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THE UNIVERSITY OF NEW HAMPSHIRE
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DEPARTMENT OF AGRICULTURAL CHEMISTRY

Inspection of Commercial Fertilizers for 1924

MADE FOR THE

STATE DEPARTMENT OF AGRICULTURE

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THE UNIVERSITY OF NEW HAMPSHIRE
DURHAM, N. H.

INSPECTION OF COMMERCIAL FERTILIZERS

This bulletin is a report of the results obtained in the inspection of commercial fertilizers for the year 1924 carried out under the direction of the Honorable Andrew L. Felker, Commissioner of Agriculture. The State Inspector, Mr. Eugene D. Sanborn, visited practically every section of the state and collected samples of 115 different brands.

In 1923 out of a total of 101 brands analyzed, 20, or approximately 20 per cent, were low analysis fertilizers containing less than a total of 14 pounds of plant food per 100 pounds. This year there is a slight improvement. Only 18 brands out of a total of 115, or approximately 16 per cent, are low analysis fertilizers.

There were more serious deficiencies in guaranteed analysis this year than in 1923. These deficiencies indicate the importance of studying this bulletin and buying from those companies whose fertilizers meet their guarantee.

The prices during the past year were very similar to those of 1923. The average prices of some of the brands were cheaper while those of others were slightly higher. An examination of Table 1 shows the importance of selecting your fertilizer according to the cost per pound of plant food rather than according to the cost per ton. The lowest price per ton fertilizer may be the highest price per pound of plant food. In the 1-8-2 fertilizer the cost of nitrogen per pound was almost three times as great as in the 4-8-4 brands. *Ask for high analysis fertilizer. It will pay. Do you consider the actual plant food value of the fertilizer when you buy? The object of the following discussion is to aid you in purchasing fertilizers.* Use it when you buy fertilizer! The following discussion of the meaning of the analysis and the methods of calculating relative values are given to aid

you in purchasing fertilizer. If you need further help write to the Department of Agricultural Chemistry, The University of New Hampshire Agricultural Experiment Station, Durham, N. H.

MEANING OF THE CHEMICAL ANALYSIS.

Three of the ten elements essential for plant growth are most likely to be lacking in sufficient available quantity for best crop growth in our usual soils. These are nitrogen, phosphorus and potassium. Sometimes calcium, magnesium and sulphur may be deficient, but because these deficiences have apparently not been marked and widespread, our fertilizer practices have dealt largely with the application of nitrogen, phosphorus and potassium. The value of commercial fertilizers depends, therefore, upon their available content of these three elements. For this reason manufacturers are required to state upon their label the guaranteed content of these three materials.

Nitrogen.. Pure nitrogen is a colorless, odorless, tasteless gas which makes up about four-fifths of the air surrounding us. In this form, however, it is not available to plants with the exception of a few, such as legumes, which are able to get nitrogen from the air by means of the bacteria which exist on their roots. In order to be available for most plants nitrogen must be in the form of a compound known as a nitrate.

In commercial fertilizers the nitrogen occurs in three different forms as follows: (1) nitrate, (2) ammonia and (3) organic nitrogen. The nitrate nitrogen is readily soluble in water and immediately available to the plant. The ammonia nitrogen and organic nitrogen must be converted into the nitrate form before they are available to the plant. The ammonia nitrogen becomes available quite rapidly during the growing season and so can be considered as an available form. Some types or organic nitrogen such as are contained in dried blood, cotonseed meal, tank-

age, etc., are also rapidly converted into nitrate nitrogen in the soil and made available to the plant. Other types of organic nitrogen like those contained in hoof, hair and leather waste, however, are only very slowly converted into nitrate nitrogen and are not readily available.

Phosphorus occurs in the various fertilizer materials principally as phorphoric acid in combination with calcium (lime). In order to be available to plants these compounds of lime and phosphorus must be soluble or be made soluble. The amount of lime combined with the phosphoric acid determines the solubility; the material containing the smallest amount of lime is the most soluble. That part of the phosphoric acid which is readily soluble in water is immediately available to the plant during the growing season. This is known as "water soluble" phosphoric acid. A part of the phosphoric acid which is insoluble in water is soluble in a certain strength of ammonium citrate solution. This is known as "citrate soluble" or "reverted" phosphoric acid. This is also available to the plant. In the analysis the "available" phosphoric acid includes the "water soluble" and the "citrate soluble." The insoluble may be obtained by subtracting the available from the total in the table of analyses. The "insoluble" phosphoric acid becomes available to the plant only very slowly.

