. Phos. & Acid Wks., Stand- ard U. S. 8/16/14†	8/16/14	8.36	8.36	8	14.28	16	14.07	16	13.12	14	6%
Standard Whole. Phos. & Acid Wks., Stand- ard U. S. 7/11/10.....	7/11/10	7.35	7.35	7	11.30	11	10.60	11	9.75	10	1%
Standard Whole. Phos. & Acid Wks., Stand- ard U. S. 7/6/5.....	7/6/5	5.92	6.44	7	7.28	6	6.68	6	5.31	5	None
Standard Whole. Phos. & Acid Wks., Stand- ard U. S. 5/10/5.....	5/10/5	4.73	5.14	5	9.94	10	9.64	10	5.29	5	None
Standard Whole. Phos. & Acid Wks., Stand- ard U. S. 2/8/10.....	2/8/10	2.62	2.62	2	8.86	8	8.52	8	9.09	10	None
Stimulant Lab., Inc., Stimulant 11/12/15....	11/12/15	10.65	10.65	11	13.56	12.4	13.56	12	18.38*	15	None

† Analysis represents average of two samples.

§ One-third potash as nitrate; remainder as muriate.

\* Four-fifths potash as nitrate; remainder as muriate.

IV. COW, SHEEP, GOAT AND HEN MANURES

Manufacturer and Brand	Moisture	Organic Matter	Insoluble matter	Nitrogen		Phosphoric Acid		Potash	
				Found	Guaranteed	Found	Guaranteed	Found	Guaranteed
American Agricultural Chemical Co. Pulverized Sheep & Goat Manure..	6.50	46.55	15.93	1.92	1.23	1.18	1.	3.10	2
Armour Fertilizer Works. Sheep & Goat Manure.....	16.17	36.73	16.73	1.47	1.25	1.10	1.	2.51	2
Consolidated Rendering Co. Corenco Sheep Manure .....	10.43	41.62	19.61	1.71	1.23	1.20	0.5	2.94	2
Premier Poultry Manure Co., Chicago, Ill. Premier Brand Pulverized Poultry Manure .....	6.68	74.09	9.68	5.56	4.93	2.46	2.75	1.21	1.3
Premier Brand Pulverized Sheep Manure .....	6.87	59.83	11.71	1.71	1.65	4.44	1.	1.81	2
Pulverized Manure Co., Chicago, Ill. Wizard Brand Pulverized Sheep Manure .....	7.45	62.83	16.68	1.92	2.	1.46	1.	4.03	2
Walker-Gordon Farms, Juliustown, N. J. "Driconure" .....	6.30	81.32	3.38	1.85	1.	1.10	1.	1.30	1

Only one of the seven brands listed in table IV failed to meet its guaranty, it proving to be low in phosphoric acid but within tolerance limits in potash. However, no shortage in total plant food occurred.

This type of goods is better this year than it was last year. Its insoluble matter or sand content has decreased considerably. Parties using this class of fertilizer will do well to choose a brand high in plant food and organic matter, then the cost of a pound of plant food will be lower.

Ten of the 15 limes and limestones were analyzed. Apparently five registrants either made no sales or sold only small amounts. The American Agricultural Chemical Co.'s Pownal Agricultural Limestone was low in magnesia; the A. U. Dingman's Perkinsville Limestone and the Vermarco Lime Co.'s Vermarco Agricultural Limestone low in calcium oxid. All three more than maintained their combined carbonates of lime and magnesia guaranties. Vermont is well supplied with lime and it is a pity that farmers do not more generally make use of this admirable soil amendment.

