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COMMERCIAL FERTILIZERS.

LEXINGTON, KENTUCKY
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KENTUCKY

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KENTUCKY AGRICULTURAL EXPERIMENT STATION,
LEXINGTON, KY.

BULLETIN NO. 51.

COMMERCIAL FERTILIZERS.

INTRODUCTION BY A. M. PETER.

The study of the chemistry of plants in comparatively recent years has established certain important facts, the knowledge of which is necessary to the intelligent use of fertilizers, and especially of that class called "Chemical," or "Commercial Fertilizers."

Plant Food Derived From Soil and Air.

A growing plant increases in size and weight by constantly adding to itself new material drawn from the soil and the air through its roots and leaves. Aside from the water which plants contain, the greater part of their substance is drawn from the air. When a plant is burned, most of the substances that come from the soil are left in the ash, except a very important one, nitrogen, which is largely derived from the soil; and the small amount of the ash, as compared with what was burned, shows roughly how much more of the substance of the plant comes from the air than from the soil.

Importance of Soil Supply.

Yet, although relatively small in amount, it is found that unless the soil is capable of furnishing certain substances in the required quantity, and in a condition to be taken up by the roots, plants will not thrive. The substances which are most important in this respect, for

the reason that they are most likely to be deficient in soils or to become so by cropping, are *potash, nitrogen* and *phosphoric acid*, and it is these that commercial fertilizers are intended to supply, and they are referred to in our bulletins and analyses as the "*essential ingredients*" of commercial fertilizers. Even if the season is favorable and the soil otherwise in good condition, plants will not reach perfection where any one of these substances is absent from the soil or deficient in quantity, or exists in such an insoluble combination as not to be taken up by the roots.

To use commercial fertilizers intelligently and economically, then, a farmer must know:

1st. Whether his soil needs potash, nitrogen or phosphoric acid for the production of the desired crop.

2d. What "essential ingredients" can be supplied by the commercial fertilizers he can obtain.

How to Determine What a Soil Needs.

The best way to determine the first point is by field experiments in which we apply fertilizers containing each one, two or all three of the "essential ingredients" to separate plots of equal size, say 1-10 or 1-20 acre, tend all alike during the growing season, and carefully harvest and weigh the crop from each plot separately. By comparing the yields of the plots we can usually determine whether the soil on which the experiment was made is very deficient in one or more of the "essential ingredients" of fertilizers. Experiments of this kind have been made at the station farm with corn, potatoes, wheat, tobacco, oats, hemp and grass, and the results in detail have been published in the Bulletins of the Station, to which we refer the reader. Copies of nearly all of these bulletins can still be furnished on application.

Good Results From Potash on the Blue Grass Soil.

For lack of space, we can only call attention here to the very remarkable agreement of these results for a series of years in showing the benefit derived from a liberal use of potash fertilizers on the soil of the Station farm. In nearly every instance, potash produced a very marked increase in the yield; and, in some cases, it was the most profitable fertilizer used. The use of potash and nitrogen, or of potash, nitrogen and phosphoric acid together, sometimes produced a still greater yield, but the profit was often taken up in the additional cost of the nitrogen, which is the most expensive constituent of fertilizers. A very conspicuous exception to the above statement was proven in the case of tobacco, where the greatest profit was obtained from the use of potash and nitrogen together. The tobacco crop requires a great deal of both of these, but a comparatively small amount of phosphoric acid.

It must not be supposed that the results obtained upon the blue grass (limestone) soil of the Station farm will hold good all over the State. There is a great variety of soils in our State, and upon a large part of them, especially for grain crops, the use of phosphatic manures is found to be profitable. They serve to show, however, the need of determining by experiment the requirements of each kind of soil to guard against unnecessary expenditure for fertilizers which supply ingredients that the soil is already capable of supplying in abundance. It must be borne in mind also that every crop taken off the land removes a certain amount of all the "essential ingredients," so that, under continuous cropping, it is necessary to return what has been carried away, and probably the heaviest drain from this source falls upon the potash and nitrogen. These results should also serve as

an indication to the manufacturers of commercial fertilizers that a greater variety is needed in the composition of their goods than now exists, to correspond with the requirements of different localities. The great majority of fertilizers offered for sale in this State at present are highly phosphatic and contain comparatively small proportions of potash and nitrogen; whereas it is clearly shown that the soil of our blue grass region is already well supplied with phosphates.

Nitrogen and Nitrogen-Gatherers.

