

No. 19
Connecticut Agricultural Experiment Station.

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THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION is established in accordance with an Act of the General Assembly, approved March 21, 1877, "for the purpose of promoting Agriculture by scientific investigation and experiment."

The Station is prepared to analyze and test fertilizers, cattle-food, seeds, soils, waters, and other agricultural materials and products, to identify grasses, weeds, and useful or injurious insects, and to give information on the various subjects of Agricultural Science, for the use and advantage of the citizens of Connecticut.

All chemical analyses, seed examinations, etc., proper to an Experiment Station, that can be used for the public benefit, will be made without charge. Work done for the use of individuals will be charged for at moderate rates. The Station will undertake no work, the results of which are not at its disposal to use or publish, if deemed advisable for the public good.

Samples of Commercial Fertilizers, Seeds, etc., will be examined in the order of their coming; but when many samples of one brand or kind are sent in, the Station will make a selection for analysis. In taking samples of Commercial Fertilizers and Seeds for examination, the Station's "Instructions for Sampling" must be strictly followed, and its blank "Forms for Description of Samples" must be filled out and sent with the samples.

The results of each analysis or examination will be promptly communicated to the party sending the sample. **Results that are of general interest will be sent simultaneously to all the newspapers of the State for publication.**

The officers of the Station will take pains to obtain for analysis, samples of all the commercial fertilizers sold in Connecticut; but the organized cooperation of the farmers is essential for the full and timely protection of their interests. Farmers' Clubs and like Associations can efficiently work with the Station for this purpose, by sending in samples early during each season of trade.

It is the wish of the Board of Control to make the Station as widely useful as its resources will admit. Every Connecticut citizen who is concerned in agriculture, whether farmer, manufacturer, or dealer, has the right to apply to the Station for any assistance that comes within its province to render, and the Station will respond to all applications as far as lies in its power.

☞ Instructions and Forms for taking samples, and Terms for testing Fertilizers, Seeds, etc., for private parties, sent on application.

☞ Parcels by Express, to receive attention, should be prepaid, and all communications should be directed to

AGRICULTURAL EXPERIMENT STATION,

NEW HAVEN, CONN.

Laboratory and Office, in East Wing of Sheffield Hall, Grove St., head of College St.

BULLETIN No. 19.

One of the most obvious means of fulfilling the purposes for which this Station was established is the chemical analysis of the commercial fertilizers and feeding stuffs whose extensive purchase by the citizens of the State is a necessity of our time, and involves **an annual cash outlay of hundreds of thousands of dollars.** The money-value of these materials it is difficult or impossible for the consumer to determine, and for that reason he is liable to suffer serious loss in their purchase or still greater loss by being deterred from their use. To the Experiment Station is assigned the duty of receiving and collecting from consumers, authentic samples of all these articles, submitting them to exact chemical analysis and reporting upon their cost and real value. Since July, 1877, the Station has published in its Annual Report and its 19 Bulletins,* analyses and valuations of 154 fertilizers and feeding stuffs, including nearly all the fertilizers sold in the State. The analyses have shown that a few of these articles were frauds; that some cost more than they are worth, and that some are worth more than they cost.

To put this information promptly before the people, so that the cultivators of the soil may have its full benefit, cannot be done without the coöperation of the public press unless the funds of the Station are considerably increased. The Station sends out its Bulletins simultaneously to each and every newspaper published in the State, assured that so soon as the nature and object of these Bulletins is correctly apprehended, they will be promptly printed in all our newspapers, as they now are in a large number of them. Farmers who do not find the Station Bulletins in their local newspapers should make use of the maxim—"Demand creates supply."

* The Annual Report, printed in January, is by the existing law limited to 1,000 copies. The Bulletins of the Station are issued from time to time as material accumulates. About 200 copies of each, taken by aid of the "Electric Pen and Duplicating Press," are distributed to Farmers' Clubs, Agricultural Journals, and the newspapers of Connecticut. This Bulletin is printed in order to supply explanations of the Fertilizer-Analyses and Valuations for which the usual Bulletin cannot give space.

FERTILIZER ANALYSES.

New Haven, September 18, 1878.

No. **176** Fine Bone and No. **177** Coarse Bone. Manufactured and sold by G. W. Miller, Middlefield, Ct. Sent by P. M. Augur, Middlefield, June 26, 1878.