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				
								Percent pass 20-mesh sieve	Percent pass 40-mesh sieve	Percent pass 60-mesh sieve	Percent pass 80-mesh sieve	Percent pass 100-mesh sieve
<b>Hydrated Limes</b>												
Brewer & Co., Inc., Worcester, Mass.												
Producto Agricultural Hydrated Lime.....	64.42	60	0.70	1	17.97	....	9.11	..	..	..	..	..
Producto Agricultural Lime .....	67.29	60	3.84	1	26.34	....	4.36	..	..	..	..	..
Fonda Lime Kilns, St. Albans, Vt.												
Fonda Agricultural Lime .....	68.49	60	0.50	0.50	19.70	....	0.40	..	..	..	..	..
Swanton Lime Works, Swanton, Vt.												
Agricultural Lime .....	69.57	60	0.71	0.30	21.25	....	0.52	..	..	..	..	..
Vermarco Lime Co., West Rutland, Vt.												
Vermarco Agricultural Hydrated Lime.....	70.72	68	1.70	1	6.37	....	0.71	..	..	..	..	..
<b>Ground Limestones</b>												
Amer. Agri. Chem. Co., North Weymouth, Mass.												
Pownal Agricultural Limestone .....	48.39	45	3.72	5	94.13	90	4.40	100	94	88	82	80
Brewer & Co., Inc., Worcester, Mass.												
Producto Agricultural Limestone .....	50.04	40	3.01	1	95.59	90	3.72	99	85	70	59	58
A. U. Dingman, Perkinsville, Vt.												
Perkinsville Land Lime .....	46.96	40	6.66	10	97.72	90	2.18	93	60	37	24	22
Vermarco Lime Co., West Rutland, Vt.												
Vermarco Agricultural Limestone (Pulverized)..	50.91	54	3.09	1	97.31	96	1.91	100	98	90	75	73
<b>Lime Ashes</b>												
Brewer & Co., Inc., Worcester, Mass.												
Lime Kiln Ashes .....	46.18	42	3.13	2	38.08	..	11.37	..	..	..	..	..

## RESULTS OF FERTILIZER INSPECTION

## (a) AS TO QUANTITY OF PLANT FOOD

The 110 brands of mixed goods analyzed in 1933 as a whole were better than were those tested last year as is set forth in tables I and III on pages 6-8 and 10. Only 19 of the 330 guaranties, or six percent, were not maintained. The 1932 figure was five percent. Three of these shortages amounted to less than 0.25 percent, nine were between 0.25 and 0.50 percent, six above 0.50 percent but less than one percent and only one exceeded one percent. They were distributed as follows: Nitrogen six, available phosphoric acid seven, potash six. Only 15 of the 110 brands failed to meet their guaranties, and only six showed an actual shortage of plant food, ranging from one to six percent. This is an excellent showing.

The manufacturers of mixed goods as a rule, and naturally, furnished but little more plant food than they promised to supply. Taking each brand analyzed as a unit in the computation, regardless of the amounts sold, they furnished in the average goods 5.56 percent nitrogen, 10.36 percent available phosphoric acid and 7.87 percent of potash, which is 0.26 percent more nitrogen, 0.56 percent more available phosphoric acid and 0.37 percent more potash than they guaranteed to sell. In other words for each 100 pounds of actual plant food guaranteed 105 pounds were furnished. The 32 brands of crude stock, with three exceptions, equalled or exceeded the guaranties made in their behalf (tables II and III, pages 9 and 10).

So far as quantity of plant food is concerned Vermont consumers with few exceptions received what was promised them. The following efficiency table tells its own story as to the mixing practices of the several licensees.

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. ....	3	3	9	9	..	..	..	..	..	0.27	0.26	0.46
American Agricultural Chemical Co. 19	18	57	55	2	..	2	..	..	..	0.12	0.51	0.26
American Soda Products Co. ....	1	1	3	3	..	..	..	..	..	0.25	1.24	0.31
Apothecaries Hall Co. ....	7	6	21	20	1	..	1	..	..	0.39	0.48	0.42
Armour Fertilizer Works ....	5	3	15	13	2	1	..	1	..	0.01	0.16	0.24
Consolidated Rendering Co. and subsidiaries .....	29	26	87	83	4	..	2	2	..	0.18	0.08	0.09
Eastern States Farmers' Exchange..	13	12	39	38	1	..	1	..	..	0.67	0.58	0.56
International Agricultural Corp....	2	2	6	6	..	..	..	..	..	0.09	0.04	0.21
J. O. Middlebrook & Sons ....	1	..	3	2	1	1	..	..	..	-0.14	0.46	0.27
Old Deerfield Fertilizer Co. ....	2	2	6	6	..	..	..	..	..	0.21	0.73	0.49
Olds & Whipple, Inc. ....	1	1	3	3	..	..	..	..	..	0.12	1.14	1.10
Rogers & Hubbard Co. ....	11	11	33	33	..	..	..	..	..	0.09	0.47	0.29
Standard Wholesale Phosphate & Acid Works .....	9	4	27	20	7	1	2	3	1	0.17	0.27	0.08
Stimulant Laboratories, Inc.....	1	..	3	2	1	..	1	..	..	-0.35	1.56	3.38
Swift & Co. ....	1	1	3	3	..	..	..	..	..	0.09	0.76	0.39
Tennessee Corp. ....	2	2	6	6	..	..	..	..	..	0.25	0.45	0.59
Virginia-Carolina Chemical Co.....	3	3	9	9	..	..	..	..	..	0.26	-0.28	0.27
Total and averages .....	110	95	330	311	19	3	9	6	1	0.16	0.47	0.37

