

CONNECTICUT
AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONN.

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The Cost of Plant Food in Connecticut, Spring
Months of 1898.

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NOTICE AS TO BULLETINS.

The Bulletins of this Station are mailed free to citizens of Connecticut who apply for them, and to others as far as the limited editions permit.

Applications should be renewed annually before January 1st.

The matter of all the Bulletins of this Station, in so far as it is new or of permanent value, will be made part of the Annual Report of the Station Staff.

All Bulletins earlier than No. 71 and Nos. 83, 86, 93, 101, 102 and 118 are exhausted and cannot be supplied.

NOTICE AS TO SUPPLY OF STATION REPORTS.

The Station has no supply of its Annual Reports for the years 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1887 and 1891.

The Annual Report of this Station, printed at State expense, is by law limited to an edition of 7,000 copies.

After exchanging with other Experiment Stations and Agricultural Journals, the Reports remaining at the disposal of the Station will be sent to citizens of Connecticut who shall seasonably apply for them, and to others as long as the supply lasts.

FORMER REPORTS WANTED.

There is frequent call for our earlier Annual Reports on the part of public Libraries, students, chemists, naturalists, and station workers.

Persons who can supply copies of Reports of this Station for any of the years above named, will be likely to find purchasers by communicating with the Director.

TRADE VALUES OF FERTILIZER ELEMENTS FOR 1898.

The following schedule of Trade Values has been adopted for use in 1898 :

	Cents per pound.
Nitrogen in ammonia salts	14
nitrates	13
Organic nitrogen, in dry and fine ground fish, meat, and blood and in mixed fertilizers	14
in cotton seed meal	12
in fine* bone and tankage	13½
in coarse* bone and tankage	10
Phosphoric acid, water-soluble	4½
citrate-soluble†	4
of fine* ground fish, bone and tankage	4
of coarse* fish, bone and tankage	3½
of cotton seed meal, castor pomace and ashes	4
of mixed fertilizers, if insoluble in ammonium citrate†	2
Potash as high-grade sulphate and in forms free from muriate (or chlorides)	5
as muriate	4½

The foregoing are, as nearly as can be estimated, the average prices at which, during the six months preceding March last, the respective ingredients were retailed for cash, in our large markets, in those *raw materials* which are the regular source of supply.

These figures are used by the Station to make an annual comparison of the brands of mixed fertilizers in our market, by showing what would be the *average* cost to the purchaser of the quantities of nitrogen, phosphoric acid and potash which each contains, if this plant food were bought in raw materials of ready availability.

For this purpose the trade values adopted at the beginning of the year should be adhered to as nearly as possible throughout the whole season, so that all the brands sold in a single season may be compared on a common basis.

* "Fine" signifies smaller than $\frac{1}{16}$ inch; "coarse," larger than $\frac{1}{16}$ inch.

† Dissolved from 2 grams of the fertilizer, previously extracted with pure water, by 100 c.c. neutral solution of ammonium citrate, sp. gr. 1.09, in 30 minutes, at 65° C., with agitation once in five minutes. Commonly called "reverted" or "backgone" Phosphoric Acid.

ON THE PURCHASE OF FERTILIZERS.

As we have previously pointed out, these trade values are *average* figures and therefore not strictly applicable to the conditions of any one farm or fertilizer market, or of any one month in the year.

The only rational way to buy fertilizers—or anything else—is for purchasers to *make their own schedule of valuations* immediately before purchasing, thus getting figures which are strictly correct for their special circumstances, and enable them to compare accurately the different forms of plant food offered to them with reference to their cost.

To illustrate: in the above schedule the "trade value" of soluble phosphoric acid is $4\frac{1}{2}$ cents, and of reverted phosphoric acid 4 cents—figures justified by the *average* prices of plain superphosphates. But by getting quotations from a number of dealers and paying cash, certain farmers have within the last two months bought available phosphoric acid in this form for 3.1 cents per pound. On the other hand, others have paid 6.8 cents per pound for it, in form of dissolved bone black.

There is no known difference between the two forms, in respect to their value as plant food, and the buyer has paid in the one case more than twice as much for the same quantity of plant food as in the other.