No. **188** Bridgeport Bone. Manufactured by Manhattan Fertilizer Co., Bridgeport, Ct. Sent by F. C. Stickney, Bridgeport, Ct., Aug. 12, 1878. Warranted 30 per cent. Bone phosphate.

No. **189** Strictly Pure Bone. H. J. Baker & Bros., New York. Sold by Olds & Whipple, Hartford, Ct. Sample taken May 1, 1878, by J. J. Webb.

No. **199** Celebrated Ground Bone. Lister Brothers, Newark, N. J. Sold by Wills & Treat, Rockville. Sampled and sent Sept. 7th by A. H. Pomeroy, Coventry, Ct.

No. **200** Americus Brand Bone Meal. Rafferty & Williams, New York city. Sold by Rodney Kellogg, Hartford. Sampled and sent Sept. 7th, by Andrew Kingsbury, Coventry, Ct.

No. **179** No. 1 Peruvian Guano. Hobson, Hurtado & Co., N. Y. Sold by Olds & Whipple, Hartford, Ct. Sample taken May 1, 1878, by J. J. Webb.

No. **192** Russel Coe's Ammoniated Superphosphate, sold by Olds & Whipple, Hartford, Ct. Sampled May 1, 1878, by J. J. Webb. Guarantee: Soluble Phos. Acid 7 per cent., Insoluble Phos. Acid 5 per cent., Ammonia 2 per cent.

No. **175** Stockbridge Strawberry Fertilizer, manufactured by W. H. Bowker & Co., New York. Sent June 26, 1878, by P. M. Augur, Middlefield. Guarantee: Nitrogen 4.50-5 per cent., Potash 6-6.60 per cent., Soluble Phos. Acid 6-7 per cent.

No. **181** Stockbridge Lawn Dressing. Guarantee: Nitrogen 6-8 per cent., Sol. Phos. Acid 4-6 per cent., Potash 4-6 per cent.

No. **193** Stockbridge Fertilizer for Kitchen Garden. Guarantee: Nitrogen 4.50-5.25 per cent., Potash 7-8 per cent., Sol. Phos. Acid 2-3 per cent., Available Phos. Acid 4-5 per cent.

No. 195 Stockbridge Fertilizer for Corn. Guarantee: Nitrogen 5.75-6.50 per cent., Potash 7-8 per cent., Sol. Phos. Acid 3-4 per cent., Available Phos. Acid 6-8 per cent.

No. 196 Stockbridge Fertilizer for Squashes, Cucumbers and Tomatoes. Guarantee: Nitrogen 4.75-5 per cent., Potash 7-8 per cent., Sol. Phos. Acid 4.50-5 per cent.

No. 197 Stockbridge Fertilizer for Hay. Guarantee: Nitrogen 8-8.50 per cent., Potash 9.50-10.50 per cent., Sol. Phos. Acid 2.50-3 per cent.

Nos. 181, 193, 195, 196 and 197 were manufactured by W. H. Bowker & Co. and sold by Olds & Whipple, Hartford, Ct. Samples were taken May 1, 1878, by J. J. Webb.

	176	177	188	189	199	200
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Nitrogen,	2.90	3.20	1.95	3.42	3.02	3.38
Phosphoric Acid,	23.46	21.69	16.26*	22.15	12.92	23.04
	Per ton.	Per ton.	Per ton.	Per ton.	Per ton.	Per ton.
Estimated Value,	\$43.28	\$31.29	\$29.78	\$43.32	\$28.96	\$44.43
Cost,	\$35.00	\$32.00	\$30.00	\$38.00	\$35.00	\$35.00

	179	192	175	181	193	195	196	197
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Nitrogen as Nitric Acid,	----	----	----	----	----	1.39	----	8.68
Nitrogen as Ammonia,	----	----	2.32	7.99	----	2.23	1.45	----
Organic Nitrogen,	7.69	1.92	2.10	----	4.57	2.61	3.61	----
Sol. Phos. Acid,	5.85	4.72	6.64	5.17	4.83	2.11	4.05	2.11
Reverted Phos. Acid,	3.58	0.82	1.13	----	0.79	1.64	----	----
Insoluble Phos. Acid,	3.47	6.11	0.24	----	0.17	2.22	----	----
Potash,	2.86	----	6.49	6.35†	7.22	6.95	7.66‡	10.38
	Per ton.	Per ton.	Per ton.	Per ton.	Per ton.	Per ton.	Per ton.	Per ton.
Estimated Value,	\$59.26	\$29.51	\$44.35	\$60.82	\$38.54	\$45.41	\$43.02	\$56.28
Cost,	\$56.00	\$38.00	\$53.33	\$130.00	\$60.00	\$56.00	\$55.00	\$66.67

* Equivalent to Bone Phosphate 35.50 per cent.