Potassium occurs in commercial fertilizers usually in the form of chloride (muriate) or sulphate. Only the water soluble potassium is readily available to plants. The analysis, therefore, expresses the percentage of "water soluble" potash (K_2O)

Statement of the Analysis. There are numerous ways of expressing the amounts of nitrogen, phosphoric acid and potash contained in a fertilizer. The purchaser should not be misled by these statements. For instance, if a fertilizer contains 3 per cent of nitrogen, it may be expressed as nitrogen 3 per cent, as nitrogen equivalent to 3.65 per cent ammonia, or as nitrogen equivalent to 14.1 per cent of am-

monium sulphate. The per cent of nitrogen is the thing which is important and is the figure which should be used in calculating the value of a fertilizer. The following shows how to calculate the per cent of nitrogen from the per cent of ammonia and vice versa. The nitrogen per cent multiplied by 1.21584 gives the per cent of ammonia. The per cent of ammounia multiplied by 0.82247 gives the per cent of nitrogen. Do not be misled by thinking that a tag stating 3.29 per cent of nitrogen and nitrogen equivalent to 4 per cent of ammonia means that the fertilizer contains the sum of these two. It does not. It means that the fertilizer contains 3.29 per cent nitrogen only.

For convenience, phosphorus is expressed as per cent of "phosphoric acid" or (P_2O_5) phosphorus pentoxide. The tag usually gives the total per cent of "phosphoric acid," the "water soluble," "citrate soluble" and "insoluble." For the purpose of figuring out the value of these we can take the sum of the "water soluble" and the "citrate soluble" and call it available phosphoric acid. The per cent of available phosphoric acid is the figure to use in determining the value of the fertilizer. Potassium is expressed as per cent of available (K_2O) or potash. This is water soluble and available to the plant.

METHOD OF CALCULATING THE RELATIVE COMMERCIAL VALUE.

Because of the variations in prices during the season and the differences in freight costs, etc. it is difficult to calculate accurately the values of the different brands of fertilizer. The commercial value of a fertilizer is based upon the content of available nitrogen, phosphoric acid, (P_2O_5) and potash (K_2O) If we know the guaranteed analysis and assign approximate commercial values for a pound of each of the plant foods, we can decide the relative values of fertilizers.

The terms "unit" of nitrogen, "unit" of phosphoric acid and "unit" of potash are sometimes used to express the

amounts instead of the per cent. The term "unit" means 20 pounds per ton of 2,000 pounds, or 1 per cent. One unit means 1 per cent of a ton or 20 pounds. A fertilizer having 4 per cent of nitrogen has four units of nitrogen or 80 pounds per ton.

Prices of Plant Foods. It is impossible to give accurate figures for the cost of the different plant foods because the cost of mixing, bagging, freight and the manufacturers' and dealers' profits vary with the quantity purchased, distance shipped and number of persons through whose hands the material has passed. It is possible, however, to obtain figures which are sufficiently accurate for use in comparing the relative values of fertilizers.

The average cost of acid phosphate containing 16 per cent of phosphoric acid was $26.20 per ton. One ton contained 0.16 times 2,000 pounds or 320 pounds of available phosphoric acid. The cost per pound was $26.20 divided by 320 or approximately 0.082 and one unit of available phosphoric acid cost 20 times 0.082 or approximately $1.64.

The average cost of muriate of potash containing 50.0 per cent of water soluble potash was $43.00 per ton. One ton contained 0.50 times 2,000 pounds or 1,000 pounds of potash. The cost per pound was $43.00 divided by 1,000 or $0.043 and one unit of water soluble potash cost 20 times $0.043 or $0.86.

The average cost of nitrate of soda containing 15 per cent nitrogen was $63.00 per ton. One ton contained 0.15 times 2,000 or 300 pounds of nitrogen. The cost per pound was $63.00 divided by 300 or $0.21; this made the cost price per unit 20 times $0.21 or $4.20. The average cost of tankage was $47.40 per ton and it contained an average of 5.40 per cent of nitrogen and 7.90 per cent available phosphoric acid. The value of the 7.90 units of phosphoric acid was 7.90 times $1.64 or $12.96, making the nitrogen cost $47.40 minus $12.96 or $34.44. The cost per unit of nitrogen was $34.44 divided by 5.40 or $6.38 and the cost per pound of nitrogen was $0.319. If we assume that our com-

plete fertilizers contain both forms of nitrogen, we can approximate an average and use the values of $0.264 per pound and $5.28 per unit for nitrogen of complete fertilizers. These figures will not give the price at which fertilizers should be sold within the state, but they can be used to determine the relative value of the different brands which may be offered to the purchaser.