While on this subject, a few words in regard to nitrogen in fertilizers will not be out of place. As remarked above, this is the most costly constituent of commercial fertilizers; and, in many instances, the increased cost of the fertilizer due to the nitrogen it contains will balance or even exceed the increase in the proceeds from the crop, due to the nitrogen. Fortunately, we are not obliged to rely entirely upon commercial fertilizers for our supply of nitrogen to enrich our soils. Recent investigations have proved that the class of plants called "leguminous plants," to which the clovers, peas, beans, &c., belong, have the power of deriving from the air a part of the nitrogen required in their growth. For this reason they are sometimes called "*nitrogen-gatherers.*" This fact helps to explain why clover is so valuable in restoring and enriching poor soils. The clover plant is rich in nitrogenous matters and, when the crop is plowed under, they decay in the soil and add to its supply of nitrogen for the next crop. If we fertilize our crop of clover liberally with potash and moderately with phosphates we cause it to grow more luxuriantly and to draw a larger amount of nitrogen from the air, thus enriching our soil in all three "essential ingredients" of fertilizers for the next crop, when the clover is plowed under, be-

cause the potash and phosphates applied are returned again to the soil, and as much of the nitrogen as has been derived from the air is clear gain. This is a very important principle in the economical use of commercial fertilizers, and is in accordance with long established practice.

Analyses of Fertilizers.

The best way of determining the second point above is by chemical analysis of all the fertilizers that are offered for sale in the state. By chemical analysis we determine how much phosphoric acid, nitrogen, and potash a fertilizer contains. The results of the analysis are stated as *per cent.* which means *in the hundred.* Thus when we say a fertilizer contains 3.25 per cent. of potash we mean that in every hundred parts by weight of the fertilizer there are three and twenty-five hundredths parts by weight of potash; or, what would be the same thing, in every 100 lbs. of the fertilizer there are 3¼ lbs. of potash.

The Fertilizer Law.

Our State law requires that every commercial fertilizer sold in the state, the price of which is more than $10 per ton, shall be analyzed at the Experiment Station, and that each sack or other package offered for sale shall bear a label on which the result of such analysis is printed over the Director's signature. This analysis, then, becomes the standard of quality and the guide by which the purchaser is to judge what he is getting. The analyses made this year, up to the present date are printed in the tables, at the end of this bulletin.

As an additional means of keeping the quality of the fertilizers sold in the state up to the standard, the law

also provides that any farmer purchasing a fertilizer may take a sample for analysis, according to the rules and regulations prescribed by the Director, and may have the analysis made at the Station free of cost. Farmers who desire to take advantage of this provision should always apply to the Director for instructions before taking samples for analysis, because it is very important that such samples be so taken as to fairly represent the fertilizer; otherwise the results would be useless. Commercial fertilizers are usually mixtures of several different materials and it is, at best, a difficult matter to get representative samples.

The rules also require that a tag from one of the sacks sampled be sent along with the sample.

As these analyses are for the benefit of the public, as well as of the person taking the sample for analysis, it is necessary for the Director to know the brand of the fertilizer and its manufacturer and the date of issue of the tags in order that the results may be published and compared with other analyses of the same brand. The tag gives this information.

It has sometimes happened, when a farmer has sent in a sample of fertilizer for free analysis, without the tags, that, after the analysis has been made and the results reported to the sender of the sample with the request that information be given of the name of the fertilizer, such information has been refused or, at least, has not been furnished. This leaves the Director powerless to make the results of benefit to the public, and the only sure remedy seems to be to require that a tag be sent with the sample.

It is also necessary, under the law, that the Director be assured that the person sending the sample is an agriculturist and a purchaser and, as such, is entitled to have the analysis made free of cost.

To Purchasers of Fertilizers.

The Director makes the following suggestions to farmers purchasing fertilizers:

1. To purchase with a guarantee that the fertilizer is as represented by the official tag attached.

2. Take a sample immediately, especially if purchasing in large quantities, and send it to the Director for analysis, to see whether the fertilizer is as represented by the seller.

3. To have nothing to do with fertilizers which are not labeled with a tag bearing an analysis, and certified to and signed by the Director. Manufacturers of genuine goods are always willing to comply with a law which protects them as well as the purchaser, and their goods will be found labeled as required by law. It is generally those who offer adulterated or inferior goods that do not desire the quality of their goods to be known.

In order to obtain a fair sample for analysis the following directions should be followed.

HOW TO TAKE SAMPLES.

a. If possible, let the agent or dealer from whom the fertilizer is purchased, or his representative, be present when the sample is taken, so that the claim of unfairness may not afterwards be raised.

b. Select at least two average sacks of the fertilizer, preserving the lables to send with the sample. Open these sacks and mix well together the contents of each, down to one-half its depth, emptying out upon a clean floor, if necessary, and crushing any soft, moist lumps, in order to facilitate mixture, but leaving hard, dry lumps unbroken, so that the sample shall exhibit the texture and mechanical condition of the fertilizer. In a large lot at least one sack in every twenty should be taken.

c. Take out five equal cupsful from different parts of the mixed portions of each package. Pour them all one over another, upon a paper or clean floor; intermix again thoroughly, but quickly, to avoid loss or gain of moisture; fill a can or jar from this mixture; enclose a tag taken from one of the sacks; seal; label plainly, giving also name of sender.

d. Prepare and send with the sample a certificate signed by the purchaser and attested by at least one witness, stating that the affiant is an agriculturist and purchaser of the fertilizer and that the sample has been taken in the manner prescribed, for the purpose of free analysis under the law.