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

BRANDS OF MIXED FERTILIZERS LICENSED AND ANALYZED 1924-1933

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Licensed .....	148	122	116	140	115	137	138	152	160	125
Collected .....	133	100	103	115	98	108	116	131	134	110
Not found on sale .....	15	22	13	25	17	29	22	21	26	15

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

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Nitrogen .....	3	3	3 $\frac{1}{8}$	3 $\frac{1}{8}$	3 $\frac{1}{3}$	3 $\frac{1}{4}$	3 $\frac{3}{8}$	4 $\frac{1}{8}$	4 $\frac{3}{8}$	5 $\frac{1}{8}$
Available phosphoric acid .....	8	8	8 $\frac{1}{2}$	8 $\frac{1}{2}$	8 $\frac{3}{4}$	8 $\frac{3}{4}$	10	10	10	9 $\frac{1}{2}$
Potash .....	5	5 $\frac{1}{3}$	5 $\frac{1}{2}$	6	6 $\frac{1}{6}$	6	6 $\frac{1}{8}$	7 $\frac{1}{2}$	7	7 $\frac{1}{2}$
Total plant food*..	16	16 $\frac{1}{3}$	17 $\frac{1}{2}$	17 $\frac{3}{8}$	18 $\frac{1}{4}$	18	21 $\frac{1}{4}$	21 $\frac{3}{8}$	21 $\frac{1}{2}$	22 $\frac{1}{2}$

\* Nitrogen, available phosphoric acid, potash.

An unfortunate error in calculation occurring in the 1931 bulletin (No. 334) made the similar table incorrect in 1931 and in the 1932 bulletin (No. 345). The statement of the average composition of the fertilizers sold in 1931, as given on page 21 of bulletin 334, was very much too high, and certain comments made, following the analogous table on page 23 of bulletin 334, were not justified by the facts. The original error is regretted, as well as the late date at which it was discovered.

Manufacturers are guaranteeing more total plant food nowadays than in the past. This is largely due to an increase in the demand for higher grade fertilizers and, also, to the increased use of high analysis chemicals in the manufacture of modern goods.

During the past five years the percentage of deficiencies has not been large, about one brand in eight being more or less deficient. This year the figure is one in nine. And, as has been pointed out, the lapses are almost always peccadillos.

## DEFICIENCIES (MIXED FERTILIZERS)

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Analyzed .....	133	100	103	118	98	108	116	131	134	110
Up to guaranty .....	122	88	82	96	77	91	106	107	116	95
Deficient .....	11	12	21	22	21	17	10	24	18	12
Percentage of deficiency....	9	12	20	19	22	16	9	18	13	11

## (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 are applicable only to mixed goods containing at least 0.3 percent of water-insoluble nitrogen. Sixty-four brands carried less than this of their nitrogen contents and were held to be of good quality. The remaining 46 brands are grouped as follows:

- 3 brands, 6 percent, below 50-55 percent activity
- 6 brands, 13 percent, between 50-55 percent activity
- 10 brands, 22 percent, between 55-65 percent activity
- 27 brands, 59 percent, between 65-80 percent activity

Three brands, namely, Acme 4/8/7 and Acme 4/8/4, manufactured by the Acme Guano Co., and Soil-Prep, manufactured by the Tennessee Corporation, contained organic nitrogen of inferior quality.

