

Commercial Fertilizers

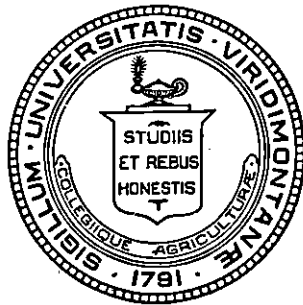
University of Vermont and State Agricultural College

Vermont Agricultural Experiment Station

BURLINGTON, VERMONT

COMMERCIAL FERTILIZERS

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BULLETIN 345: COMMERCIAL FERTILIZERS

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

SUMMARY

That manufacturers have met the requirements of the Vermont laws controlling the sale of commercial fertilizers is evidenced by the results reported in this bulletin. Only 18 brands of mixed goods and two of crude stock failed to furnish all the plant food that was promised, in only eight instances did a shortage occur in the total amount of plant food guaranteed, and in but a single case did this shortage exceed four percent. Safe overruns were the rule. This is an excellent showing.

Three brands of sheep manure contained excessive amounts of sand. The limes and limestones were what they were said to be with one exception, which was low in combined carbonates and was not as finely ground as it should have been.

Organic nitrogen was used rather more freely in the 1932 fertilizers than was the case last year. Not a single brand contained organic nitrogen of inferior quality.

Every brand licensed for sale in Vermont in 1932 was in the so-called "high analysis" class, carrying 14 percent or more of plant food. This is the first year that this desirable situation has existed.

Fertilizer usage was less than in previous years, the shrinkage being doubtless due to the current business conditions.

The average cost, \$36 per ton, is lower than at any time for many years.

DEFINITIONS AND INTERPRETATIONS RELATING TO FERTILIZERS

The following definitions of fertilizers and liming materials have either been adopted by or proposed to the Association of Official Agricultural Chemists. They are inserted here for the first time in order that Vermont users may become more familiar with the nature of the materials now used in the manufacture of this class of goods.

NITROGEN COMPOUNDS

Nitrate of Soda (Commercial sodium nitrate).—Containing not less than 15 percent of nitrogen, chiefly as sodium nitrate.

Sulphate of Ammonia.—A commercial product composed chiefly of ammonium sulphate and containing 20.5 percent or more of nitrogen.

Cyanamid and Urea Nitrogen.—These shall be classified as synthetic non-proteid organic nitrogen.

Dried Blood.—The collected blood of slaughtered animals, dried and ground and containing not less than 12 percent of nitrogen in organic form.

Crude, Inert or Slow-Acting Nitrogenous Materials.—Unprocessed organic substances relatively high in nitrogen but having a very low value as plant food and showing a low activity by both the alkaline and neutral permanganate methods (below 50 percent and 80 percent, respectively).

Peat.—The partly decayed vegetable matter of natural occurrence, composed chiefly of organic matter with some nitrogen of low activity.

PHOSPHORIC ACID COMPOUNDS

Superphosphate.—The product resulting from mixing rock phosphate and sulphuric acid or phosphoric acid. The grade should always be used as a prefix to the name, e.g., 16 percent superphosphate. It is recommended that the use of the term "Acid Phosphate" be discontinued.

Dicalcium Phosphate.—A manufactured product consisting chiefly of phosphoric acid in the dicalic form.

Basic Phosphate Slag.—A by-product in the manufacture of steel from phosphatic iron ores. The product shall be finely ground and should contain no admixture of materials other than what results in the original process of manufacture. It shall contain not less than 12 percent of total phosphoric acid (P_2O_5), not less than 80 percent of which shall be soluble in two percent citric acid solution, according to the Wagner method of analysis. Any other phosphate slag not conforming to this definition shall be designated *low grade*.

Ground Phosphate Rock is a natural rock containing one or more calcium phosphate minerals of such purity and quantity as to permit their use, either directly or after concentration, in the manufacture of commercial products.

Soft Phosphate with Colloidal Clay is a very finely divided, low-analysis by-product resulting from mining Florida rock phosphate by a hydraulic process. Most of the colloidal material settles in artificial ponds and basins at points farthest from the washer, whence it is recovered when the water evaporates.

POTASH COMPOUNDS

Muriate of Potash (Commercial potassium chlorid).—A potash salt containing not less than 48 percent of potash (K_2O) largely as chlorid.

Sulphate of Potash (Commercial potassium sulphate).—A potash salt containing not less than 48 percent of potash (K_2O) largely as sulphate, and not more than 2.5 percent of chlorin.

Kainit.—A potash salt containing potassium and sodium chlorids and sometimes sulphate of magnesia with not less than 12 percent of potash (K_2O).

Manure Salts.—Shall be understood to mean potash salts containing high percentage of chlorid and from 20 to 30 percent of potash (K_2O). The term "double manure salts" should be discontinued.

Sulphate of Potash-Magnesia.—A potash salt containing not less than 25 percent of potash (K_2O), nor less than 25 percent of sulphate of magnesia and not more than 2.5 percent of chlorin.

NITROGEN AND PHOSPHORIC ACID COMPOUNDS

Ammoniated Superphosphate.—A product containing superphosphate and dissolved bone and nitrogenous compounds, but without the addition of potash.

Ammonium Phosphate.—(Fertilizer grade).—A product resulting from a chemical union of monocalcium phosphate with ammonia.

Ground Steamed Bone.—A product resulting from grinding animal bones that have been previously steamed under pressure.

Ground Raw Bone.—A product resulting from drying and grinding animal bones that have not been previously steamed under pressure.

Tankage.—This term (without qualification) shall be restricted to meat and bone tankage derived from the rendered, dried and ground by-products from the slaughter of animals, or from carcasses that have died otherwise than by slaughter.

Fish Tankage, Fish Scrap, Dry Ground Fish, Fish Meal.—(Fertilizer grade).—The dried ground product derived from rendered or unrendered fish.

Garbage Tankage.—The rendered, dried and ground product derived from waste household food materials.

Acidulated Fish Tankage, Acidulated Fish Scrap.—The rendered product derived from fish and treated with sulphuric acid.

NITROGEN AND POTASH COMPOUNDS

Nitrate of Potash (Commercial potassium nitrate).—A salt containing not less than 12 percent of nitrogen and 44 percent of potash (K_2O).

NITROGEN, PHOSPHORIC ACID AND POTASH COMPOUNDS

Dried Pulverized or Shredded Manures.—These products shall be only what the name indicates and not mixtures of manures and other materials.

Sheep Manure Wool Waste.—The by-product from wool-carding establishments consisting chiefly of sheep manure with seeds and wool fiber.

LIMING MATERIALS

Unleached Wood Ashes.—A product that results from burning unleached wood, that have had no part of their plant food removed, and that contain four percent or more of water-soluble potash (K_2O).

Ashes from Leached Wood.—Unleached ashes resulting from burning wood that has been exposed to or digested in water or other liquid solvents, as in the extraction of dyes, so that a part of the plant food has been dissolved and removed.

Leached Wood Ashes.—Ashes resulting from burning unleached wood, but as having had part of their plant food removed by artificial means or by exposure to rains, snows, or other solvent.

Agricultural Lime and Liming Material.—Any neutralizing substance containing calcium and magnesium oxides in condition and quantity suitable for use in agriculture.

Lime.—The word "lime" when applied to liming materials means calcium and magnesium oxides.

High Calcium Lime Products.—Those classes of liming materials containing not less than 45 percent of calcium and magnesium oxides and not more than four percent of their total oxides of calcium and magnesium as magnesium oxide.

