

CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 71.

JULY 29, 1882.

FERTILIZER ANALYSES.

NORFOLK FERTILIZER.

772. Norfolk Fertilizer. Made by Styron Whitehurst & Co., Norfolk, Va. Sampled, sent and sold by M. B. W. Wheeler, Westport, Ct.

The direct results of analysis were as follows:

| | |
|-------------------------------------|---------|
| Lime | 43.43 |
| Magnesia | 1.39 |
| Soda | 5.44 |
| Potash | .93 |
| Oxide of iron | .51 |
| Chlorine | 6.55 |
| Phosphoric acid | .16 |
| Sulphuric acid | 1.78 |
| Carbonic acid | 11.23 |
| Insoluble matters | 2.67 |
| Moisture at 212° | 16.01 |
| Combined water, by difference | 9.90 |
| | <hr/> |
| | 100.00. |

The actual state of combination of the ingredients of the "Norfolk fertilizer" is probably the following:—

| | |
|---|--------|
| Common salt (sodium chloride) | 10.26 |
| Muriate of potash (potassium chloride) | .67 |
| Sulphate of potash (potassium sulphate) | .95 |
| Gypsum (hydrated calcium sulphate) | 2.88 |
| Carbonate of lime (calcium carbonate) | 25.52 |
| Slacked lime (calcium hydrate) | 37.26 |
| Slacked magnesia (magnesium hydrate) | 2.02 |
| Phosphate of iron | .67 |
| Sand and insoluble matters | 2.67 |
| Moisture and loss | 17.10 |
| | <hr/> |
| | 100.00 |

The Norfolk Fertilizer is a mixture of ground oyster-shells and slacked lime with some 15 per cent. of "kainite" or similar low-grade "potash-salts" or the equivalent. Its fertilizing and commercial values are about those of leached ashes. The Connecticut farmer can scarcely afford to pay more than \$7 to \$8 per ton for it. The price quoted to the Station was \$30.

LIME.

796. Fertilizer Lime from Canaan, Ct. Sold by H. K. Brainard, Thompsonville. Sampled and sent by W. F. Fuller, Suffield.

797. Fertilizer Lime (from Pennsylvania?) Sold by W. F. Fuller, Suffield. Sampled and sent by H. H. Austin.

The direct results of the analyses were as follows:—

| | 796 | 797 |
|------------------------------------|-------------|--------------|
| Lime | 70.12 | 45.08 |
| Magnesia | .67 | 31.59 |
| Oxide of iron and alumina..... | .20 | 3.61 |
| Carbonic acid | 7.76 | 3.48 |
| Water | 20.50 | 4.77 |
| Silica..... | | 5.56 |
| Insoluble in acids | .28 | 5.78 |
| Undetermined matters and loss..... | .47 | .13 |
| | <hr/> | <hr/> |
| | 100.00 | 100.00 |
| Cost per ton..... | \$9.00 | \$8.00 |

The compounds actually existing in the Canaan lime, **796**, are almost certainly, both in kind and quantity, as given below. The state of combination of the ingredients of **797** cannot be so positively ascertained from the analysis. The statement below is probably correct except that the silica is combined with the iron and a small part of the lime (perhaps also with a little magnesia and alumina). The quantities of lime, &c., that thus chemically unite to silica in the burning of impure limestones, such as yield **797**, depend upon the temperature to which the rock is subjected in the kiln.

| | 796 | 797 |
|--|------------|------------|
| Calcium hydrate (slacked lime)..... | 79.61 | 12.62 |
| Calcium carbonate (carbonate of lime)..... | 17.63 | 7.91 |
| Magnesium hydrate | .93 | |
| Magnesium oxide (magnesia)..... | | 31.59 |
| Calcium oxide (lime)..... | | 32.80 |
| Oxide of iron and alumina..... | .20 | 3.61 |
| Matters insoluble in acids..... | .28 | 5.78 |
| Silica (combined with lime and iron as silicates)..... | | 5.56 |
| Moisture, undetermined matters and loss..... | 1.30 | .13 |
| | <hr/> | <hr/> |
| | 100.00 | 100.00 |

The effect of much silicates (glass- or slag-like compounds formed by strongly heating together silica and lime or iron) in a lime is "to bind" the lime and retard slacking. The effect of magnesia, especially in large proportion, is also to retard or prevent slacking and to diminish the caustic or corroding quality of the lime.

Sample **797** is stated not to have heated when drenched with water, but after standing three weeks it crumbled without killing the grass on which it was heaped.

The question of the comparative value of the two samples is an important one. **797** was bought for application upon tobacco-land. The value of lime applied to land is of two sorts. It may be of service by its caustic or alkaline character in virtue of which it, for example, provokes decomposition of the inert nitrogen-compounds of the soil and thus acts indirectly as a supply of nitrogen. For this use **796** is much superior to **797**. The other mode of action of fertilizer-lime lies in its direct supply of plant-food. On a soil destitute of magnesia, **797** would be better than **796**, but magnesia is commonly abundant enough in our soils, and while an occasional application of a magnesia fertilizer may be advantageous we may conclude that, generally speaking, a nearly pure lime is preferable to one containing a large proportion of magnesia.