Apparently manufacturers are using a little less organic nitrogen in the average goods this year than was the case last year. In 1932 eight percent of the brands tested were in the 50-55 percent activity class against 13 percent this year; 72 percent in the 65-80 percent class in 1932 against 59 percent in 1933; and five percent more brands contained less than 0.3 percent of insoluble nitrogen. Except for the three brands above mentioned, the quality of organic nitrogen is good.

*Availability of Phosphoric Acid; Forms of Potash.*—Most mixed goods now carry little insoluble phosphoric acid, a highly commendable state of affairs. All but 10 of the brands carried their potash solely as muriate; the others contained more or less nitrate.



FERTILIZER USAGE

This bulletin is issued at an earlier date than usual, hence 1933 tonnage figures are not included. There seems reason to believe that the usage will be somewhat lower than last year, that it will not exceed 10,000 tons. The distribution as between grades is not likely to be materially different from that obtaining in 1932.

FERTILIZER GRADES

The following tables show the trend during the past season. If one may judge by licenses, the grades carrying 20, 19 and 16 units were deemed likely to sell a bit better than in former years and those carrying 14 units a bit less readily. Recent tonnage returns indicate that Vermont farmers tend to use somewhat higher grades as the years go by.

DISTRIBUTION OF GRADES AMONG MANUFACTURERS

	Total	14% and +	47-63%	38-44%	26-32%	22-24%	21%	20%	19%	18%	17%	16%	15%	14%	8%
Acme Guano Co. ....	3	3	.	.	.	.	.	1	.	.	1	1	.	.	.
American Agricultural Chemical Co. ....	19	19	.	1	.	4	.	3	5	1	2	1	.	2	.
American Soda Products Co. ....	1	1	.	.	.	.	.	.	.	.	.	.	.	1	.
Apothecaries Hall Co. ....	7	7	1	.	.	2	1	2	.	.	.	1	.	.	.
Armour Fertilizer Works ....	5	5	.	.	.	1	.	1	1	.	1	1	.	.	.
Consolidated Rendering Co. and subsidiaries	29	29	.	1	1	4	.	6	7	.	4	3	.	3	.
Eastern States Farmers' Exchange.....	13	13	4	1	3	.	.	5	.	.	.	.	.	.	.
International Agricultural Corp. ....	2	2	.	.	.	1	.	.	.	.	.	1	.	.	.
J. O. Middlebrook & Sons ....	1	1	.	.	.	.	.	.	1	.	.	.	.	.	.
Old Deerfield Fertilizer Co. ....	2	2	.	.	.	.	.	.	1	.	.	1	.	.	.
Olds & Whipple, Inc. ....	1	1	.	1	.	.	.	.	.	.	.	.	.	.	.
Rogers & Hubbard Co. ....	11	11	.	1	.	1	1	3	2	1	.	2	.	.	.
Standard Wholesale Phosphate & Acid Works ....	9	9	.	1	1	.	.	4	.	1	.	1	1	.	.
Stimulant Laboratories, Inc. ....	1	1	.	1	.	.	.	.	.	.	.	.	.	.	.
Swift & Co. ....	1	1	.	.	.	.	.	1	.	.	.	.	.	.	.
Tennessee Corp. ....	2	1	.	.	.	.	.	.	1	.	.	.	.	.	1*
Virginia-Carolina Chemical Co. ....	3	3	.	.	.	1	.	1	.	1	.	.	.	.	.
Totals .....	110	109	5	7	5	14	2	26	19	4	7	12	2	6	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:

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
	%	%	%	%	%	%	%	%	%	%
9-11 percent total plant food..	5	3	0	0	0	0	0	0	0	1
12-13 percent total plant food..	19	17	12	6	4	4	4	4	0	0
14-15 percent total plant food..	18	13	19	23	21	21	18	16	10	7
16-17 percent total plant food..	15	18	14	12	13	13	12	12	17	17
18-19 percent total plant food..	21	15	16	16	16	14	11	12	19	21
20 or more percent total plant food .....	22	34	39	43	46	48	55	57	54	54

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

	Total pounds plant food in 100 pounds	Total pounds plant food in a ton	Approximate average costs per ton	Average cost per pound plant food
High analysis.....	14	280	\$29	10.4 cts.
High analysis.....	16	320	30	9.4 "
High analysis.....	18	360	32	8.9 "
High analysis.....	20	400	33	8.3 "
High analysis.....	22	440	35	8 "
High analysis.....	40	800	50	6.3 "