PRICES OF PLANT FOOD MATERIALS.

	Per Unit	Per lb.
Nitrogen	$5.28	$0.264
Phosphoric acid (P_2O_5) available	1.64	0.082
Potash (K_2O) water soluble	0.86	0.043

Either the unit or the pound method can be used to calculate the commercial value of the fertilizer. If we have a fertilizer with the following guaranteed analysis:

Nitrogen total	3.00%
Phosphoric acid (P_2O_5) available	8.00%
Potash (K_2O) water soluble	2.00%

By the unit method we find:

Nitrogen	3 x $5.28=$15.84
Phosphoric acid available	8 x $1.64= 13.12
Potash (K_2O) water soluble	2 x $0.86= 1.72
Total commercial value	$30.68

By this method we multiply the per cent of each plant food by the cost per unit and then add these figures to give the total value.

Employing the pound method we obtain:

3 x 20=Number of pounds of nitrogen in a ton	60 x 0.264=$15.840
8 x 20=Number of pounds of phosphoric acid in a ton	160 x 0.082= 13.120
2 x 20=Number of pounds of potash water soluble in a ton	40 x 0.043= 1.720
Total commercial value	$30.680

The per cent means the number of pounds in 100 pounds. Since there are twenty hundred pounds in a ton we multiply the per cent by twenty to find the number of pounds of each plant food. Then by knowing the value of these per pound, we can figure the value of each plant food per ton.

BUY HIGH ANALSIS FERTILIZERS.

It costs just as much to mix, bag and deliver a ton of low analysis fertilizer as it does a ton of high analysis. For this reason the cost of the plant food must be much higher in the low analysis fertilizer. The average cost of a 1-8-2 fertilizer the past season was $41.00. The value of the 8 units of phosphoric acid was 8 times $1.64 or $13.12. The value of the two units of potash was 2 times $0.86 or $1.72. The value of the available phosphoric acid and potash then was $13.12 plus $1.72 or $14.84 and the nitrogen cost $41.00 minus $14.84 or $26.16. The average content of nitrogen was 0.89 per cent. One ton contained 0.89 times 2,000 or 17.8 pounds of nitrogen. The cost per pound of nitrogen was $26.16 divided by 17.8 or 1.48. The cost per unit was 20 times $1.48 or $29.60. On the same basis the average cost per unit of nitrogen in a 4-8-4 fertilizer is $10.00 or about one-third as much as in the 1-8-2 fertilizer.

Table No. 1 gives the cost of nitrogen in the different brands of complete fertilizer analyzed this past year.

TABLE NUMBER I.

Formula	Average cost of one pound of nitrogen	Average cost of one unit, 20 pound, of nitrogen	Average retail price per ton of complete fertilizer
1—8—2	1.44	28.80	41.00
1—10—3	1.31	26.20	46.00
2—8—2	0.82	16.40	42.80
2—8—3	0.91	18.20	47.20
2—8—10	0.82	16.40	50.00
2—10—3	0.54	10.80	40.00
2—10—4	0.74	14.80	46.00
2—12—2	0.56	11.20	40.00
2—12—4	0.75	15.00	50.00
3—6—10	0.67	13.40	52.50
3—8—4	0.55	11.00	45.00
3—8—10	0.68	13.60	55.00
3—9—2	0.67	13.40	50.00
3—10—4	0.41	8.20	42.00
3—12—3	0.43	8.60	45.00
4—6—10	0.56	11.20	55.20
4—8—2	0.58	11.60	55.00
4—8—4	0.50	10.00	50.80
4—8—7	0.46	9.20	50.80
4—8—10	0.38	7.60	50.00
4—10—4	0.54	10.80	54.00
5—8—7	0.39	7.80	52.20
6—6—4	0.53	10.60	67.60
6—8—5	0.55	11.00	68.00
7—5—2	0.46	9.20	63.00
7—6—5	0.65	13.00	90.00
8—6—6	0.38	7.60	61.00
10—3—8	0.39	7.80	78.00

CLASSIFICATION OF SAMPLES ANALYZED.