Send the sample by express, *charges prepaid*, to

M. A. SCOVELL, Director, Lexington, Ky.

These directions must be strictly complied with in sending samples for free analysis.

Blank forms for the certificate and copies of the fertilizer law will be furnished on application to the Director.

Explanations in Regard to the Analyses.

The analyses in this Bulletin have been arranged in two tables; Table I contains the ground bones, while Table II contains all those fertilizers in which the phosphatic material has undergone treatment with sulphuric acid to render its phosphoric acid more soluble.

Bones contain both nitrogen and phosphoric acid and the finer a bone is ground, the more quickly can plants use these materials when the bone is applied to the soil. For this reason, in making the analysis, we sift the bone into two grades of fineness, "medium bone" and "fine bone," and give the amount of phosphoric acid contained in each.

"Medium bone" is that part which is fine enough to pass through a sieve with meshes 1-6 inch square but will not pass through a 1-25 inch mesh; "fine bone" is all that passes through the sieve with meshes 1-25 inch square. There is no ground bone on our market too coarse to go through a 1-6 inch mesh. The total amount of phosphoric acid is stated, with its "equivalent" of bone phosphate, that is, the amount of phosphate of lime that would contain this much phosphoric acid. The total amount of nitrogen is also given, with its "equivalent" in ammonia, or the amount of ammonia that would contain the stated quantity of nitrogen.

In Table II it will be noticed that the phosphoric acid is given under three heads: "*soluble*," "*reverted*," and "*insoluble*" phosphoric acid. If these three be added together the sum will be the total amount of phosphoric acid present in the fertilizer. If the "soluble" and "re-

verted" be added together the sum will be the amount of phosphoric acid present that can be of immediate use to plants, or, as is commonly said, the "available" phosphoric acid. In judging a fertilizer by its analysis the amount of available phosphoric acid is important, for this is much more valuable than the "insoluble" which is in such a state of combination that it cannot readily be used by plants.

Besides the nitrogen and its equivalent in ammonia we have also given in this table the amount of potash and have indicated whether it comes from sulphate or muriate. The sulphate of potash is somewhat more costly than the muriate and is also thought to be better for tobacco.

The "Estimated Value per Ton."

The fertilizer law also requires that the Director shall give, along with the analysis of each fertilizer, "the money value of such fertilizer computed from its composition, as he may determine." This is the "estimated value per ton" given in the last column of the tables. The words of the law, "the money value of such fertilizer, computed from its composition" define as nearly as possible what these "estimated values" are intended to represent; that is, they are intended to show what the phosphoric acid, potash and nitrogen in a ton of each fertilizer is actually worth in dollars and cents. In other words, they are intended to show about how much the raw materials necessary to furnish the same quantity of "essential ingredients" as is found by the analysis would cost if purchased separately and then combined. It is important to note, however, that on account of the differences in the prices of different materials which may be used to furnish phosphoric acid, ni-

trogen and potash, and differences in the price of the same material at different times, as well as differences in rates of freight to different points in the state, it is practically impossible to make these "estimated values" represent exactly the money value of the fertilizers. At best they are only relatively correct.

In order to calculate these values from the analysis, the Director assigns each year a certain price per pound for each of the "essential ingredients" of fertilizers. These prices are based upon the New York prices of the principal materials of which fertilizers are made, and include an allowance for freight from New York and for cost of mixing and loss in handling.

The framers of the fertilizer law evidently intended these estimated values to be an index that would show at a glance whether the purchaser was getting the worth of his money, and in a general way they do serve this purpose. Thus, when the "estimated value per ton" is very much below the price at which a ton of the fertilizer is sold, it shows that the purchaser at this price is paying high for the plant food it contains. But the estimated value alone is not a sufficient guide in purchasing fertilizers; it is necessary to consider the analysis also.

Importance of the Analyses.

In purchasing fertilizers it is of the first importance to consider the analyses, either in the tables of this bulletin or on the tags which should always be found attached to each sack; for by the analysis only can we tell whether we are getting, in the fertilizer, the plant food that we want to supply to our crop. If we were selecting a fertilizer for corn, for instance, to be used in a soil that was rich in phosphates but deficient in potash, we certainly would not buy a so called "Corn Grower"

that contained no potash, even if it was offered at a price much lower than the "estimated value." Let us illustrate this farther by example. Suppose that a farmer, desiring to purchase a fertilizer for his corn crop, is offered by his merchant either of two "corn growers" at $28.00 per ton. The price, fortunately, does not help him to decide in this case. He next looks at the tags attached to the sacks, and finds that the Director has estimated the value of each fertilizer at $28.80 per ton. He next looks at the analyses and finds fertilizer No. 1 to contain:

Soluble Phosphoric Acid	11 per cent.
Reverted " "	7 per cent.
Potash	None.
Nitrogen	None.