† Not named in guarantee and not sought for in analysis.

‡ As Sulphate, valued at 7½ cents per pound. In all the others, potash as Muriate, is valued at 4½ cents.

EXPLANATIONS.

Nitrogen is commercially the most valuable fertilizing element. It occurs in various forms or states. *Organic nitrogen* is the nitrogen of animal and vegetable matters generally, existing in the albumin and fibrin of meat and blood, in the uric acid of bird dung, in the urea and hippuric acid of urine, and in a number of other substances. Some forms of organic nitrogen, as that of blood and meat, are highly active as fertilizers; others, as that of hair and leather, are comparatively slow in their effect on vegetation, unless these matters are reduced to a fine powder or chemically disintegrated. *Ammonia* and *nitric acid* are results of the decay of *organic nitrogen* in the soil and manure heap, and are the most active forms of Nitrogen. They occur in commerce—the former in sulphate of ammonia, the latter in nitrate of soda. 17 parts of ammonia contain 14 parts of nitrogen.

Soluble Phosphoric acid implies phosphoric acid or phosphates that are freely soluble in water. It is the characteristic ingredient of Superphosphates, in which it is produced by acting on “insoluble” or “reverted” phosphates with oil of vitriol. It is not only readily taken up by plants, but is distributed through the soil by rains. Once well incorporated with soil it shortly becomes reverted phosphoric acid.

Reverted (reduced or precipitated) Phosphoric acid, means strictly, phosphoric acid that was once freely soluble in water, but from chemical change has become insoluble in that liquid. It is freely taken up by a strong solution of ammonium citrate, which is therefore used in analysis to determine its quantity. “Reverted phosphoric acid” implies phosphates that are readily assimilated by crops, but have less value than soluble phosphoric acid, because they do not distribute freely by rain.

Insoluble Phosphoric acid implies various phosphates not freely soluble in water or ammonium citrate. In some cases the phosphoric acid is too insoluble to be readily available as plant food. This is true of the South Carolina rock phosphate, of Navassa phosphate, and especially of Canada apatite. The phosphate of raw bones is nearly insoluble in this sense, because of the animal matter of the bone which envelopes it, but when the latter decays in the soil, the phosphate remains in essentially the “reverted” form.

By multiplying the per cent. of Nitrogen, &c., by the trade-value per pound, and then by 20, we get the values per ton of the several ingredients, and adding the latter together we obtain the total estimated value per ton.

The uses of the "Valuation" are, 1st, to show whether a given lot or brand of fertilizer is worth as a commodity of trade what it costs. If the selling price is no higher than the estimated value, the purchaser may be quite sure that the price is reasonable. If the selling price is but \$2 to \$3 per ton more than the estimated value it may still be a fair price, but if the cost per ton is \$5 or more over the estimated value, it would be well to look further. 2d, Comparisons of the estimated values, and selling prices of a number of fertilizers will generally indicate fairly which is the best for the money. But the "estimated value" is not to be too literally construed, for analysis cannot always decide accurately what is the *form* of nitrogen, &c., while the mechanical condition of a fertilizer is an item whose influence cannot always be rightly expressed or appreciated.

The *Agricultural value* of a fertilizer is measured by the benefit received from its use, and depends upon its fertilizing effect, or crop-producing power. As a broad general rule it is true that Peruvian guano, superphosphates, fish scraps, dried blood, potash salts, plaster, &c., have a high agricultural value which is related to their trade-value, and to a degree determines the latter value. But the rule has many exceptions, and in particular instances the trade-value cannot always be expected to fix or even to indicate the agricultural value. Fertilizing effect depends largely upon soil, crop and weather, and as these vary from place to place and from year to year, it cannot be foretold or estimated except by the results of past experience, and then only in a general and probable manner.

S. W. JOHNSON,
Director.