High Magnesium Lime Products.—Those classes of liming materials containing not less than 25 percent of their total oxides of calcium and magnesium as magnesium oxide.

Quicklime, Burned Lime, Caustic Lime, Lump Lime, Unslaked Lime.—Liming materials having a high content of calcium oxide and magnesium oxide resulting from heating suitable carbonates until substantially all the carbon dioxide has been eliminated.

Hydrated or Slaked Lime.—The product obtained by treating quicklime with sufficient water or steam to combine with its oxides.

Air-Slaked Lime.—The product obtained by exposing caustic lime to the atmosphere, whereby it absorbs moisture and carbon dioxide.

Ground Limestone.—The product obtained by grinding calcitic or dolomitic limestone. Seventy-five percent or more should pass a 100-mesh sieve and it should contain not less than 90 percent of calcium and magnesium carbonates equivalent to not less than 45 percent of the mixed oxides of calcium and magnesium.

Ground Shell Lime.—The product obtained by grinding the shells of mollusks. Seventy-five percent or more should pass a 100-mesh sieve and it should contain not less than 80 percent calcium and magnesium carbonates, equivalent to not less than 40 percent of the mixed oxides of calcium and magnesium.

Marl, Ground Shell Marl.—The product obtained by grinding natural deposits of shell marl. Seventy-five percent or more should pass a 100-mesh sieve and it should contain not less than 80 percent calcium and magnesium carbonates, equivalent to not less than 40 percent of the mixed oxides of calcium and magnesium.

Waste Lime, By-product Lime.—Any industrial waste or by-product containing calcium or calcium and magnesium in forms that will neutralize acids. It may be designated by the prefixation of the name of the industry or process by which it is produced, i.e., gashouse lime, tanners' lime, acetylene lime waste, lime-kiln ashes, lime silicate, etc.

Calcium Sulphate, Gypsum or Land Plaster.—A product consisting chiefly of calcium sulphate. It is accompanied by varying quantities of impurities and contains about 20 percent of combined water. It does not neutralize acids.

INTERPRETATIONS

Orders of terms in mixed fertilizers shall be nitrogen first, phosphoric acid second and potash third.

Statement of guarantees of mixed fertilizers shall be given in whole numbers.

Significance of the name of a material used as the brand name or part of the brand name of a mixed fertilizer.—When the name of a material is used as a part of the brand name of a mixed fertilizer, as, for example, blood, bone or fish, the nitrogen or phosphoric acid shall be derived from or supplied entirely by the material named. When the name of a material is used as a brand or as part of a brand and the nitrogen and phosphoric acid is not supplied by the material named, the word "brand" shall follow the name of the material. Example: "Fish Brand Fertilizer."

Available phosphoric acid.—The sum of the water-soluble and the citrate-soluble phosphoric acid.

Citrate-soluble ("reverted") phosphoric acid is that part of the total phosphoric acid in a fertilizer that is insoluble in water but soluble in a solution of citrate of ammonia according to the method adopted by the Association of Official Agricultural Chemists.

Net weights.—The weights appearing on packages of fertilizer, agricultural lime and liming material shall always mean net weight.

Interpretation of the word "lime" as applied to fertilizers.—The term "lime" shall not be used in the registration labeling or guaranteeing of fertilizers or fertilizing materials, unless the lime is in a form to neutralize soil acidity, such as the oxide, hydroxide, or carbonate, or equivalent magnesia compounds.

Fertilizer formula.—This term shall be interpreted as expressing the quantity and grade of the crude stock materials used in making a fertilizer mixture. For example, 800 pounds of 16 percent superphosphate, 800 pounds of 9-20 tankage and 400 pounds of sulphate of potash-magnesia.

Analysis.—This word as applied to fertilizers shall designate the percentage composition of the product expressed in terms of nitrogen or ammonia, phosphoric acid and potash in their various forms.

Brand and brand name.—A brand is a term, design, or trade-mark used in connection with one or several grades of fertilizers. A brand name is a specific designation applied to an individual fertilizer.

Unit.—A unit of plant food is 20 pounds or one percent of a ton.

Form of nitrogen in cyanamid.—The nitrogen in calcium cyanamid shall be considered as being of organic nature.

Meaning of term "finely ground."—This term in the definition of basic slag shall refer to actual size of particles as determined by the use of standard sieves, as follows: Seventy percent or more should pass a 100-mesh sieve, and 90 percent or more should pass a 50-mesh sieve.

Interpretation of brand name to include the analysis or grade of fertilizer.—The committee recommends and urges the practice of including the analysis or grade of fertilizer with the brand name, both by the manufacturer, on sacks and in printed literature, and by the control official in his reports and publications.

Activity of water-insoluble nitrogen in mixed fertilizers.—The alkaline and neutral permanganate methods distinguish between the better and the poorer sources of water-insoluble nitrogen and do not show the percentage availability of the material. The available nitrogen of any product can be measured only after carefully conducted vegetation experiments.

(a) The methods shall be used on mixed fertilizers containing water-insoluble nitrogen amounting to 0.30 percent or more of the weight of the material. In the event of a total nitrogen exceeding the minimum guarantee, accompanied by a low activity of the insoluble nitrogen, the overrun may be taken into consideration in determining the classification of the water-insoluble nitrogen.

(b) The water-insoluble nitrogen in mixed fertilizers showing an activity below 50 percent by the alkaline method and also below 80 percent by the neutral method shall be classed as inferior. This necessitates the use of both methods before classifying as inferior.

THE 1932 INSPECTION

The results of the 1932 inspection are set forth herewith in condensed form. The licenses for the current year cover: Complete mixed fertilizers 152; fertilizers furnishing phosphoric acid and potash 2; crude stock 45; sheep, goat and hen manures 10; florists goods 6; limes 16; total 231.

The station sampling agents visited some 90 Vermont cities, towns and villages in the spring of 1932 and drew 362 samples from dealers stocks representing 188 of the 231 commercial fertilizers and limes licensed for sale. No samples of the 43 brands named below were secured.

ALLIED MILLS, INC., Baltimore, Md.

Allied Fertilizers 5-10-5; Allied Fertilizers 4-10-10; Allied Fertilizers 4-8-7; Allied Fertilizers 2-8-10; Allied Fertilizers 2-8-5; Allied Ammonium Sulphate; Allied Steamed Bone Meal; Allied Superphosphate.

AMERICAN AGRICULTURAL CHEMICAL Co., North Weymouth, Mass.

Agrico for Fruit 7-6-6; Agrico 5-9-6; Muriate of Potash.

AMERICAN CYANAMID Co., New York, N. Y.

Ammo-Phos 11-48-0; Ammo-Phos 16-20-0.

APOTHECARIES HALL Co., Waterbury, Conn.

Liberty Potato and General Crops 4-8-10; Muriate of Potash.

ARMOUR FERTILIZER WORKS, New York, N. Y.

Armour's Vert-The Green Colored Plant Food 5-8-6.

BERKSHIRE CHEMICAL Co., Bridgeport, Conn.

Berkshire 7-11-10; Berkshire 4-8-4; Berkshire 2-8-10.

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

Standard Chilean Nitrate of Soda.