And fertilizer No. 2 to contain:

Soluble Phosphoric Acid Reverted " "	9.0 per cent.
Nitrogen	2.2 per cent.
Potash	4.0 per cent.

He is now able to judge quickly which of the two fertilizers to purchase. If his soil needs phosphoric acid, he will quickly decide on No. 1, for he will get twice as much for the same money, while did he purchase No. 2 he would have paid $14.00 for the phosphoric acid which he needed and $14.00 for the nitrogen and potash which he did not need. But should he be in doubt whether his land needed one or all the elements of a fertilizer, he would be wise in purchasing No. 2. For should his soil need potash and nitrogen, or all three of the essential elements, to produce a large corn crop, and should he have purchased No. 1 it is doubtful whether he would have received any benefit from it.

Concentrated Fertilizers More Economical.

Another matter of relative cost may properly be considered here. Other things being equal, the cost per pound of the essential ingredients in a concentrated fertilizer is usually less than in one where the percentages are lower, on account of the increased cost for freight and handling in the latter case. Suppose, for example, our farmer is offered fertilizer No. 1 at $25.00 per ton at the factory, and another containing just twice the percentage of phosphoric acid, in equally available form, at $50.00. It is evident that the second would be really cheaper, because in one ton he would get as much available phosphoric acid as in two tons of No. 1, and would save freight, cost of sacks, and handling on one ton of fertilizer. This is an extreme case, but the principle holds good where the difference is not so great.

How to Apply Fertilizers.

In applying fertilizers it is important that they be so scattered and mixed with the soil as to encourage the spreading of the roots of plants, and also to place the necessary amount of plant food within the reach of the roots from the very first.

It is generally best to sow them broadcast or drill and work well into the soil before planting. When a small quantity of fertilizer is applied to each hill or row at planting time, it acts mainly as a stimulant to produce an early and vigorous start, which is considered necessary for the tobacco crop, but often renders the crop more sensitive to drouth. *In any case care should be taken to mix the fertilizer with the soil, so that it will not come in contact with the seeds or plants. Most fertilizers, and especially those containing much nitrogen, soluble phosphoric acid, or potash, will injure or destroy young plants if brought directly in contact with them.*

In applying a very concentrated fertilizer it is usually best to mix it with dry earth, road dust, etc., for convenience in sowing.

Materials of Which Commercial Fertilizers are Made.

For further explanation relative to the materials of which commercial fertilizers are made, and the chemical terms used in speaking of them, we refer to Bulletin 41 and other issues on commercial fertilizers, copies of which will be furnished on application.

As we receive many inquiries about the prices of fertilizer chemicals, it may not be out of place to give here roughly the cost of some of the more important ones. The prices given are about what the materials would cost in New York in ton lots or less, and freight from New York is to be added. Of course prices are subject to change and also governed in a measure by the amount of the purchase, so that the only way to obtain perfectly correct information is by correspondence with the dealers. The following prices are for one ton:

Acid Phosphate, containing 13 to 15 per cent. available phosphoric acid	$14 00
Acidulated Black, containing 16 to 19 per cent. available phosphoric acid	23 00
Double Superphosphate, containing 45 per cent. available phosphoric acid	56 00
Sulphate of Potash, containing 48½ to 51½ per cent. actual potash	50 00
Muriate of Potash, containing 50½ to 53½ per cent. actual potash	41 00
Kainit, containing 12 to 13 per cent, potash	12 00
Nitrate of Soda, containing 15¾ to 16 per cent. of nitrogen	52_50
Sulphate of Ammonia, containing 20½ per cent. of nitrogen	75 00

Values Used.

The following are the values used for the essential ingredients in calculating the estimated value per ton: Phosphoric acid soluble in water, 8 cents; "reverted" phosphoric acid, 8 cents; insoluble phosphoric acid, 2½ cents; phosphoric acid in fine bone, 4½ cents, in medium bone, 4 cents per lb.; potash from muriate 6 cents; from sulphate 7½ cents, and nitrogen, 20 cents per lb.

Fine bone is all that passes through a sieve with meshes 1-25 inch square. Medium bone passes through a seive with meshes 1-6 inch square, but does not include fine bone.

Fertilizers Analyzed.

For the year 1894, up to August 1st, 28 manufacturers have had 109 different fertilizers analyzed in compliance with the law, and 116,500 tags have been issued. These analyses are printed in the following tables:

TABLE I.—Raw Bone Manures.