Table No. 2 gives the number of samples collected and analyzed in each of the respective classes.

TABLE NUMBER II.

Complete Fertliizer	91
Acid Phosphate	5
Sheep Manure	6
Poultry Manure	1
Nitrate of Soda	1
Ground Bone	5
Tankage	3
Tankage and Bone	1
Sulphate of Ammonia	1
Muriate of Potash	1
	115

COMPLETE FERTILIZERS.

Table No. 3 shows the average analysis and retail prices for the brands of complete fertilizer analyzed. There were 91 brands of complete fertilizer which represented a slightly larger proportion of the total number than in 1923.

TABLE NUMBER III.

Formula	No. of Brands	Average per cent of nitrogen	Average per cent of total phosphoric acid	Average per cent of available phosphoric acid	Average per cent of water soluble potash	Average retail price per ton
1—8—2	2	0.89	9.36	8.19	2.24	41.00
1—10—3	1	1.02	13.56	10.10	3.26	46.00
2—8—2	9	1.67	9.32	8.35	2.12	42.80
2—8—3	7	1.71	9.11	8.17	3.17	47.20
2—8—10	1	1.68	9.00	8.40	10.21	50.00
2—10—3	1	2.01	17.95	9.40	3.14	40.00
2—10—4	1	1.90	12.76	8.73	4.32	46.00
2—12—2	1	1.65	12.81	11.86	2.29	40.00
2—12—4	1	1.69	13.77	12.71	4.36	50.00
3—6—10	2	2.48	7.43	6.47	10.12	52.50
3—8—4	9	2.50	9.24	8.34	4.22	45.00
3—8—10	1	2.56	10.82	7.04	10.00	55.00
3—9—2	3	2.44	10.29	9.39	2.15	50.00
3—10—4	2	2.58	11.32	10.30	4.30	42.00
3—12—3	2	2.53	13.56	12.49	3.20	45.00
4—6—10	10	3.23	7.20	6.32	9.96	55.20
4—8—2	1	3.40	9.28	8.28	2.09	55.00
4—8—4	13	3.34	9.51	8.38	4.16	50.80
4—8—7	5	3.42	9.80	7.97	7.13	50.80
4—8—10	1	3.53	9.05	8.57	10.41	50.00
4—10—4	1	3.18	13.15	9.48	4.52	54.00
5—8—7	5	4.18	9.37	7.92	7.30	52.20
6—6—4	3	5.04	7.44	6.19	4.26	67.60
6—8—5	1	4.82	11.93	6.58	5.02	68.00
7—5—2	3	5.63	6.32	5.78	2.13	63.00
7—6—5	1	5.71	7.29	6.96	5.06	90.00
8—6—6	2	5.99	7.40	6.31	6.42	61.00
10—3—8	1	8.22	9.35	4.69	8.02	78.00

The wide range of prices again suggests the wisdom of selecting your fertilizers according to the cost per pound of plant food.

ACIDULATED PHOSPHATES.

Five brands of acid phosphates were analyzed which showed from 17.22 to 18.94 per cent available phosphoric

acid. The price ranged from $20.00 to $34.00 per ton. *This wide range of prices again emphasizes the need of buying according to the cost of the plant food.*

SHEEP MANURE TOO EXPENSIVE.

Six brands of sheep manures were analyzed which averaged 1.46 per cent of nitrogen, 1.53 per cent of total phosphoric acid and 2.38 per cent of potash. The price ranged from $45.00 to $70.00 per ton averaging $55.00. Figuring their value on the basis of the cost of phosphoric acid at $1.64 per unit, potash at $0.86 per unit and nitrogen at $5.28 per unit we find the average value of these sheep manures to be $12.27 per ton. *Their cost was more than four times their commercial value.*

DEFICIENCIES IN ANALYSIS.

Twenty-four brands out of 115 analyzed or 21.0 per cent showed a deficiency of 0.2 per cent or more in one or more of the plant foods, nitrogen, phosphoric acid and potash. In 1923, 21.0 per cent of the samples showed deficiencies.

Table No. 4 shows the number of brands analyzed from each manufacturer and the number which met and failed to meet the guarantee. *Study this table and buy from manufacturers who maintained their guarantee.*

TABLE NUMBER IV.