- CONSOLIDATED RENDERING Co., Boston, Mass.
Corenco 5-16-7.
- EASTERN STATES FARMERS' EXCHANGE, Springfield, Mass.
Eastern States 4-16-20; Eastern States 0-20-20; Eastern States Urea.
- ESSEX FERTILIZER Co., Boston, Mass.
Essex 5-8-10 Banner Brand for Potatoes; Essex 4-8-7 Old General Crop Manure for Potatoes and Market Garden Crops; Essex 2-8-10 Vegetable and Grain.
- INTERNATIONAL AGRICULTURAL CORP., Boston, Mass.
International 4-8-10.
- NEW ENGLAND FERTILIZER Co., Boston, Mass.
New England 4-8-7 Old General Crop Manure for Potatoes and Vegetables.
- PARMENTER & POLSEY FERTILIZER Co., Boston, Mass.
P & P 3-10-4 Plymouth Rock Brand for all Crops; P & P 2-10-2 Grain Grower.
- PLANTABBS CORP., Baltimore, Md.
Fulton's Plantabbs.
- PREMIER POULTRY MANURE Co., Chicago, Ill.
Premier Brand Pulverized Sheep Manure.
- ROGERS & HUBBARD Co., Portland, Conn.
Hubbard's "Bone Base" Soluble Potato Manure; Hubbard's "Bone Base" Soluble Corn Manure.
- SYNTHETIC NITROGEN PRODUCTS CORP., New York, N. Y.
Calcium Nitrate (Nitrate of Lime); Cal-Nitro 16 percent.
- VIRGINIA-CAROLINA CHEMICAL Co., Richmond, Va.
Bloom Aid, Tablet Form and Liquid Form, 10-14-6.
- L. B. ANDREWS & SON, Wilmington, Vt.
Agricultural Lime.
- LAWRENCE PORTLAND CEMENT Co., Thomaston, Me.
Dragon Mainrok Agricultural Hydrated Lime.
- SHAWINIGAN CHEMICALS LIMITED, Montreal, Que.
Shawinigan Limestone.
- SOLVAY PROCESS Co., Syracuse, N. Y.
Solvay Pulverized Limestone.
- VERMARCO LIME Co., West Rutland, Vt.
Vermarco Agricultural Limestone.

Concerning the 38 unsampled brands of goods other than limes it should be said:

(1) In 19 instances either no sales whatsoever were made or sales were in lots of four tons or less, totaling 16 tons.

(2) In five instances from five to eight tons were sold, totaling 31 tons.

(3) In 14 instances from nine to 111 tons were sold, totaling 415 tons.

(4) These 38 brands represent less than four percent of the entire tonnage shipped into Vermont.

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 9 to 12). (2) Those brands of crude stock which conform to promise (table II, page 13). (3) The 20 brands which contained less plant food than guaranteed (table III, page 14). (4) Sheep manures and limes (tables IV and V, pages 15 to 16).

Table I (pages 9 to 12), shows:

1. The names and addresses of licensees.
2. The brand names, including therein—with two exceptions—the grade.
3. The "grades"—nitrogen,¹ available phosphoric acid² 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).

Table II (page 13) shows the analyses of the sundry crude stocks which were found to be equivalent to their guaranties.

Table III (page 14) sets forth the facts as to 20 brands which failed to meet their guaranties. In 12 cases no actual shortage occurred due to the fact that the overruns more than offset the underruns. The shortages occurring in eight brands are recorded in the last column. With one exception these are few and small. They range from one to 11 percent, an excellent showing. Special mention should be made, however, of the Standard Wholesale Phosphate & Acid Works' U. S. 3-12-5 and U. S. 8-16-14. The first named goods is short in all three forms of plant food, the total deficiency equalling 11 percent. The second carries less nitrogen and phosphoric acid than was promised but more potash, the shortage in this case being four percent. All percentages beyond tolerance limits are printed in bold face type.

Florists' goods have been separately listed during the past few years but they seem to have been sold less commonly during 1932 than of late. The four brands found on sale are listed with the general run of fertilizers in table I.

¹ 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.

² Total phosphoric acid guaranty is usually 0.5 or one 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)
American Agricultural Chemical Company, 285 River St., North Weymouth, Mass.			
A A Hi-Test Fertilizer 10/20/20.....	10-20-20†	99	98
A A Double Strength 8/16/14.....	8-16-14	96	98
A A Top Dresser 7/6/6.....	7- 6- 6	96	92
A A Aroostook Potato Manure 5/8/7.....	5- 8- 7	95	94
A A Complete Manure with 10% Potash 4/8/10	4- 8-10	93	90
A A Peerless Potato Manure 4/8/7.....	4- 8- 7	93	87
A A Monarch Fertilizer 4/8/4.....	4- 8- 4	92	87
A A Corn Favorite 3/10/4.....	3-10- 4	91	90
A A Prolific 10% Potash Fertilizer 2/8/10	2- 8-10	93	93
A A General Crop Fertilizer 2/10/2.....	2-10- 2	93	93
Agrico for Aroostook with 10% Potash 5/8/10	5- 8-10	96	94
Agrico Aroostook 5/8/7.....	5- 8- 7	94	92
Agrico New England 4/8/10.....	4- 8-10	91	93
Agrico for Truck 4/10/5.....	4-10- 5	94	88
Agrico for Corn 3/10/6.....	3-10- 6	95	88
Agrico for Grain 2/12/4.....	2-12- 4	95	94
Bowker's Stockbridge Potato & Vegetable Manure 4/8/10.....	4- 8-10	90	99
Bowker's All Round Fertilizer 3/10/4.....	3-10- 4	91	97
Bowker's Farm and Garden Phosphate 2/10/2	2-10- 2	89	92
Bradley's Complete Manure with 10% Potash 4/8/10.....	4- 8-10	91	96
Bradley's XL Fertilizer 3/10/4.....	3-10- 4	90	90
Bradley's Eclipse Fertilizer 2/10/2.....	2-10- 2	95	93
E. Frank Coe's Columbian Fertilizer 2/10/2	2-10- 2	87	96
American Soda Products Company, 121 East Oak Ave., Morristown, N. J.			
Grogreen 3/8/3.....	3- 8- 3	67	87
Apothecaries Hall Company, 8-24 Benedict St., Waterbury, Conn.			
Liberty 10/16/14.....	10-16-14	89	96
Liberty 10/6/4.....	10- 6- 4	87	96
Liberty 8/13/11.....	8-13-11	87	98
Liberty Special Fertilizer for Fruit 7/8/6..	7- 8- 6	98	96
Liberty High Grade Market Gardeners 5/8/7	5- 8- 7	92	95
Liberty Market Gardeners Special 4/8/4..	4- 8- 4	78	97
Liberty Potato and Vegetable 2/8/10.....	2- 8-10	62	96
Liberty High Grade Corn 2/12/4.....	2-12- 4	93	97
Liberty Corn 2/10/2.....	2-10- 2	72	96

* Percentage of total phosphoric acid present in so-called available form.
 † One twentieth of potash as sulphate; remainder as muriate.