Station Number.	Name and Address of Manufacturer.	Name of Brand.	Pounds in the Hundred.						
			Phosphoric Acid.			Equivalent to Bone Phosphate.	Nitrogen.	Equivalent to Ammonia.	Estimated Value per Ton.
			In Fine Bone.	In Medium Bone.	Total.				
2477	Armour & Co., Chicago, Ill	Bone Meal	22.43	4.05	26.48	57.84	2.46	2.99	$33 27
2394	Armour Packing Co., Kansas City, Mo.	Fine Ground Beef Bone	21.53	4.26	25.79	56.33	3.29	3.99	35 95
2395	Cincinnati Desiccating Co., Cincinnati, O.	Pure Raw Bone Meal	13.33	11.13	24.46	53.42	3.53	4.29	35 02
2396	Same	Fine Ground Bone	12.90	8.67	21.57	47.11	3.40	4.13	32 15
2383	The Currie Fertilizer Co., Louisville, Ky.	Currie's Raw Bone Meal	11.72	11.54	23.26	50.79	4.12	5.00	36 26
2581	Globe Fertilizer Co., Louisville, Ky.	Globe Bone Meal	16.83	6.20	23 03	50.29	3.91	4.75	35 75
2583	J. B. Jones, Louisville, Ky.	Pure Raw Bone Meal	14.46	9.72	24.18	52.81	4.14	5.03	37 35
2584	Same	Pure Ammoniated Bone Meal	10 92	3.74	14.66	32.02	3.10	3.76	25 22
2315	Jones Fertilizing Co., Cincinnati, O.	Pure Raw Bone Meal	19.20	3.57	22.77	49.73	3.49	4.24	34 10
2317	Same	Ammoniated Bone Meal	17.15	1.25	18.40	40.18	4.14	5.03	33 00

TABLE I.—Raw Bone Manures—Continued.

Station Number.	Name and Address of Manufacturer.	Name of Brand.	Pounds in the Hundred.						
			Phosphoric Acid.			Equivalent to Bone Phosphate.	Nitrogen.	Equivalent to Ammonia.	Estimated Value per Ton.
			In Fine Bone.	In Medium Bone.	Total.				
2454	A. B. Mayer Manufacturing Co. St. Louis, Mo.	Anchor Brand Pure Raw Bone Meal	16 65	5.79	22.44	49.01	4.05	4.92	$35 82
2475	Nolte & Dolch Fertilizer Co., St. Louis, Mo.	Pure Raw Bone Meal	21.22	1.19	22.41	48.95	3.82	4.64	35 33
2355	North-Western Fertilizing Co., Chicago, Ill.	Horse Shoe Brand Fine Raw Bone	12.43	11.95	24.38	53.25	4.10	4.98	37 15
2356	Same	H. S. B. Ralston's Bone Meal	11.98	6.98	18.96	41.41	3.40	4.13	29 96
2365	Same	H S. B. Pure Ground Bone	17.41	5.39	22.80	49.79	2.63	3.19	30 50
2367	Same	H.S.B. Chicago Raw Bone Meal	13.47	5.16	18.63	40.68	3.21	3.90	29 09
2444	Ohio Valley Fertilizing Co., Owensboro, Ky.	Bone Meal	6.34	12.24	18.58	40.57	3.94	4.78	31 26
2413	E. Rauh & Sons, Indianapolis, Ind	Pure Raw Bone Meal	12.06	14.91	26.97	58.90	3.78	4.59	37 90
2458	Wm. Skene & Co., Louisville, Ky.	Skene's Pure Raw Bone Dust or Meal	11.50	11.37	22.87	49.96	3.96	4.81	35 29
2472	Standard Guano & Chemical Mfg. Co., New Orleans, La.	Pure Ground Bone	12 78	7.10	19.88	43.42	3.69	4.48	31 94

TABLE II—Complete Fertilizers, Superphosphates, Etc.

Station Number.	Name and Address of Manufacturer.	Name of Brand.	Pounds in the Hundred.							Estimated Value Per Ton.
			Phosphoric Acid.			Nitrogen.	Equivalent to Ammonia.	Potash.		
			Soluble.	Reverted.	Insoluble.			From Sulphate.	From Muriate.	
	A. D. Adair & McCarty Bros., see Furman Farm Impvt. Co.									
2449	Armour & Co., Chicago, Ills.	Bone and Blood	.....	5.03	3.03	7.09	8.61	.....	.....	$37 93
2451	Same	Dissolved Bone	0.79	8.90	5.44	2.21	2.68	..	.....	27 06
2478	Same	Quick Acting Bone	0.51	10 26	10.31	2.42	2.94	.....		32 07
2437	Baugh & Sons Co., Norfolk, Va	Baugh's Animal Bone and Potash Compound	7.16	1 85	2.98	1.77	2.15	....	2.27	25 71
2464	Chesapeake Guano Co., Baltimore, Md	Dissolved Bone Phosphate	13.79	1.73	0.93	....	.....	.....	.....	25 30
2397	Cincinnati Desiccating Co., Cincinnati, O	Pure Acidulated Bone	2.89	10.86	5.77	3.53	4.29	....	.....	39 01
2398	Same	Gilead Phosphate	3.07	7.24	3 75	2.23	2.71	.....	2.37	30 14
2399	Same	Ohio Valley Phosphate	1.19	7.99	5.67	1.42	1.72	.....	1.89	25 48
2400	Same	Phoenix Phosphate	1.94	6.58	3.93	1.53	1.86	.....	1.02	22 94
2401	Same	Tobacco and Potato Fert	3.17	6.99	3.72	3 61	4.38	5 31	.....	40 53

TABLE II.—Complete Fertilizers, Superphosphates, Etc.—Continued.