STANDING OF MANUFACTURERS AS DETERMINED BY INSPECTION OF 1924.

MANUFACTURER	Number of samples reported	Number equal to the guarantee in every particular	Number equal in value to the guarantee	Number not equal in value to the guarantee but within 10% of value of the guarantee	Number not within 10% of value of the guarantee
American Agricultural Chemical Co. ..	27	17	20	7	0
Armour Fertilizer Works	9	6	7	2	0
Atlantic Packing Co.	2	2	2	0	0
Bowker Fertilizer Co.	10	8	10	0	0
Joseph Breck and Sons	1	0	0	0	1
Coe-Mortimer Co.	5	4	4	1	0
Consolidated Rendering Co.	6	6	6	0	0
John C. Dow Company	1	1	1	0	0
Eastern States Farmers' Exchange	3	2	2	1	0
Essex Fertilizer Co.	8	4	6	2	0
International Agricultural Corp.	6	5	6	0	0
Lowell Fertilizer Co.	6	5	6	0	0
McQuesten and Lewis	1	1	1	0	0
Manchester Rendering Co.	5	1	2	1	2
Merrimack Farmers' Exchange	4	4	4	0	0
Natural Guano Co.	1	1	1	0	0
Nature's Plant Food Co. of Maine...	1	0	0	0	1
New England Fertilizer Co.	4	2	4	0	0
Pacific Manure and Fertilizer Co.	1	0	0	0	1
Parmenter and Polsey Fertilizer Co....	5	2	4	1	0
Premier Poultry Manure Co.	1	1	1	0	0
Pulverized Manure Co.	1	0	0	1	0
Rogers and Hubbard Co.	6	2	2	4	0
Victory Fertilizer Co.	1	1	1	0	0

ANALYSES OF BRANDS.

The following table shows the detailed results of the analyses of the different brands. In the table the names of the manufacturers are arranged alphabetically and under the name of each manufacturer the different brands are arranged alphabetically.

ACKNOWLEDGEMENT.

Acknowledgement is due to Mr. Joseph T. Sullivan, who assisted in making the phosphorus determinations.

	NITROGEN		PHOSPHORIC ACID				POTASH	
			Total		Available			
	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found
AMERICAN AGRICULTURAL CHEMICAL CO. New York City								
Bradley's Complete Manure	3.29	3.18	9.00	9.02	8.00	8.38	7.00	7.00
Bradley's Complete Manure with 10% Potash	3.29	3.30	7.00	6.72	6.00	6.00	10.00	10.10
Bradley's Corn Phosphate	1.65	1.65	9.00	9.18	8.00	8.36	2.00	2.16
Bradley's Eclipse Phosphate	0.82	0.93	9.00	9.12	8.00	8.24	2.00	2.13
Bradley's Potato Fertilizer	1.65	1.65	9.00	8.75	8.00	7.70	3.00	3.26
Bradley's Potato Manure	2.47	2.47	9.00	9.00	8.00	8.08	4.00	4.22
Bradley's XL Super-Phosphate of Lime	2.47	2.53	10.00	10.16	9.00	9.28	2.00	2.17
Lister's Corn and Potato Fertilizer	1.65	1.58	9.00	9.05	8.00	8.06	3.00	3.03
Grass and Lawn Top Dressing	4.94	5.10	7.00	7.42	6.00	6.04	4.00	4.46
6% Ground Tankage	4.94	5.19	13.73	19.11	.....	.....	.....	.....
High Grade Acid Phosphate	.....	.....	17.00	17.22	16.00	16.30	.....	.....
Lister's Success Fertilizer	1.65	1.57	9.00	9.39	8.00	8.09	2.00	2.00
Monarch Potato Manure	3.29	3.21	9.00	9.09	8.00	8.00	4.00	4.00
Patapsco 16% Acid Phosphate	.....	.....	17.00	17.81	16.00	16.93	.....	.....
Patapsco Crescent Complete Manure	1.65	1.76	9.00	9.03	8.00	8.23	3.00	3.31
Patapsco 2-12-2 Fertilizer	1.65	1.65	13.00	12.81	12.00	11.86	2.00	2.29
Patapsco 3-9-2 Fertilizer	2.47	2.31	10.00	9.87	9.00	9.00	2.00	2.09
Patapsco 3-12-3 Fertilizer	2.47	2.57	13.00	13.65	12.00	12.79	3.00	3.18
Patapsco 4-6-10 Fertilizer	3.29	3.13	7.00	7.00	6.00	6.20	10.00	9.44
Patapsco General Truck Fertilizer	2.47	2.36	9.00	9.04	8.00	8.26	4.00	4.09
Patapsco Peerless Potato Guano	3.29	3.36	9.00	9.01	8.00	8.05	4.00	4.04
Peerless Potato Manure	3.29	3.40	9.00	9.28	8.00	8.28	2.00	2.09
Prolific 10% Potash Fertilizer	1.65	1.68	9.00	9.00	8.00	8.40	10.00	10.21
Sheep Manure Pulverized	1.15	1.15	1.25	1.57	.....	1.37	2.00	2.16
Special Ground Bone	2.06	3.31	22.88	26.69	.....	.....	.....	.....
Williams and Clark Americus Corn Phosphate	1.65	1.78	9.00	9.00	8.00	8.30	2.00	2.18
Williams and Clark Americus Potato Manure	1.65	1.78	9.00	9.16	8.00	8.06	3.00	3.26