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

I. MIXED FERTILIZERS SUBSTANTIALLY COMPLYING WITH GUARANTIES

—continued

Brand name	Grade	Percentage of nitrogen which is water-soluble	*(See title in footnote)	
Armour Fertilizer Works, 10 E. 40th St., New York, N. Y.				
Armour's Big Crop Fertilizers	6/11/10...	6-11-10	100	99
Armour's Big Crop Fertilizers	4/12/4....	4-12- 4	100	98
Armour's Big Crop Fertilizers	4/8/4....	4- 8- 4	98	98
Armour's Big Crop Fertilizers	3/10/4....	3-10- 4	88	95
Armour's Big Crop Fertilizers	2/12/4....	2-12- 4	98	97
Armour's Big Crop Fertilizers	2/8/10....	2- 8-10	96	96
Berkshire Chemical Company, 92 Howard Ave., Bridgeport, Conn.				
Berkshire 8/16/14 Fertilizer	.....	8-16-14	93	97
Berkshire Grass Special Fertilizer	6/6/5..	6- 6- 5	86	95
Berkshire Market Garden Fertilizer	3/8/4	3- 8- 4	83	91
Burlington Rendering Company, North Ave., Burlington, Vt.				
Burlington	4/12/4.....	4-12- 4	84	95
Burlington	4/8/7.....	4- 8- 7	82	93
Burlington	3/10/4.....	3-10- 4	82	88
Burlington	2/8/10.....	2- 8-10	76	93
Burlington	2/10/2.....	2-10- 2	70	95
Consolidated Rendering Company, 40 North Market St., Boston, Mass.				
Corenco	8/16/14.....	8- 16-14	93	99
Eastern States Farmers' Exchange, Box 1482, Springfield, Mass.				
Eastern States	15/20/15.....	15-20-15†	100	100
Eastern States	10/20/20.....	10-20-20	99	99
Nitrophoska	10/20/20.....	10-20-20	98	100
Eastern States	8/24/8.....	8-24- 8‡	94	99
Eastern States	8/16/16.....	8-16-16	97	98
Eastern States	6/15/9.....	6-15- 9	96	98
Eastern States	6/8/6.....	6- 8- 6	95	94
Eastern States	4/10/6.....	4-10- 6	96	95
Eastern States	4/8/8.....	4- 8- 8	93	96
Eastern States	4/12/4.....	4-12- 4	94	98
Eastern States	2/12/6.....	2-12- 6	91	98
Eastern States	0/14/6.....	0-14- 6	..	95
Essex Fertilizer Company, 39 North Market St., Boston, Mass.				
Essex	5/8/7 Complete Manure.....	5- 8- 7	88	93
Essex	4/8/10 Peerless Potato Manure....	4- 8-10	81	95
Essex	4/8/4 Market Garden.....	4- 8- 4	84	95
Essex	3/10/4 Fish Brand Fertilizer for all Crops	.....	.....	.....
	.....	3-10- 4	84	94
Essex	2/10/2 A-1 Super.....	2-10- 2	75	95

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

† Five-eighths of potash as sulphate; remainder as muriate.

‡ Three-fourths of potash as sulphate; remainder as muriate.

All brands listed above "passed" in respect to the quality of their organic nitrogen 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)
International Agricultural Corp., 38 Chauncy St., Boston, Mass.			
International 7/6/6.....	7- 6- 6	100	96
International 4/8/4.....	4- 8- 4	100	94
International 2/12/4.....	2-12- 4	96	97
Lowell Fertilizer Company, 40 North Market St., Boston, Mass.			
Lowell 7/6/6 Top Dressing.....	7- 6- 6	99	98
Lowell 5/8/10 Banner Brand for Potatoes	5- 8-10	89	97
Lowell 5/8/7 Market Garden Manure.....	5- 8- 7	89	94
Lowell 4/8/10 Potato Grower.....	4- 8-10	88	92
Lowell 4/8/7 Old General Crop Manure for Potatoes & Market Garden Crops	4- 8- 7	88	95
Lowell 4/8/4 Corn and Vegetable.....	4- 8- 4	86	95
Lowell 3/10/4 Animal Brand.....	3-10- 4	84	90
Lowell 2/8/10 Vegetable and Grain.....	2- 8-10	71	91
Lowell 2/10/2 Bone Brand.....	2-10- 2	70	90
J. O. Middlebrook & Sons, 190 College St., Burlington, Vt.			
Midco Special Lawn & Garden Fertilizer..	7- 6- 6	94	93
New England Fertilizer Company, 40-A North Market St., Boston, Mass.			
New England 5/8/10 Banner Brand for Potatoes	5- 8-10	90	94
New England 5/8/7 Market Garden Manure	5- 8- 7	87	94
New England 4/8/10 Complete Manure...	4- 8-10	86	92
New England 4/8/4 Potato & Vegetable Manure	4- 8- 4	84	92
New England 3/10/4 Super.....	3-10- 4	84	92
New England 2/10/2 Corn Phosphate.....	2-10- 2	74	91
Old Deerfield Fertilizer Company, Inc., 28 Sugarloaf St., South Deerfield, Mass.			
Valley Brand 4/8/4.....	4- 8- 4	95	95
Olds & Whipple, Inc., 168 State St., Hartford, Conn.			
O. & W. Potato & General Purpose Fertilizer 4/8/7.....	4- 8- 7	82	93
J. W. Alsop, Inc. Special Tobacco Formula 4/1/8	4- 1- 8†	67	75
Parmenter & Poley Fertilizer Company, 41 North Market St., Boston, Mass.			
P. & P. 5/8/7 Potato & Vegetable.....	5- 8- 7	89	95
P. & P. 4/8/10 Maine Potato Fertilizer..	4- 8-10	88	94
P. & P. 4/8/4 Corn & Vegetable Fertilizer	4- 8- 4	86	95

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

† One-fifteenth of potash as sulphate; remainder as muriate.

All brands listed above "passed" in respect to the quality of their organic nitrogen contents and, save in two 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)
Rogers & Hubbard Company, Portland, Conn.			
Hubbard's "Bone Base" Fertilizer for Seeding Down.....	3- 7- 6	49	62
Hubbard's Potato Fertilizer 5/8/7.....	5- 8- 7	88	88
Hubbard's High Potash Fertilizer 2/8/10	2- 8-10	88	93
Hubbard's Corn & Grain Fertilizer 2/12/4	2-12- 4	88	95
Portland Brand 5/8/7.....	5- 8- 7	98	98
Portland Brand 4/8/7.....	4- 8- 7	98	97
Portland Brand 4/8/4.....	4- 8- 4	99	96
Portland Brand 3/10/4.....	3-10- 4	99	97
Portland Brand 2/10/2.....	2-10- 2	98	97
A. S. Sergent, Continental Bldg., Baltimore, Md.			
4/8/10	4- 8-10	93	98
4/8/7	4- 8- 7	90	100
3/8/4	3- 8- 4	91	97
Standard Wholesale Phosphate & Acid Works, Inc., 1600 Continental Bldg., Baltimore, Md.			
Standard U. S. 2/8/10.....	2- 8-10	87	97
Standard U. S. 2/12/2.....	2-12- 2	85	98
Swift & Company, Court Square Bldg., Baltimore, Md.			
Vigoro 4/12/4.....	4-12- 4	93	98
Synthetic Nitrogen Products Corp., 285 Madison Ave., New York, N. Y.			
Nitrophoska 15/30/15.....	15-30-15	99	100
Tennessee Corporation, Lockland, Ohio			
Loma 5/10/4.....	5-10- 4	93	95
Virginia-Carolina Chemical Corp., 20 Exchange Place, New York, N. Y.			
V-C Tip Top Dresser 7/6/6.....	7- 6- 6	98	98
V-C Fairway Fertilizer 6/6/5.....	6- 6- 5	77	99
V-C Aroostook Potato Grower 5/8/7.....	5- 8- 7	95	97
BloomAid 5/10/4.....	5-10- 4	93	97
V-C National 4/8/10.....	4- 8-10	98	93
V-C Double Owl 4/8/7.....	4- 8- 7	96	95
V-C Good Luck Fertilizer 3/12/6.....	3-12- 6	97	98
V-C Owl Brand Fertilizer 2/12/4	2-12- 4	91	93
V-C Indian Brand Fertilizer 2/8/10.....	2- 8-10	96	97