Station Number.	Name and Address of Manufacturer.	Name of Brand.	Pounds in the Hundred.							Estimated Value per Ton.
			Phosphoric Acid.			Nitrogen.	Equivalent to Ammonia.	Potash.		
			Soluble.	Reverted.	Insoluble.			From Sulphate.	From Muriate.	
2402	Cincinnati Desiccating Co., Cincinnati, O.	Kentucky and Tennessee Tobacco Grower	1.29	8.06	2.98	1.93	2.34	....	3 23	$28 05
2438	Cleveland Dryer Co., Cleveland, O.	XXX Phosphate	7.50	3.45	4.71	.....	..	.....	.....	19 88
2494	Same	Square Bone	4.44	11.27	7.01	2.99	3.63	.....	.....	40 61
2495	Same	Ammon. Dissolved Bone	7.33	3.92	1.97	1.69	2.05	.....	.....	25 75
2496	Same	Buckeye Ammon. Bone Superphosphate	7.10	4.52	2.03	3.44	4.18	0.21	.....	33 66
2497	Same	Ohio Seed Maker	5.46	5.70	2.78	1.81	2.20	.....	.....	26 49
2340	Crocker Fertilizer & Chemical Co., Buffalo, N. Y.	Crocker's New Rival Ammoniated Superphosphate	7.82	2.42	1.75	1.26	1.53	.....	1.84	24 51
2341	Same	Crocker's Ammon. Practical Superphosphate	6.04	2.33	1.14	0.82	1.00	.....	1.19	18 67
2354	Same	Crocker's Kentucky Tobacco Fertilizer	7.25	2.06	1.38	2.13	2 59	....	3 34	28 12
2412	Same	Same	10.02	2.00	1.07	2.47	3.00	.....	4.56	35 12

2333	The Currie Fertilizer Co., Louisville, Ky.	Currie's Tobacco Grower	6.29	1.77	3.67	1.55	1.88	9.59	..	$35 33
2384	Same	Currie's Dissolved Bone	7.51	1.80	1.24	1.15	1.40	3 15	.....	24 85
2385	Same	Currie's Corn Grower	6.72	3.13	4.55	1.52	1.85	1.19	.....	25 91
2386	Same	Currie's Falls City Bone Meal	6.60	4.05	4.86	1.01	1.23	.....	1.50	25 31
2387	Same	Currie's Falls City Phosphate	6.82	3.22	4.44	1.45	1.76	1.11	.....	25 75
2388	Same	Currie's Wheat Grower	6.92	3.20	4.43	1.49	1.81	1.14	....	26 08
2389	Same	Currie's Guano	7.88	1.86	1.30	1.05	1.27	2.93	....	24 83
2390	Same	Currie's Black Diamond Phosphate	8.10	1.74	1.15	0.36	0.44	0.76	.....	18 90
2447	Same	Currie's Golden Leaf Tobacco Grower	5.58	2.28	3.03	1.52	1.85	1.28	4.68	27 71
2461	Detrick Fertilizer & Chemical Co., Baltimore, Md	Detrick's Soluble Bone Phosphate and Potash	8.53	2 42	1.36	.....	.....	.....	2.07	20 68
2462	Same	Detrick's N. & R. Wheat Fertilizer	8 69	2.41	2.26	1.28	1.55	....	.....	24 01
2479	Same	Detrick's Dissolved Bone Phosphate	14.01	2.01	0.59	.. ..	.....	.....	.....	25 93
2480	Same	Detrick's Ammonia'd Bone	8.70	1.75	1.36	1.83	2.22	.....	2.71	27 97
2309	Dunn & Backer, Troy, Ind.	C. L. Brand Fine Ground Fla. Soft Bone Phos	.....	0.84	18.78	.....	.....	.....	.....	10 73
2311	Same	C. L. Brand Tobacco and Potato Grower	.....	7.40	13.43	2.51	3.05	.....	.....	28 60
2467	Furman Farm Improvement Co., Atlanta, Ga.	Furman High Grade Fertilizer	7.29	2.05	2.88	2.29	2.78	.....	1.81	27 71
2468	Same	Buffalo Bone Fertilizer	6.68	1.90	3.01	2.01	2.44	.....	1.70	25 32

TABLE II.—Complete Fertilizers, Superphosphates, Etc.—Continued.