If available phosphoric acid in form of unmixed goods costs 6 cents per pound, it may be cheaper for the buyer to get a factory mixture containing nitrogen, phosphoric acid and potash. If he can get available phosphoric acid for three cents a pound it may pay him to do his own mixing, or better, perhaps, apply the chemicals unmixed.

The farmer goes into the market to buy plant food in forms which have a suitable mechanical condition and are available to crops, at as low a price as he can.

The mixed fertilizer has no special virtue in it because of its being a mixture. Whether the forms which contain the plant food are mixed before application or not is a circumstance which affects the cost of application or the cost of the ingredients, but does not affect the availability to crops of the plant food itself. Where fertilizers are applied broadcast it may often be cheaper to apply each raw material separately, than to buy them all in a ready-made mixture, or to prepare a mixture on the farm.

No general rule can be given, but the farmers in any community can yearly determine these things for themselves, by jointly securing quotations for mixed fertilizers and fertilizer chemicals from a number of manufacturers and by buying together.

There is no apparent reason why members of granges or other associations in one neighborhood should not more generally combine and secure from a number of manufacturers bids for a considerable number of tons, or of car lots even, of a fertilizer having a given guaranteed composition, made from certain specified raw materials, with a rebate provided for any failure to meet the guarantee, and at a specified cash price. This practice, quite common in other States and adopted to a limited extent here, deserves more attention by those who prefer to buy mixed goods rather than raw materials.

At present in many of our towns a large number of brands, made by different firms, are sold in small lots to the members of the neighborhood at prices which are from 50 to 100 per cent. above the *cash ton price* of the real plant food contained in them.

If it is granted that this number of fertilizer agents is necessary, that each of the brands sold has a special merit for some particular crop, and if—as is too often the case—the seller must wait six or nine months for his pay, these prices are perhaps justified.

It is, however, quite certain that one, two, or three brands at most, of concentrated mixed fertilizers containing the best forms of plant food—none of them so-called “cheap” fertilizers—would perfectly satisfy the agricultural needs of that community.

It is also certain that if this supply was made by one firm rather than by half a dozen different ones, the work of manufacture and sale could be more cheaply done.

Further, it is certain that if a number of firms made bids for doing the work, a still further reduction of cost to the farmer could be made; and finally, if purchasers would not call on dealers or manufacturers to do a banking business for them, as well as a fertilizer business, by carrying their notes for three, six or nine months, the cost of mixed fertilizers to the farmers of this State would be considerably lessened and the profit of their use correspondingly increased.

The present condition of the trade is illustrated by the following facts:

In one town in this State there are forty farmers, each of whom uses a ton or more of commercial fertilizers, and in the aggregate

between 300 to 400 tons are sold. There are eight distinct firms having selling agents there, but the number of brands sold is not known.

In another town there are about seventy farmers who use commercial fertilizers. There are three resident agents, and the goods made by eleven other manufacturers are also sold; the number of brands is considerably larger.

Another correspondent writes: "I know of only one agent in town. He only sells to accommodate his neighbors and to obtain what he uses at somewhere near reasonable cost. He pays cash and waits two years for his pay. He is a fool and he knows it. He is I."

ON THE COST OF PLANT FOOD IN CONNECTICUT. SPRING MONTHS OF 1898.

The following summary contains a general statement of the cost of plant food in the raw materials thus far examined during the present season in this State. The analyses will appear in the Station Report for 1898. A part of the samples referred to were sent in by purchasers and a part were collected by our sampling agent.

NITROGEN.

NITRATE OF SODA.

The average retail price of nitrogen in this form, calculated from the eight samples collected, has been 13.2 cents per pound, or \$42 per ton for nitrate.

In one case a purchaser of a "mixed car lot" of chemicals bought for 11.7 cents per pound, or \$37 per ton for the nitrate, an illustration of the saving of buying in quantity and after securing competitive bids.

SULPHATE OF AMMONIA.

A single sample cost \$60 per ton and contained 20.94 per cent. of nitrogen, making the cost of nitrogen per pound 14.3 cents.

DRIED BLOOD.