	NITROGEN		PHOSPHORIC ACID				POTASH	
			Total		Available			
	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found
ARMOUR FERTILIZER WORKS **Carteret, N. J.**								
Armour's 16% Acid Phosphate	.....	.....	16.50	18.50	16.00	17.26	.....	.....
Armour's Corn Grower Fertilizer	1.65	1.66	8.50	9.78	8.00	8.66	2.00	2.04
Armour's 3-8-4 Fertilizer	2.47	2.55	8.50	8.93	8.00	8.01	4.00	4.12
Armour's 4-6-10 Fertilizer	3.29	3.01	6.50	6.50	6.00	5.71	10.00	9.38
Armour's 4-8-4 Fertilizer	3.29	3.16	8.50	9.98	8.00	8.29	4.00	4.03
Armour's 5-8-7 Fertilizer	4.11	4.16	8.50	9.06	8.00	8.00	7.00	7.46
Armour's 8-6-6 Fertilizer	6.56	5.62	6.50	6.86	6.00	6.06	6.00	6.96
Armour's Sheep Manure	1.23	1.23	1.00	1.53	.....	1.22	2.50	2.61
Bone Meal	2.47	2.53	22.00	26.91	.....	.....	.....	.....
ATLANTIC PACKING CO. **Boston, Mass.**								
2-8-2 Fertilizer	1.64	1.64	9.00	9.28	8.00	8.00	2.00	2.17
4-8-7 Fertilizer	3.26	3.46	9.00	9.11	8.00	8.01	7.00	7.07
BOWKER FERTILIZER CO. **Boston, Mass.**								
Bowker's 16% Acid Phosphate	.....	.....	17.00	18.77	16.00	17.61	.....	.....
Bowker's All Round Fertilizer	2.47	2.47	9.00	9.10	8.00	8.40	4.00	4.30
Bowker's Corn, Grain and Grass Phosphate	1.65	1.65	9.00	8.84	8.00	8.08	2.00	2.00
Bowker's Market Garden Fertilizer	3.29	3.23	9.00	9.18	8.00	8.08	4.00	4.27
Bowker's New England Cereal Fertilizer	1.65	1.69	13.00	13.77	12.00	12.71	4.00	4.36
Bowker's Potato and Vegetable Phosphate	1.65	1.77	9.00	9.00	8.00	8.34	3.00	3.41
Bowker's Sure Crop Phosphate	0.82	0.85	9.00	9.59	8.00	8.03	2.00	2.34
Maryland 4-8-4	3.29	3.29	9.00	9.78	8.00	8.78	4.00	4.12
Stockbridge Potato and Vegetable Manure	3.29	3.30	7.00	7.56	6.00	6.78	10.00	10.32
Stockbridge Top Dressing and Forcing Manure	4.94	5.07	7.00	7.42	6.00	6.20	4.00	4.14