Station Number.	Name and Address of Manufacturer.	Name of Brand.	Pounds in the Hundred.							Estimated Value per ton.
			Phosphoric Acid.			Nitrogen.	Equivalent to Ammonia.	Potash.		
			Soluble.	Reverted.	Insoluble.			From Sulphate.	From Muriate.	
2469	Furman Farm Improvement Co., Atlanta, Ga.	Furman Soluble Bone with Ammonia and Potash	7.91	2.24	2.58	1.24	1.51	.....	1.82	$24 67
2482	Same	Farish Furman Formula	8.94	2.33	2.19	.....	.....	.....	2.94	22 66
2376	Globe Fertilizer Co, Louisville, Ky	Big Four Tobacco Grower	7 36	0.86	2.72	2.47	3.00	2.93	...	28 79
2377	Same	Eagle Fertilizer	7.15	1.80	3.08	2.12	2.57	2.16	....	27 58
2378	Same	Progress Phosphate	7.77	1.90	3.31	1.66	2 02	1.17	.....	25 53
2379	Same	Ky. Stand. Tobacco Grower	7.00	1.15	2.53	2.76	3.35	4.00	.....	31 35
2380	Same	Globe Wheat Grower	7.24	1 35	3.06	2.33	2.83	2.52	.....	28 37
2393	Jarecki Chemical Co., Sandusky, O	Lake Erie Fish Guano	9.61	1.58	1.69	2.25	2.73	2.57	.....	31 61
2585	J. B. Jones, Louisville, Ky	Bromophyte	0.29	2.36	0.60	1.07	1.30	0 21	....	9 13
2373	Jones Fertilizing Co, Cincinnati, O	Acidulated Bone	3.17	8.13	5.64	3.84	4.66	.. ..	.....	36 26
2374	Same	Tobacco and Potato Grower	2.14	6.33	3.24	4.38	5 32	5.29	.....	40 63

2375	Jones Fertilizing Co., Cincinnati, O.	Miami Valley Phosphate.	2.44	6.52	2.49	3.26	3.96	.....	2.44	$31 56
2422	Same	Jones Reliable.	1.36	4.61	2.79	2.52	3 06	0.96	0.77	23 39
2313	The Loudenback Fertilizer Co., Urbana, O.	Urbana Prize Tobacco Grower	9.39	1.92	0.84	2.63	3.19	.....	6.95	37 38
2350	Same	Urbana Bone Meal.	5.94	4.42	2.70	3.28	3.98	.....	4.20	36 09
2351	Same	Urbana Ammoniated Bone.	7.62	4.25	1.55	2.44	2 96	....	4 42	34 83
2352	Same	Urbana Sweepstakes Bone Phosphate	5.09	5.45	1.24	2.29	2.78	.....	4.48	32 02
2353	Same	Urbana Superphosphate & Potash	2.80	7.26	1.42	2.47	3.00	.....	3 51	30 90
2455	A. B. Mayer Manufacturing Co., St. Louis, Mo	Anchor Brand Complete Fertilizer	.....	5.40	5.68	3.21	3.90	2.44	....	27 98
2456	Same	A. B. Wheat Grower	.....	8.20	7.54	4 92	5.97	.....	.....	36 57
2471	Meridian Fertilizer Factory, Meridian, Miss	Standard Home Mixture Guano	7.29	2.22	1.27	2.13	2.59	.....	1 71	26 43
2432	Michigan Carbon Works, Detroit, Mich	Homestead Corn & Wheat Grower.	8 42	0.91	1.42	2.34	2.84	1.91	.....	27 87
2433	Same	Homest'd Tobacco Grower.	8.78	0.64	1.56	3.72	4.52	4.48	...	37 45
2434	Same	Homestead Potato Grower.	8.15	1.05	1.56	2.63	3.19	3.87	.....	31 83
2435	Same	Jarves Tobacco Fertilizer.	5.59	0.60	1.20	2.05	2.49	.....	2.14	21 27
2436	Same	Jarves Drill Phosphate.	7.62	0.97	2.17	1.41	1.71	.....	.....	20 47
2417	National Fertilizer Co., Nashville, Tenn	Tennessee Guano	7.39	2.59	0.96	1.67	2.03	.....	0.77	24 05
2418	Same	Nat'l Tobacco Fertilizer.	7.70	2.40	1.07	1.82	2.21	.....	2.19	26 61

TABLE II.—Complete Fertilizers, Superphosphates, Etc.—Continued.