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

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

II. CRUDE STOCKS SUBSTANTIALLY COMPLYING WITH GUARANTEES

Nitrogenous materials	Nitrogen	
	Found	Guaranteed
<i>Nitrate of Soda</i>		
American Agricultural Chemical Co.....	16.16	15.50
Barrett Co., New York, N. Y., "Arcadian".....	16.36	16.
Chilean Nitrate Sales Corp., New York, N. Y., "Champion Brand".....	16.22	16.
<i>Sulphate of Ammonia</i>		
American Agricultural Chemical Co.....	21.26	20.56
Barrett Co., New York, N. Y., "Arcadian".....	21.06	20.56
Barrett Co., New York, N. Y.....	21.26	20.56
Consolidated Rendering Co.....	21.40	20.50
Eastern States Farmers' Exchange, "Eastern States"....	20.98	20.50
Ford Motor Co., Detroit, Mich.....	21.06	20.80
Hudson Valley Fuel Corp., Troy, N. Y., "Nusoil".....	21.26	20.80
<i>Air-nitrogen Products</i>		
American Cyanamid Co., New York, N. Y., Aero Cyanamid	22.18	22.

Nitrogenous and phosphatic material	Nitrogen		Total phosphoric acid	
	Found	Guar.	Found	Guar.
<i>Ground Bone</i>				
American Agricultural Chemical Co., "Special"	2.59	2.47	22.68	22.88
Berkshire Chemical Co., "Berkshire Fine"....	3.15	2.47	22.88	20.
Consolidated Rendering Co.....	2.38	2.05	26.80	22.90
Eastern States Farmers' Exchange, "Eastern States"	2.62	2.50	26.76	23.
F. Rynveld & Sons, New York, N. Y., "Rynveld's Bone Meal Fertilizer".....	2.97	1.85	24.88	22.88
Virginia-Carolina Chemical Corp.....	3.11	2.45	23.24	22.

Phosphatic materials	Total Phosphoric Acid		Available	
	Found	Guar.	Found	Guar.
<i>Superphosphate (Acid Phosphate)</i>				
American Agricultural Chemical Co.....	16.80	..	16.08	16
Apothecaries Hall Co.....	18.56	..	17.94	16
Armour Fertilizer Works, 20%.....	20.40	..	19.90	20
Armour Fertilizer Works, 16%.....	17.24	..	16.60	16
Berkshire Chemical Co.....	17.96	..	17.50	16
Consolidated Rendering Co., 20%.....	21.56	..	21.16	20
Consolidated Rendering Co., 16%.....	17.92	16	17.36	16
Eastern States Farmers' Exchange, 32%.....	32.80	32.5	32.80	32
Eastern States Farmers' Exchange, 16%.....	17.20	16.5	16.56	16
International Agricultural Corp.....	17.52	..	16.88	16
Rogers & Hubbard Co.....	17.12	..	17.12	16
<i>Miscellaneous</i>				
International Agricultural Corp., International Basic Slag	18.12	18	14.82	14
Virginia-Carolina Chemical Corp., V-C Phospho-Tobacco Dairy Absorbent	15.24	..	14.32	14

Potassic materials	Found	Potash	
		Guaranteed	
<i>Muriate of Potash</i>			
Eastern States Farmers' Exchange.....	49.98	50	
N. V. Potash Export My. Corp., New York, N. Y.....	48.30	48	

III. EIGHTEEN BRANDS OF MIXED GOODS AND TWO OF CRUDE STOCK FAILING TO MAKE GOOD THEIR GUARANTIES

Manufacturer and Brand	Grade	Nitrogen			Phosphoric Acid				Potash		Shortage in guaranteed plant food Total = 100%
		Water-soluble	Found	Guaranteed	Total		Available		Found	Guaranteed	
					Found	Guaranteed	Found	Guaranteed			
Amer. Agl. Chem. Co., Agrico for Lawns, Trees and Shrubs 7/6/6	7/6/6	6.94	7.53	7	6.68	...	6.46	6	5.67	6	None
Amer. Agl. Chem. Co., E. Frank Coe's Standard Potato Fertilizer 4/8/10	4/8/10	3.80	4.09	4	8.34	...	8.00	8	9.31	10	3%
Armour Fert. Works, Big Crop Fert. 8/20/20	8/20/20	7.93	8.04	8	22.91	...	22.56	20	19.67	20	None
Armour Fert. Works, Big Crop Fert. 7/6/6	7/6/6	6.79	6.80	7	6.30	...	6.13	6	6.34	6	None
Armour Fert. Works, Big Crop Fert. 5/8/7	5/8/7	4.25	4.85	5	8.38	...	8.20	8	6.82	7	1%
Armour Fert. Works, Big Crop Fert. 4/8/10	4/8/10	3.81	3.85	4	8.20	...	8.00	8	9.93	10	1%
Berkshire Chem. Co., Berkshire Long Island Fertilizer 3/16/4	3/16/4	3.70	3.78	3	15.76	...	15.20	16	4.54	4	None
Berkshire Chem. Co., Berkshire Long Island Fertilizer 4/8/7	4/8/7	3.45	4.16	4	9.90	...	8.20	8	6.71	7	None
Burlington Rendering Co., Burlington 7/6/6	7/6/6	6.24	6.88	7	6.74	...	6.36	6	5.93	6	None
Burlington Rendering Co., Burlington 4/8/10	4/8/10	3.28	3.88	4	8.67	...	8.29	8	10.79	10	None
Consolidated Rendering Co., Corenco 7/13/11	7/13/11	7.35	7.95	7	13.34	...	13.04	13	10.65	11	None
Consolidated Rendering Co., Ground Tankage 7.41/9.15/0	...	...	8.90	7.41	8.00	9.15	...	...	...	...	None
Essex Fertilizer Co., Essex 7/6/6 Top Dressing	7/6/6	7.03	7.11	7	6.18	...	6.08	6	5.67	6	1%
International Agl. Corp., International 5/8/7	5/8/7	4.82	4.86	5	8.52	...	8.06	8	6.94	7	1%
Old Deerfield Fert. Co., Inc., Ground Steamed Bone	2.47/22/0	...	4.65	2.47	19.16	22	...	...	...	...	3%
Rogers & Hubbard "Bone Base" Oats and Top Dressing	8/5/8	8.14	8.39	8	7.39	...	6.20	5	7.53	8	None
Rogers & Hubbard, Portland Brand 4/8/10 Fertilizer	4/8/10	4.43	4.51	4	7.88	...	7.82	8	9.56	10	None
Standard Whole. Phos. & Acid Wks., Standard U. S. 8/16/14	8/16/14	6.74	6.76	8	14.00	...	13.90	16	15.77	14	4%
Standard Whole. Phos. & Acid Wks., Standard U. S. 3/12/5	3/12/5	2.45	2.67	3	10.48	...	10.24	12	4.85	5	11%
Va.-Car. Chem. Corp. V.-C. Super-Forty 10/16/14	10/16/14	9.94	10.05	10	15.62	...	15.56	16	14.86	14	None

NOTE. A. A. C. Co.'s Agrico; Armour's 8/20/20, 7/6/6, 5/8/7; Burl. Rend. Co.'s 7/6/6, 4/8/10; Rogers & Hubbard's Oats and Top Dressing; analysis in each case represents average of two samples.