PRICE DATA

COMPARISONS BETWEEN 1931 AND 1932 TON PRICES

Grade	'32	'33	Grade	'32	'33	Grade	'32	'33
2/10/ 2	\$29	\$27	4/8 / 7	\$34	\$32	8/16/14	\$48	\$48
2/ 8/10	35	33	4/ 8/10	38	35	8/16/16	48	50
2/12/ 4	34	32	4/10/ 5	33	35	10/ 6/ 4	42	..
3/10/ 4	32	30	4/12/ 4	33	32			
3/10/ 6	32	35	5/ 8/ 7	37	35			
3/12/ 6	34	..	5/ 8/10	43	34			
4/ 8/ 4	33	30	6/ 8/ 6	34	33			
4/ 8/ 6	31	..	7/ 6/ 6	39	37			

TEN-YEAR AVERAGES

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Approximate average retail prices .....	\$46	\$46	\$47	\$42	\$42	\$44	\$44	\$45	\$36	\$34
Approximate average pounds plant food per ton .....	320	327	350	353	365	360	435	433	432	453
Approximate average price per pound of plant food .....	14.4c	14.1c	13.4c	11.9c	11.5c	12.2c	10.1c	10.4c	8.4c	7.5c
Percentage of pre-war prices .....	142	139	132	117	113	120	100	102	86	77
Percentage of 1916 prices	103	101	96	85	82	87	72	73	60	54

Unfortunate errors in computation occurred in the table analogous to this in the bulletins for 1929 to 1932 inclusive. That such occurred and that they were not earlier discovered is regretted.

These three tables show the average prices by grades obtained during April and May, 1932 and 1933; the cost of a pound of plant food in various grades; a comparison of the average ton and pound price of plant food for the last 10-year period in Vermont; the approximate number of pounds of plant food per ton; and a comparison with pre-war and 1916 prices.

To illustrate different costs a comparison may be made between 2/10/2 selling at \$27 and 8/16/16 selling at \$50 per ton. The first carries 280 and the second 800 pounds of plant food, and cost 9.6 cents and 6.2 cents per pound of plant food, respectively. The 2/10/2 if sold at the 8/16/16 rate would cost only \$17.36; but it does cost \$27. It costs as much to bag, to freight and to sell the one as the other. It is cheaper to buy higher grades, so be it, they fit plant needs.

Vermont farmers paid over \$400,000 last year for fertilizers. Only \$15,000 (about four percent) was paid for brands which carried 14 and 15 percent plant food. The rest was spent for brands carrying from 16 to 40 percent. This is as it should be.

The average ton price for 1933 has been \$34. This is the lowest price for many years, two dollars less than last year's average price and only 60 percent of 1916 prices. Vermont fertilizer buyers can feel assured that they are getting what they pay for.

#### THE VERMONT FERTILIZER LAW

Three inspection laws dealing with agricultural products are and long have been operative in Vermont. The first fertilizer law was enacted in 1882, the first feeding stuff law in 1898, the first agricultural seed law in 1912. In their present forms they are quite unlike what they were originally. In their essential features they now seem reasonably well standardized. They resemble similar laws operative in most states and especially in the northeastern section. The seed law varies more than the others from that generally in vogue in that a brand tax is assessed against purveyors, a method of revenue raising which does not obtain elsewhere in respect to this particular commodity. No federal enactment as yet exists dealing with either of these three trades.

How do these laws work? What does their conduct cost? Do they protect the buyer? Are they helpful to the purveyor?

The fertilizer law requires manufacturers to "state what they sell and sell what they state." Each package must set forth the maker's name and address, net weight of the package contents, the name of the goods (brand name) and its guaranteed contents of the three forms of plant food it contains.

100 lbs.	
Smith's Corn Grower	
4/8/7	
Nitrogen .....	4
Available phosphoric acid.....	8
Potash (soluble in water).....	7
Smith Fertilizer Company, Smithburg, N. Y.	