Station Number.	Name and Address of Manufacturer.	Name of Brand.	Pounds in the Hundred.							Estimated Value per ton.
			Phosphoric Acid.			Nitrogen.	Equivalent to Ammonia.	Potash.		
			Soluble.	Reverted.	Insoluble.			From Sulphate.	From Muriate.	
2419	National Fertilizer Co., Nashville, Tenn.	Tobacco Grower.	7.57	2.74	0.92	1.58	1.92	.....	0.85	$24 30
2420	Same	Corn Grower.	8.74	2.69	1.15	0.82	1.00	.....	0.91	23 24
2421	Same	National Dissolved Bone.	8.51	2.73	1.13	0.77	0.93	.....	0 95	22 77
2330	Nolte & Dolch Fertilizer Co., St. Louis, Mo.	Pure Animal Bone Phos'te.	6.63	2.48	1.87	2.48	3.01	.	1.44	27 17
2445	Same	Tobacco & Potato Fertilizer	2.79	3.66	1 70	2.97	3.61	.....	6.54	30 90
2476	Same	No. 27 Bone Blk. Fertilizer.	1.15	6.10	2.09	1.76	2.14	.....	.....	19 69
2582	Same	Acidulated Slaughter House Bone.	5.10	5.02	1.74	3 27	3 97	....	.....	30 14
2357	North-Western Fertilizing Co., Chicago, Ills.	H. S. B. Tobacco Grower.	4.45	3.43	4.03	2.74	3.33	2.42	.....	29 22
2358	Same	H. S. B. Challenge Corn Grower.	5.78	3.43	3 80	2.23	2.71	1.11	...	27 23
2359	Same	H. S. B. $26 Phosphate.	3.74	2.81	4.06	1.93	2.34	.....	.....	20 23
2360	Same	H. S. B. Prairie Phosphate.	3.72	2.88	4.45	1.79	2.17	.....	....	19 95

2361	North-Western Fertilizing Co., Chicago, Ill.	Horse Shoe Brand Ky. Corn and Tobacco Grower	3.80	2.92	4.17	1.92	2.23	0.35	.....	$21 05
2362	Same	H. S. B. Potato Grower	4 53	3.38	4.04	2.74	3.33	2.37	.....	29 20
2363	Same	H. S. B. Ky.-Ana. Phos.	4.08	2.55	2.72	1.26	1.53	.....	.....	17 01
2364	Same	H. S. B. Nat'l Bone Dust	5 83	3.27	3.85	2.27	2.76	1.08	.....	27 19
2366	Same	H. S. B. Raw Bone and Superphosphate Mixture	4.71	4.60	7.77	2.86	3.47	0.23	.....	30 58
2368	Same	H. S B High Grade Truck Manure	5.27	3.15	2.33	3.40	4.13	2.47	.....	31 95
2426	Same	H. S. B. Tobacco Grower	5 87	2.45	3.40	3.03	3.68	2.98	.....	31 60
2427	Same	H. S. B. Ky. Corn and Tobacco Grower	7.38	2.04	2.67	1.67	2.03	1.60	.....	25 49
2428	Same	H. S. B. Challenge Corn Grower	5.90	2.36	3.66	2.48	3.01	1.75	.....	27 60
2429	Same	H S. B. $26 Phosphate	7.36	2.14	2.58	1.66	2.02	1.65	...	25 61
2430	Same	H. S. B. Prairie Phosphate	7.32	1.90	2.65	1.74	2.11	1.52	.....	25 32
2431	Same	H. S. B Potato Grower	5.87	2.11	3.57	3 00	3.64	2.91	....	30 93
2414	E. Rauh & Sons, Indianapolis, Ind.	Half Pure Bone and Half Pure Bone Phosphate	13.51	3.66	3.53	1.81	2.20	.....	.....	36 48
2415	Same	Special Corn, Potato, and Tobacco Fertilizer	8.02	1.75	1.24	3.88	4.71	7.00	.....	42 27
2473	John S. Reese & Co., Baltimore, Md.	Reese's Pacific Guano	5.41	5.28	2.51	1.83	2.22	.....	1.35	27 30
2474	Same	Crown Bone Phosphate & Potash	13.18	3.38	0.68		.....	....	3.67	31 24
2424	Wm. Skene & Co., Louisville, Ky.	Skene's Louisville Superphosphate	2.05	2.84	4.14	1 94	2.36	.....	7.66	26 84

TABLE II.—Complete Fertilizers, Superphosphates, Etc.—Continued.

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			Phosphoric Acid.			Nitrogen.	Equivalent to Ammonia.	Potash.		
			Soluble.	Reverted.	Insoluble.			From Sulphate.	From Muriate	
2425	Wm. Skene & Co., Louisville, Ky	Skene's Ky. Bone Meal & Potash	2.76	3.40	4.09	2 40	2.91	.....	4.66	$27 10
2457	Same	Skene's Com. P't F'd & Per Tob. and Potato Grower.	4.76	3 48	1.02	3.25	3.95	13.30	.....	46 64
2382	Thompson & Edwards Fertilizer Co., Chicago, Ill	World-of-Good R. B. Pot., Tob., and Veg. Grower	.....	7.74	11.10	3.16	3 84	7.92	.....	42 45

Analyses by H. E. Curtis.

August 1, 1894.

M. A. SCOVELL, Director.