A single sample of dried blood, containing 10.70 per cent. of nitrogen, was bought for \$28, making the cost of nitrogen 13.1 cents per pound.

COTTON SEED MEAL.

This material is chiefly used by tobacco growers, but deserves wider recognition as a very cheap and quickly available form of nitrogen.

The per cent. of nitrogen in the eighteen samples analyzed has ranged from 7.10 to 7.97 and has averaged 7.45.

The average cost has been \$21.50 per ton and, allowing four and five cents respectively for the phosphoric acid and potash in the meal, the average cost of nitrogen has been 11.4 cents a pound.

Cotton Seed Meal is sold as a fertilizer chiefly in Hartford and vicinity. It is said that the price in some other places, where the demand and competition are less, is much higher.

CASTOR POMACE,

Which is, we believe, used only by tobacco growers, is the most expensive source of nitrogen, costing \$19 per ton, equivalent to 16 cents a pound for nitrogen.

PHOSPHORIC ACID.

DISSOLVED BONE BLACK AND ACID PHOSPHATE.

At \$22 per ton, available phosphoric acid in form of dissolved bone black, costs from 6.4 to 6.8 cents a pound.

In dissolved rock phosphate ("acid phosphate"), which is the form chiefly used in commercial mixed fertilizers, available phosphoric acid costs less, or about 4 cents a pound. Phosphoric acid in these two forms has the same *agricultural* value.

POTASH.

HIGH GRADE SULPHATE.

Two samples, quoted at \$47 and \$49 for a ton, contained 48.35 and 47.90 per cent. of potash, respectively, the cost of actual potash being 4.9 cents and 5.1 cents a pound.

DOUBLE SULPHATE OF POTASH AND MAGNESIA.

The percentage of potash in seven samples ranged from 22.22 to 27.12, the cost from \$26 to \$32 a ton, and the cost of actual potash from 4.9 to 6.5 cents, averaging 5.7 cents per pound. In the single sample tested for chlorine there was found 2.32 per cent.

MURIATE OF POTASH.

The percentage of potash in ten samples of this material ranged from 48.77 to 53.67, the cost per ton from \$37 to \$45.00, and the cost of actual potash from 3.6 to 4.4 cents, averaging 4 cents per pound.

CARBONATE OF POTASH.

A single sample of this material is a fine, white granular salt and contains 64.55 per cent. of actual potash. It also contains 2.70 per cent. of chlorine, and no appreciable amount of sulphates or of lime or magnesia. It costs \$110 per ton, which is equivalent to 8.5 cents per pound for the actual potash in it.

COTTON HULL ASHES.

Twenty-six analyses of these ashes have been made in the last few months.

They show the usual range of composition: from 12.30 to 29.24 per cent. of potash soluble in water, and from 5.36 to 14.40 per cent. of phosphoric acid. The average percentage of water-soluble potash was 23.2 per cent.

The price per ton ranged from \$25 to \$45 per ton. Allowing $4\frac{1}{2}$, 4 and 2 cents for the water-soluble, citrate-soluble and insoluble phosphoric acid, the average cost per pound of actual potash, which is chiefly in the form of carbonate, is 7.2 cents.

ANALYSES OF FERTILIZERS.

Following are analyses of certain fertilizers which have not been previously noticed in our reports, being newly introduced into this State:

10289. Bowker's Fairfield Formula, a special mixture made for farmers in Southport and vicinity by the Bowker Fertilizer Co., Boston, Mass. Sampled and sent by Simeon Pease, Greenfield Hill.

10241. Preston's Potato Phosphate, made by the Preston Fertilizer Co., Greenpoint, Long Island. Stock of O. G. Beard, Shelton.

10188. Bat Guano. Sampled and sent by Olin Wheeler, Buckland.

10245. Fertilizer made by the Connecticut Reduction Co., Bridgeport. Sampled at the factory and sent by S. E. Frisbee, Milford.

10217. Fertilizer made by the same company. Sampled and sent by Joseph Lee, Southport.

ANALYSES AND VALUATIONS.