JOSEPH BRECK AND SONS CORP. Boston, Mass.								
Sheep Manure, Ram's Head Brand	1.46	1.21	0.75	1.06	.....	0.88	3.00	2.06
COE MORTIMER CO. New York City								
E. Frank Coe's Celebrated Special Potato Fertiilzers	3.29	3.29	9.00	9.80	8.00	8.82	4.00	4.24
E. Frank Coe's Corn King	2.47	2.48	10.00	10.85	9.00	9.89	2.00	2.20
E. Frank Coe's New England Top Dressing	6.58	6.36	7.00	7.94	6.00	6.56	6.00	5.88
E. Frank Coe's Special Grass Top Dressing	4.94	4.95	7.00	7.48	6.00	6.32	4.00	4.18
E. Frank Coe's Standard Potato Fertilizer	3.29	3.36	7.00	7.00	6.00	6.50	10.00	10.28
CONSOLIDATED RENDERING CO. Boston, Mass.								
Ground Bone	2.05	2.13	26.00	29.27	.....	8.43	.....	.....
Ground Tankage 6-30	4.92	5.53	14.00	18.11	.....	.....	.....	.....
High Grade Acid Phosphate	.....	.....	17.00	18.94	16.00	18.16	.....	.....
Muriate of Potash	.....	.....	.....	.....	.....	.....	50.00	50.35
Nitrate of Soda	15.22	15.24	.....	.....	.....	.....	.....	.....
Sulphate of Ammonia	20.50	20.98	.....	.....	.....	.....	.....	.....
JOHN C. DOW CO. Boston, Mass.								
Dow's Pure Ground Bone	2.00	3.02	24.00	24.16	.....	.....	.....	.....
EASTERN STATES FARMERS' EXCHANGE Springfield, Mass.								
Eastern States 3-12-3	2.46	2.49	13.00	13.46	12.00	12.18	3.00	3.21
Eastern States 4-8-4 Fertilizer	3.29	3.32	9.00	9.99	8.00	8.31	4.00	4.09
Eastern States 5-8-7 Fertilizer	4.11	4.23	9.00	9.70	8.00	7.50	7.00	7.00

	NITROGEN		PHOSPHORIC ACID				POTASH	
			Total		Available			
	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found
ESSEX FERTILIZER CO. **Boston, Mass.**								
Essex 2-8-2	1.64	1.71	9.00	9.60	8.00	8.32	2.00	2.13
Essex 2-8-3	1.64	1.56	9.00	9.76	8.00	8.76	3.00	2.86
Essex 3-6-10	2.46	2.46	7.00	7.16	6.00	6.28	10.00	10.18
Essex 4-6-10	3.28	3.04	7.00	7.56	6.00	6.50	10.00	9.78
Essex 4-8-4	3.28	3.15	9.00	8.33	8.00	7.53	4.00	4.36
Essex 5-8-7	4.10	4.30	9.00	9.16	8.00	7.86	7.00	7.21
Essex Fish Fertilizer 3-8-4	2.46	2.49	9.00	9.27	8.00	8.53	4.00	4.14
Essex Top Dressing 7-5-2	5.74	5.77	6.00	6.75	5.00	6.15	2.00	2.00
INTERNATIONAL AGRICULTURAL CORP. **Woburn, Mass.**								
Buffalo Economy	1.60	1.85	9.00	9.75	8.00	8.87	2.00	2.30
Buffalo General Favorite	2.50	2.63	11.00	11.20	10.00	10.28	4.00	4.29
Buffalo High Grade Manure	3.28	3.28	7.00	7.05	6.00	6.57	10.00	10.00
Buffalo Ideal	3.30	3.30	9.00	9.73	8.00	9.05	4.00	4.26
Buffalo Top Dresser and Starter	5.80	5.71	6.50	7.29	6.00	6.96	5.00	5.06
Osceola 3-10-4	2.50	2.53	11.00	11.44	10.00	10.32	4.00	4.30
LOWELL FERTILIZER CO. **Boston, Mass.**								
Lowell Animal Brand 3-8-4	2.46	2.46	9.00	9.42	8.00	8.26	4.00	4.16
Lowell 2-8-3	1.64	1.85	9.00	9.00	8.00	8.02	3.00	3.07
Lowell 3-6-10	2.46	2.49	7.00	7.70	6.00	6.66	10.00	10.06
Lowell 4-6-10	3.29	3.47	7.00	7.99	6.00	6.27	10.00	10.00
Lowell 4-8-4	3.28	3.52	9.00	9.00	8.00	8.19	4.00	4.00
Lowell 7-5-2 Top Dressing	5.74	5.55	6.00	6.40	5.00	6.18	2.00	2.38