IV. 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 and Goat Manure..	7.32	43.75	29.15	1.29	1.23	1.06	1.00	4.23	2
Berkshire Chemical Co. Sheep	7.95	70.33	15.40	2.06	1.80	1.46	1.00	3.17	2
Jos. Breck & Sons, Boston, Mass. Breck's Ram's Head Brand Sheep Manure	8.42	41.08	33.85	1.40	1.46	0.70	0.75	3.77	3
C. E. Buell, Inc., Boston, Mass. Two-in-One Peat Poultry Manure†..	10.84	74.89	3.91	2.89	2.75	2.64	3.50	1.93	1.5
Consolidated Rendering Co. Corenco Sheep Manure	5.94	41.86	28.59	1.33	1.23	1.16	0.50	4.66	2
Emporia Elevator & Feeding Co., Bos- ton, Mass. "Big Sheep" Brand Pulverized Sheep Manure	5.56	70.68	14.05	1.99	2.00	1.94	1.00	4.37	2
Natural Guano Co., Aurora, Ill. "Sheep's Head" Pulverized Sheep Manure	7.80	68.92	12.98	2.17	2.00	1.30	1.25	3.49	2
Premier Poultry Manure Co., Chicago, Ill. Premier Brand Pulverized Poultry Manure	7.91	75.39	8.45	5.74	4.93	2.20	2.75	1.28	1.3
Pulverized Manure Co., Chicago, Ill. "Wizard Brand" Pulverized Sheep Manure	6.42	66.29	15.67	1.92	2.00	1.34	1.00	4.15	2

† Average of two samples.

Two of the nine brands listed in table 4 failed to meet guaranties. The "Two-in-One Peat Poultry Manure" was short in its phosphoric acid content and the total shortage amounted to four percent. The "Premier Brand Pulverized Poultry Manure" was short in its phosphoric acid content but carried enough potash to balance the deficiency.

There were 160 tons of sheep, etc., manure sold in Vermont this year. The nine samples collected averaged to contain about 18 percent of insoluble matter or sand; in other words, buyers of this class of goods paid for 28.8 tons of sand. Three of the brands, (American Agricultural Chemical Company's Pulverized Sheep and Goat; Jos. Breck & Sons' Ram's Head Brand Sheep; Consolidated Rendering Company's Corenco Sheep) contained but little more than 40 percent of organic matter and carried from 28 to 33 percent of insoluble matter.

Purchasers of this class of fertilizers may well study this table and bear its teachings in mind.

V. LIMES AND LIMESTONES

Manufacturer and Brand	Lime (CaO) found	Lime (CaO) guaranteed	Magnesia (MgO) found	Magnesia (MgO) guaranteed	Total carbonates (CaCO ₃ + MgCO ₃) found	Total carbonates (CaCO ₃ + MgCO ₃) guaranteed	Insoluble matter SiO ₂	Mechanical Analysis				
								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
Hydrated Limes												
Brewer & Co., Inc., Worcester, Mass.												
Producto Agricultural Hydrated Lime.....	66.27	60	0.84	1	10.76	....	5.77	..	..	..	..	..
Producto Agricultural Lime	82.12	60	7.22	1	0.91	....	1.51	..	..	..	..	..
Hoosac Valley Lime Co., Inc., Adams, Mass.												
Adams Land Lime	62.45	58	1.94	0.05	30.42	....	3.84	..	..	..	..	..
Swanton Lime Works, Swanton, Vt.												
Agricultural Lime	69.93	60	1.45	0.3	11.17	....	0.66	..	..	..	..	..
United States Gypsum Co., Chicago, Ill.												
U. S. G. Agricultural Hydrated Lime†.....	73.56	70	0.93	....	5.67	....	0.30	..	..	..	..	..
Vermarco Lime Co., West Rutland, Vt.												
Vermarco Agricultural Lime.....	69.67	68	0.64	1	12.90	....	0.38	..	..	..	..	..
Ground Limestones												
Amsden Lime Co., Amsden, Vt.												
Amlico Land Lime.....	31.57	30.02	14.52	16.57	86.71	93.21	7.04	90	72	61	52	50
Brewer & Co., Inc., Worcester, Mass.												
Producto Agricultural Limestone	52.25	44	1.74	1	96.88	90	3.00	100	91	80	74	73
Dominion Lime Co., East Angus, Que.												
"Dudswell Brand" Ground Limestone.....	52.99	52	0.96	1	96.48	94	3.42	100	100	98	91	90
Pownal Lime Co., North Weymouth, Mass.												
Pownal Agricultural Limestone.....	47.92	45	4.43	5	94.78	90	4.64	100	93	88	83	92
Lime Ashes												
Brewer & Co., Inc., Worcester, Mass.												
Lime Kiln Ashes	49.06	42	4.27	2	41.79	78	10.73	..	..	..	..	..

† Manufacturers' sample.

LIMES AND LIMESTONES

Eleven of the 16 brands registered for 1932 were analyzed. Apparently four of the licensees either made no sales or sold only small amounts. Only one sample proved to be deficient, namely Amsden Lime Co., Amlico Land Lime, which was found to be 2.05 percent low in magnesia and 6.50 percent low in combined carbonates. Its usefulness would be enhanced by finer grinding since the value of limestone as a soil amendment depends largely on its mechanical condition. Users of limes and limestones may well study the definitions of lime and liming materials on an earlier page.

A good way to determine the efficiency of hydrated limes is to calculate the cost of 100 pounds of effective oxides, as follows: Divide the pounds of lime and magnesia per ton by the ton cost and multiply by 100. Example: A hydrated lime testing 82 percent of lime, 7 percent of magnesia, costing \$6 per ton. $\$6 \div [(82 + 7) \times 20] \times 100 = 34$ cents, the cost of 100 pounds of effective oxides. This rule does not apply to ground limestones since the degree of fineness is to be considered. That portion which fails to pass a 20-mesh sieve is assumed to be only 50 percent effective. Example: A limestone containing 900 pounds of lime and magnesia per ton; 10 percent failing to pass a 20-mesh sieve, costing \$5 per ton. $\$5 \div [900 - \frac{1}{2}(900 \times 10\%)] \times 100 = 59$ cents cost of 100 pounds of oxides.

Lime users who have access to competitive prices as well as the chemical and mechanical analyses of several brands of officially taken samples may well make use of these formulas in determining where they may buy to best advantage.

RESULTS OF FERTILIZER INSPECTION

(a) AS TO QUANTITY OF PLANT FOOD

The 134 brands of mixed goods analyzed in 1932 as a whole were better than were those tested last year as is set forth in tables 1 and 3 on pages 9-14. Only 20 of the 401 guaranties, or five percent, were not maintained. The 1931 figure was eight percent. Six of these shortages amounted to less than 0.25 percent, nine were between 0.25 and 0.50 percent, two above 0.50 percent but less than one percent and only three exceeded one percent. They were distributed as follows: Nitrogen eight, available phosphoric acid four, potash eight. Only 18 of the 134 brands failed to meet their guaranties, and only seven showed

an actual shortage of plant food, ranging from one to 11 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 4.81 percent nitrogen, 10.26 percent available phosphoric acid and 7.48 percent of potash, which is 0.20 percent more nitrogen, 0.16 percent more available phosphoric acid and 0.28 percent more potash than they guaranteed to sell. In other words for each 100 pounds of actual plant food guaranteed 103 pounds were furnished. The 34 brands of crude stock with two exceptions equalled or exceeded the guaranties made in their behalf (tables II and III, pages 13 and 14).