	Fairfield Formula.	Preston's Potato Phosphate.	Bat Guano.	Fertilizer. Reduction Co.	Conn. Reduction Co.
	10289	10241	10188	10245	10217
Nitrogen as nitrates ----	.90	.34	1.50	----	----
as ammonia ----	.10	----	.58	----	----
organic -----	3.10	1.81	2.87	2.65	3.35
Total Nitrogen found ---	4.10	2.15	4.95	2.65	3.35
guaranteed	4.00	1.64	----	2.7	2.7
Phosphoric Acid, soluble	5.65	4.50	.45	none	none
reverted	2.79	4.65	5.98	2.53	2.00
insoluble	.80	1.99	4.93	1.23	1.65
Phosphoric Acid, total --	9.24	11.14	11.36	3.76	3.65
available guaranteed	8.00	7.00	----	4.50	4.50
Potash as muriate -----	10.56	9.62	.49	.37	.34
as sulphate -----	----	1.04	.26	----	----
Total Potash found ----	10.56	10.66	.75	.37	.34
guaranteed	8.00	10.00	----	3.06	3.06
Chlorine -----	*	7.23	.20	*	*
Cost per ton -----	\$28.00	31.00	----	----	18.00
Valuation per ton -----	\$27.92	23.73	----	10.24†	11.93†

* Not determined.

† By the schedule used for mixed fertilizers.

AVAILABILITY OF ORGANIC NITROGEN.

Experiments made at this Station and elsewhere indicate that the solubility of organic nitrogen in an acid pepsin solution of prescribed strength, acting for a given time at a temperature of 40°C., measures in a general way the availability of this nitrogen to crops. So that if the organic nitrogen of any material used as a fertilizer is insoluble or but slightly soluble in the reagent named, it may well be suspected that this nitrogen is of quite inferior value as plant food.

Five of the fertilizers whose analyses have just been given, and two others, have been tested with reference to the solubility of their organic nitrogen, with the following results:

Station No.	Brand.	Percentage of Organic Nitrogen.	Percentage of Organic Nitrogen dissolved by pepsin solution.	Of 100 parts of Organic Nitrogen there were dissolved parts.
10314	Dried Blood from Bowker Fertilizer Co.,	10.70	9.34	87.3
10311	Tankage " " " "	5.12	3.26	63.6
10289	Fairfield Formula " " "	3.10	2.30	74.2
10241	Preston's Potato Phosphate,	1.81	1.29	71.3
10245	Fertilizer made by Conn. Reduction Co.,	2.65	.48	18.1
10217	" " " " "	3.35	.57	17.0
10188	Bat Guano,	2.87	none	0.00

The organic nitrogen of bat guano comes almost entirely from the chitinous wing cases of insects and is known to be very inert. It is also entirely insoluble in pepsin solution.

The samples of blood and of tankage have the solubility generally found in these materials.

The somewhat higher solubility of blood-nitrogen as compared with that of the tankage, corresponds with the more ready availability of the former to crops, indicated by vegetation experiments at this Station and elsewhere.

More than seven-tenths of the organic nitrogen of both the mixed fertilizers is also soluble in pepsin.

The nitrogen in the two samples of fertilizers made by the Connecticut Reduction Co. is, without exception, largely insoluble (80 per cent. or more) in pepsin solution. This fact makes it quite probable that the nitrogen of the fertilizer named is of very inferior value as plant food.

RAPE SEED MEAL.

10220. A sample of this material, stated to be the ground cake left after expressing or extracting rape seed oil, and offered as a fertilizer for tobacco, was sent for analysis by J. A. DuBon, Poquonock. It contains:

Nitrogen	5.40 per cent.
Phosphoric Acid	2.16 "
Potash99 "

STREET SWEEPINGS.

10129. A sample sent by P. P. Hickey, Burnside, is stated to consist of the sweepings from asphalt pavements in Hartford, offered as a manure.

The analysis is as follows:

Water	14.48
Organic and Volatile Matters.....	10.70
Sand and Soil.....	66.60
Other Mineral Matter	8.22
	<hr/>
	100.00
In the Organic Matter, Nitrogen.....	0.19
In the Mineral Matter, Phosphoric Acid	0.05
Potash	0.17