McQUESTEN AND LEWIS **Manchester, N. H.**								
McQuesten and Lewis 4-8-10 Fertilizer	3.29	3.53	.....	9.05	8.00	8.57	10.00	10.41
MANCHESTER RENDERING CO. **Manchester, N. H.**								
Manchester Animal Brand 4-8-7 Fertilizer	3.20	3.63	14.00	14.07	8.00	8.60	7.00	7.44
Manchester Ground Bone	2.00	2.49	.....	27.28	15.00	8.81	.....	.....
Manchester Special Fertilizer 2-10-3	1.64	2.01	14.00	17.95	10.00	9.40	3.00	3.14
Tankage	5.75	5.49	.....	19.71	8.00	8.77	.....	.....
Tankage and Bone	5.00	4.08	.....	22.62	10.00	9.05	.....	.....
MERRIMACK FARMERS' EXCHANGE **Concord, N. H.**								
Merrimack 3-8-4	2.46	2.67	9.00	9.09	8.00	8.03	4.00	4.36
Merrimack 4-6-10	3.28	3.28	7.00	7.10	6.00	6.18	10.00	10.17
Merrimack 4-8-4	3.28	3.74	9.00	9.00	8.00	8.08	4.00	4.42
Merrimack 5-8-7	4.10	4.18	9.00	9.72	8.00	8.54	7.00	7.36
NATURAL GUANO CO. **Aurora, Ill.**								
Sheep Manure, Sheep Head Brand	2.25	2.39	1.25	1.79	1.00	1.57	2.00	2.29
NATURE'S PLANT FOOD CO. OF MAINE **Byron, Maine**								
Nature's Plant Food	1.00	0.87	.....	2.76	3.00	0.43	2.00	2.31
NEW ENGLAND FERTILIZER CO. **Boston, Mass.**								
New England 5-8-7	4.10	4.01	9.00	9.22	8.00	7.70	7.00	7.48
New England Potato Phosphate 4-8-7	3.28	3.34	9.00	9.45	8.00	8.71	7.00	7.00
New England Superphosphate 3-8-4	2.46	2.49	9.00	9.44	8.00	8.56	4.00	4.17
New England Top Dressing 7-5-2	5.74	5.57	6.00	5.80	5.00	5.00	2.00	2.00

	NITROGEN		PHOSPHORIC ACID				POTASH	
			Total		Available			
	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found
PACIFIC MANURE AND FERTILIZER CO. San Francisco, Cal.								
Sheep Manure, Groz-It Brand	1.50	1.06	1.25	1.19	0.75	0.99	3.00	3.13
PARMENTER AND POLSEY FERTILIZER CO. Boston, Mass.								
P. and P. 2-8-2	1.64	1.52	9.00	9.06	8.00	8.48	2.00	2.10
P. and P. 4-6-10	3.28	3.15	7.00	7.49	6.00	6.53	10.00	10.08
P. and P. 4-8-4	3.28	3.28	9.00	10.08	8.00	9.06	4.00	4.04
P. and P. Plymouth Rock Brand 3-8-4	2.46	2.55	9.00	9.82	8.00	8.98	4.00	4.46
P. and P. Potato Phosphate 4-8-7	3.28	3.49	9.00	7.36	8.00	6.15	7.00	7.15
PREMIER POULTRY MANURE CO. Chicago, Ill.								
Poultry Manure, Premier Brand	4.10	4.24	2.70	3.06	1.70	2.79	1.30	1.30
PULVERIZED MANURE CO. Chicago, Ill.								
Sheep Manure, Wizard Brand	2.00	1.74	.....	2.02	1.25	1.72	2.00	2.00

ROGERS AND HUBBARD CO. Portland, Conn.								
All Soils-All Crops Fertilizer	3.30	3.18	11.00	13.15	10.00	9.48	4.00	4.52
Corn and Grain Fertilizer	0.82	1.02	11.00	13.56	10.00	10.10	3.00	3.26
High Potash Fertilizer	2.46	2.56	9.00	10.82	8.00	7.04	10.00	10.00
Oats and Top Dressing	8.22	8.22	8.00	9.35	3.00	4.69	8.00	8.02
Potato Fertilizer	1.64	1.90	11.00	12.76	10.00	8.73	4.00	4.32
Soluble Potato Manure	5.00	4.82	10.00	11.93	8.00	6.58	5.00	5.02
VICTORY FERTILIZER CO. Norwood, Mass.								
Victory Lawn and Garden Fertilizer	3.29	3.54	10.00	10.62	8.00	8.64	4.00	4.19