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 practises of the several licensees.

EFFICIENCY TABLE

	Brands	Brands meeting guaranties in all respects	Total guaranties	Guaranties made good	Guaranties not fulfilled	0.11-0.25% below	0.25-0.50% below	0.50% below	More than 1% below	Average overrun over guaranty		
										Nitrogen	Available phosphoric acid	Potash
American Agricultural Chemical Co.	25	23	75	73	2	..	1	1	..	0.14	0.38	0.10
American Soda Products Co.....	1	1	3	3	..	..	..	..	..	0.11	-0.04	0.32
Apothecaries Hall Co.....	9	9	27	27	..	..	..	..	..	0.28	0.05	0.67
Armour Fertilizer Works.....	10	6	30	26	4	3	1	..	..	0.00	0.49	0.02
Berkshire Chemical Co.....	5	3	15	13	2	..	1	1	..	0.26	0.06	0.25
Consolidated Rendering Co. and Subsidiaries	33	29	99	95	4	2	2	..	..	0.19	0.28	0.14
Eastern States Farmers' Exchange	12	12	35	35	..	..	..	..	..	0.35	0.51	0.58
International Agricultural Corp.....	4	3	12	11	1	1	..	..	..	-0.03	0.07	-0.09
J. O. Middlebrook & Sons.....	1	1	3	3	..	..	..	..	..	0.46	0.38	-0.07
Old Deerfield Fertilizer Co.....	1	1	3	3	..	..	..	..	..	0.30	0.06	0.63
Olds & Whipple, Inc.....	2	2	6	6	..	..	..	..	..	0.39	0.13	0.42
Rogers & Hubbard Co.....	11	9	33	31	2	..	2	..	..	0.27	0.36	0.01
A. S. Sergent.....	3	3	9	9	..	..	..	..	..	0.09	0.17	0.12
Standard Wholesale Phosphate & Acid Works.....	4	2	12	8	4	..	1	..	3	-0.25	-1.04	0.57
Swift & Co.....	1	1	3	3	..	..	..	..	..	-0.01	0.50	0.37
Synthetic Nitrogen Products Corp.	1	1	3	3	..	..	..	..	..	0.24	0.28	0.14
Tennessee Corp.....	1	1	3	3	..	..	..	..	..	0.42	0.22	0.30
V-C Chemical Corp.....	10	9	30	29	1	..	1	..	..	0.31	0.06	0.60
Total and averages.....	134	116	401	381	20	6	9	2	3	0.20	0.16	0.28

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

BRANDS OF MIXED FERTILIZERS LICENSED AND ANALYZED 1923-1932

	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
Licensed	126	148	122	116	140	115	137	138	152	160
Collected	107	133	100	103	115	98	108	116	131	134
Not found on sale.....	19	15	22	13	25	17	29	22	21	26

The approximate average guaranteed composition of fertilizers sold during the 10 years is shown below:

	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
Nitrogen	2½	3	3	3½	3½	3½	3¼	3⅞	5	4¾
Available phos- phoric acid	8	8	8	8½	8½	8¾	8¾	10	11¾	10
Potash	4¾	5	5½	5⅞	6	6⅞	6	6⅞	8¼	7
Total plant food*..	15¼	16	16½	17½	17⅞	18¼	18	21⅞	25½	21¾

* Nitrogen, available phosphoric acid, potash.

Manufacturers are guaranteeing less total plant food this year than they did last year. This may be due to changes in grades, to abandonment of the term "ammonia" and to lessened sales of double strength goods.

DEFICIENCIES (MIXED FERTILIZERS)

	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
Analyzed	107	133	100	103	118	98	108	116	131	134
Up to guaranty.....	101	122	88	82	96	77	91	106	107	116
Deficient	6	11	12	21	22	21	17	10	24	18
Percentage of deficiency....	6	9	12	20	19	22	16	9	18	13

(b) AS TO QUALITY OF PLANT FOOD

AVAILABILITY OF ORGANIC NITROGEN

When the activity of the insoluble organic nitrogen tests 50 percent or more by the alkaline potassium permanganate method and 80 percent by the neutral permanganate method it is deemed to be of good quality. These methods are applicable only to mixed fertilizers containing at least 0.3 percent or more of water-insoluble nitrogen. Fifty-three percent (70 brands) of the brands carried less than this

amount of insoluble organic nitrogen and hence it was held to be of good quality. The remainder (63 brands) are grouped as follows:

5 brands, 8 percent, between 50-55 percent activity
 12 brands, 20 percent, between 55-65 percent activity
 46 brands, 72 percent, between 65-80 percent activity

The organic nitrogen of all these brands was deemed to be of good quality. Manufacturers as a whole seem to be using somewhat better grades of organic ammoniates and more organic nitrogen in this year's goods than was the case last year, since only eight percent of brands tested fell between 50-55 percent activity in 1932 against 36 percent in 1931, 72 percent between 65-80 in 1932 against 25 percent in 1931. About half of the brands tested in 1932 carried less than 0.3 percent of insoluble nitrogen whereas four-fifths of them were in this class in 1931. Hence the proportion of total nitrogen found to be in water-soluble forms in the average goods is slightly lower this year than it was in 1931.

AVAILABILITY OF PHOSPHORIC ACID; FORMS OF POTASH

Mixed goods nowadays carry relatively little insoluble phosphoric acid, which is a highly commendable state of affairs. The facts concerning each licensee and each brand in respect to the proportions of available phosphoric acid purveyed may readily be determined by reference to the tables on pages 9 to 14.

All but four of the mixed goods carried their potash solely as muriate. Two of these four contained 15 and 20 percents of potash respectively and carried 95 percent as muriate; the third, a high analysis special purpose mixture (8-24-8) carried 25 percent of its potash as muriate; the fourth, a special tobacco mixture, carried 62 percent of its potash as sulphate.

FERTILIZER USAGE IN VERMONT

The General Assembly of 1927 so revised the law regulating the sale of commercial fertilizers as to enable the writers to make reasonably close estimates of the extent and the nature of the sales of these goods other than limes. The sales reported by manufacturers aggregated 15,663 tons in 1927, 16,911 tons in 1928, 14,905 tons in 1929, 16,069 tons in 1930, 15,031 tons in 1931 and 11,767 tons in 1932. The following table shows the tonnages by grades sold in 1932:

Grade	Average plant food	Tons	Percent- age of total trade	Grade	Average plant food	Tons	Percent- age of total trade
0/14/6	20	41	0.4	2-4/10-12/6-10	21	618	5.3
2/10/2	14	534	4.5	5-7/8-16/5-10	25	243	2.1
2/12/4	18	272	2.3	8-10/16-20/12-20	43	492	4.2
2/8/10	20	769	6.5	Superphosphate	16-32	1,838	15.6
3/10/4	17	1,221	10.4	Cyanamid			
4/12/4	20	1,176	10.0	nitrate and			
4/8/4	16	606	5.2	ammonia salts	..	407	3.5
4/8/7	19	624	5.3	Bone and tankage	..	103	0.9
5/8/7	20	590	5.0	Muriate and sul-			
5/8/10	23	75	0.6	phate of potash	..	98	0.8
7/6/6	19	249	2.1	Sheep and poul-			
4/8/10	22	1,156	9.8	try manure	..	160	1.4
8/5/5	18	41	0.4				

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

	1928	1929	1930	1931	1932
Brands carrying 14-15% plant food.....	17 %	19.2%	16.9%	16.4%	4.7%
Brands carrying 16-18% plant food.....	15.2	20.3	19.7	18.8	18.3
Brands carrying 19-24% plant food.....	33.9	30.8	28.6	37	46.3
Brands carrying 32-44% plant food.....	5.1	3.7	5.9	6.9	4.1
Superphosphate (acid phosphate).....	22.6	19.7	22.3	15.8	15.6
Other crude stock.....	4.4	4	6.3	3.5	6.5

It is evident that the trend in Vermont is towards the higher grades. In 1927 about 70 percent of the mixed goods contained 16 units or more of plant food while this year's figures approximate 94 percent. The use of crude stock materials has slightly increased. Cyanamid, nitrate and ammonia salts are being increasingly employed. A 22 percent drop in total tonnage as compared with 1931 is noted, which, in all probability, is due to present business difficulties.