This simple statement gives the buyer essential information as to the origin and quality of his proposed purchase. It is easily understood, it tells what the bag contains, it amply protects the buyer, provided it tells the truth. In order that the facts as to its truth or falsity may be determined, the Station samples, analyses, publishes. This plain guaranty, which is a uniform statement in many states, enables manufacturers to simplify their operations and lessens the likelihood of errors on his part, on the farmers' part, on the control official's part; and it lessens manufacturing costs and the price the farmer pays.

The law requires the Experiment Station to sample fertilizers as they are found on sale in the open market, to analyze them, to compare actual performance with manufacturers' promises and to publish the results of such comparisons. It assesses license and tonnage taxes on manufacturers wherewith to defray the cost of inspection.

*How does the fertilizer law work?* Manufacturers, having put the ingredients together in the mixed goods, license their sales and make shipments on orders received or on consignment, usually in April and May in Vermont. The station sampling agents sent into the field during April and May sample the shipments found on sale in the standard manner. The station regulatory chemists analyze all brands and prepare the manuscript and the director prints and distributes the bulletin.

*What does the conduct of the fertilizer control cost?* The approximate average annual income from license fees and tonnage taxes during the past five years has been \$5,300; the approximate average annual sales 15,000 tons; the approximate average annual cost to Vermont farmers \$620,000. The cost of inspection, of insuring that the buyer received what was promised him, was about 35 cents a ton.

Of course, inspection costs more per ton in Vermont than in states like Maine, New York, Pennsylvania, New Jersey, where large quantities are used. It costs as much to carry on an adequate inspection in one state as in another, but the per ton cost in Maine or New York is far less than in Vermont or Rhode Island. Since, however, most manufacturers selling in Vermont also sell throughout the northeastern section of the United States, and some of them in the South and West also, inspection costs spread over their entire trade are not excessive, far less than what, theoretically, the Vermont inspection service costs.

And since manufacturers do not have to license brands they do not expect to sell and sell at a profit, it seems fair to conclude that the cost of an inspection system is not large as compared with its benefits.

*Does the fertilizer law protect the buyer?* In pre-law—not in pre-war but pre-law—days utterly worthless stuff was sold. Reputable manufacturers were often poorly informed as to manufacturing methods and soil and crop needs. Their goods were quite apt to be uneven in quality. The constant publicity brought about by the printing of analytical results in all the states east, and in some west, of the Mississippi, has improved the situation in respect to guaranty maintenance. Let us compare 1890-99, 1900-09, 1910-19 and 1920-29 in respect to guaranty maintenance on the part of companies selling in Vermont.

PERCENTAGES OF FAILURE TO MAINTAIN GUARANTIES ON THE PART OF SEVEN COMPANIES SELLING IN VERMONT FROM 1890 TO 1929

1890-99				1900-09				1910-19				1920-29			
	%	%	%		%	%	%		%	%	%		%	%	%
A	22	8	11	8	F	37	23	13							
B	20	17	12	10	G	..	17	28							
C	12	14	17	..	Average A-G	19	20	14	12						
D	25	26	9	2	Average A-E	19	17	12	7						
E	16	20	11	8											

Since the 1910-19, 1920-29 average figures are 13 and 10 percents and the 1890-99, 1900-09 average figures 20 and 18 percents it seems to be safe to conclude that the buyer is more apt today to get what is promised him than in the gay nineties or later.

*Does the fertilizer law protect the manufacturer?* He seems to think so. Let us note the Vermont records of some of the companies which from time to time have sold during the past 40 years and faded out of the picture. To what extent the publicity caused by station analytical work was the cause, who shall say? In 1890-1907 six companies made sales whose deficiency records were 42, 25, 80, 100, 29 and 38 percents. In 1910-20 seven companies made sales whose deficiency records were 28, 41, 40, 100, 22, 19 and 17 percents. In 1921-27 three companies made sales whose deficiency records were 23, 22 and 100 percents. None of these now sell in Vermont. Their non-weighted averages were 52, 38 and 45 percents at times when those of companies selling regularly were 20, 14 and 12 percents.

The quarterly publication of the National Fertilizer Association may be quoted in this connection. It says, "The industry favors good laws and strict enforcement." "A fertilizer law properly protects the farmer (and) at the same time protects the honest manufacturer against unfair competition."