FERTILIZER GRADES

“‘Fertilizer grades’ shall represent the minimum guarantee of its plant food expressed in terms of nitrogen, available phosphoric acid and water-soluble potash.” This is the first year when all manufacturers have adhered to the above dictum. Thus has been brought about the elimination of the “low-analysis” goods carrying less than 14 percent of plant food. In 1923, 33 percent of the brands was of the “low-analysis” type; in 1924, 24 percent; in 1925, 20 percent; in 1926, 12 percent; in 1927, 6 percent; in 1928, 1929, 1930 and 1931, 4 percent; in 1932, none. Hence the comparison instituted between

“high” and “low-analysis” brands which has been made in these bulletins, for nearly or quite 40 years, can no longer be made. However, the same conclusion may still be drawn, that it pays to buy high-analysis goods; and while all the brands are now thus classified there are wide differences within class confines. A decided increase is noted in the popularity of grades carrying from 16 to 19 percent of plant food and some decrease in that of those containing 20 or more units.

DISTRIBUTION OF GRADES AMONG MANUFACTURERS

	Total	14% and +	47%-63%	38-44%	26-32%	22-24%	21%	20%	19%	18%	17%	16%	15%	14%	13%
American Agricultural Chemical Co.....	25	25	1	1	6	3	5	1	3	1	4				
American Soda Products Co.....	1	1												1	
Apothecaries Hall Co.....	9	9	1	1	1	3	1	1	1					1	
Armour Fertilizer Works.....	10	10	1	1	1	3	1	1	1						
Berkshire Chemical Co.....	5	5	1	1	1	1	1	1	1						
Consolidated Rendering Co. and subsidiaries	33	33	1	1	7	7	5	4	4					4	
Eastern States Farmers' Exchange.....	12	12	3	3		6									
International Agricultural Corp.....	4	4				1	1	1	1						
J. O. Middlebrook & Sons.....	1	1						1							
Old Deerfield Fertilizer Co.....	1	1										1			
Olds & Whipple, Inc.....	2	1						1							1*
Rogers & Hubbard Co.....	11	11			1	1	3	1	1	1	2			1	
A. S. Sergent.....	3	3			1			1				1			
Standard Wholesale Phosphate & Acid Works	4	4	1			2					1				
Swift & Co.....	1	1				1									
Synthetic Nitrogen Products Co.....	1	1	1												
Tennessee Corp.....	1	1						1							
Virginia-Carolina Chemical Corp.....	10	10	1	1	1	2	3	1	1						
Totals	134	133	6	9	3	18	3	31	21	6	11	12	2	11	1

* A special tobacco fertilizer; not in reality a low-analysis brand.

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

	1923 %	1924 %	1925 %	1926 %	1927 %	1928 %	1929 %	1930 %	1931 %	1932 %
9-11 percent total plant food..	5	5	3	0	0	0	0	0	0	0
12-13 percent total plant food..	28	19	17	12	6	4	4	4	4	0
14-15 percent total plant food..	20	18	18	19	23	21	21	18	16	10
16-17 percent total plant food..	13	15	18	14	12	13	13	12	12	17
18-19 percent total plant food..	15	21	15	16	16	16	14	11	12	19
20 or more percent total plant food	18	22	34	39	43	46	48	55	57	54

The next table displays the facts as to 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	33½	10.4 "
High analysis.....	18	360	32	9 "
High analysis.....	20	400	36	9 "
High analysis.....	21	420	34	8.1 "
High analysis.....	40	800	48	6 "

A study of these tables indicates that "high-analysis" goods are used more extensively each year by Vermont farmers. There were 349 tons of "low-analysis" goods sold in 1931 and 450 tons in 1930, whereas in 1932 no sale whatsoever was made. Apparently manufacturers have thrown them overboard. The economies thus effected benefit both maker and buyer.

PRICE DATA

The following tables show the average prices by grades obtained during April and May for both 1931 and 1932; a comparison of

COMPARISONS BETWEEN TON PRICES OF '31 AND '32

Grade	'31	'32	Grade	'31	'32	Grade	'31	'32
2/10/ 2	\$32	\$29	4/ 8/ 7	\$36	\$34	8/16/14	\$..	\$48
2/ 8/10	37	35	4/ 8/10	..	38	8/16/16	..	48
2/12/ 4	..	34	4/10/ 5	..	33	10/ 6/ 4	..	42
3/10/ 4	..	32	4/12/ 4	44	33			
3/10/ 6	39	32	5/ 8/ 7	42	37			
3/12/ 6	..	34	5/ 8/10	..	43			
4/ 8/ 4	38	33	6/ 8/ 6	..	34			
4/ 8/ 6	..	31	7/ 6/ 6	..	39			

TEN-YEAR AVERAGES

	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
Approximate average re-tail prices.....	\$44	\$46	\$46	\$47	\$42	\$42	\$44	\$44	\$45	\$36
Approximate average pounds plant food per ton	305	320	327	350	353	365	371	362	410	424
Approximate average price per pound of plant food.....	14.3c	14.4c	14.1c	13.4c	11.9c	11.5c	11.8c	12.2c	10.9c	8.5c
Percentage of pre-war prices	156	142	139	132	117	113	116	120	108	87
Percentage of 1916 prices	113	103	101	96	85	82	84	87	78	62

average ton and pound price of plant food for the last ten-year period in Vermont; the approximate pounds of plant food per ton; and a comparison with pre-war and 1916 prices.

The average 1932 price has been the lowest in 10 years and the buyer has received more for his money than at any time for many years. The greatest drop in prices has been noted in grades carrying 20 percent or more of plant food, which shows that it is good business to purchase only high grade goods.

This bulletin has set forth; definitions of fertilizer materials and interpretations of terms used in the trade; brands registered and analyzed; lists of complete fertilizers and crude stocks which complied with their guaranties; a statement of brands which failed to meet guaranties; analyses of sheep, goat, hen manures and lime products; statement of tonnages sold by grades; a discussion of the quantity and the quality of the plant food sold in Vermont in 1932; an explanation of grades and price data.

It is manifest that the goods sold in Vermont in 1932 were a more uniformly high-analysis product than those heretofore sold. The use of organic ammoniates has increased as compared with the last year or two and their quality is above reproach. The average ton price is lower than it was before the war and the average amount of plant food supplied is relatively high. Total sales have decreased which accounts in part for the higher grades demanded. Consumers who have been unable to buy may be those who usually have bought the lower grades. However, this much is clear that the 1932 Vermont buyer of commercial fertilizer has received more value for a dollar paid out than at any time during a long period of years.