SALTPETER.

811. "Saltpeter." Sold by Martin Hungerford, Gaylordsville, Ct. Sampled and sent June 19, by G. N. Woodruff, Sherman. No printed analysis or statement of composition was attached to the barrels or accompanied the goods, which were sold under verbal guarantee that they contained 95 per cent. saltpeter.

812. "Saltpeter." Sold by M. L. Hungerford, Gaylord's Bridge, Ct. Sampled and sent June 20th, by A. G. Barnes, New Milford. No guarantee upon the barrel. Stated to be pure saltpeter, such as is used in the manufacture of powder.

813. "Saltpeter." Sampled and sent June 19th, by H. T. Haviland, Sherman, Ct.

The results of the analyses of **811**, **812** and **813** were reported to Messrs. Woodruff, Barnes and Haviland, June 30th. In a few days after came to hand—

819. "Saltpeter." Sold by M. L. Hungerford. Sampled and sent July 3d, by Geo. G. Hungerford, Gaylordsville, Ct. "Name and address of manufacturer not known."

This sample contained besides the rhombohedral crystals of soda-salt-peter with nearly square faces, a number of long prismatic crystals of common or potash salt-peter.

ANALYSES.

| | 811 | 812 | 813 | 819 |
|--|----------------|---------------|---------------|---------------|
| Sodium nitrate (soda-salt-peter)..... | 37.89 | 33.57 | 43.20 | 41.22 |
| Potassium nitrate (potash-salt-peter)..... | none | none | none | 28.72 |
| Sodium chloride (common salt)..... | 62.80 | 65.05 | 55.51 | 29.38 |
| Moisture and undetermined matters..... | | 1.38 | 1.26 | .68 |
| | <u>100.69</u> | <u>100.00</u> | <u>100.00</u> | <u>100.00</u> |
| Nitrogen, in salt-peter..... | 6.24 | 5.53 | 7.12 | 16.76 |
| Chlorine, in common salt..... | 38.11 | 39.47 | 33.70 | 17.83 |
| Potash | none | none | none | 13.38 |
| Commercial value of nitrogen* per ton.. | \$32.45 | 28.75 | 37.02 | 65.95 |
| " " potash† " " | | | | 18.73 |
| " " common salt‡ " " | \$0.70 | 7.00 | 6.00 | 3.25 |
| | <u>\$39.15</u> | <u>35.75</u> | <u>43.02</u> | <u>77.93</u> |
| Cost per ton (6½ cents per lb.)..... | \$130.00 | \$130.00 | not stated | \$130.00 |

* Reckoned from the Station price of nitrogen in nitrates, viz: 26 cents per lb.

† Potash is valued at 7 cents per lb.

‡ Assuming agricultural salt, containing 94 per cent. sodium chloride, to cost \$10.00 per ton. See Station Report for 1881, p. 53.

These samples show that the material sent from Sherman and New Milford, as "pure salt-peter, such as is used in the manufacture of powder," was a variable mixture of soda-salt-peter (Chili salt-peter) with common salt, the latter predominating, and contained no potash at all, while such salt-peter as is used in making gun powder, contains 46.6 per cent. of potash. Pure potash salt-peter by the Station valuation for 1882 has an estimated value of \$136.00 per ton. These "salt-peters," are worth commercially but \$43, \$39 and \$35.75 respectively, and not only are destitute of potash, an essential ingredient of that salt-peter which, it is claimed they were represented to be, but they contain 55 to 65 per cent. of common salt which is not, in general, a benefit to land or crops, even when applied cautiously and in small quantity and is often an injury, especially on tobacco, the burning quality of which it is believed to impair very seriously.

The fourth sample contains a considerable proportion of potash-salt-peter and has about double the money-worth of the others, yet nearly 30 per cent. of it is common salt and its cost exceeds its value by more than fifty dollars per ton.

SUPERPHOSPHATES AND SPECIAL MANURES.

767. Mapes' Tobacco Manure (for use with stems). From stock of P. M. Augur & Sons, Middlefield. Sampled and sent by J. M. Hubbard, Middletown.

787. Mapes' Tobacco Manure (for use with stems).

788. Mapes' Tobacco Manure. Conn. Brand.

The last two samples were from the Mapes' Formula and Peruvian Guano Co's branch store at Hartford, and were taken and sent by C. H. Pease, South Windsor.

780. Baker's Complete Tobacco Manure.

782. Baker's Complete Corn Manure.

The last two samples were manufactured by H. J. Baker & Bro., 215 Pearl St., N. Y., and taken from the stock of Olds & Whipple, Hartford, by Olin Wheeler, Buckland.

789. Mapes' Corn Manure. From Mapes F. & P. G. Co's branch store, Hartford. Sampled by C. H. Pease, South Windsor.

815. Mapes' Corn Manure.

814. Mapes' Potato Manure.

816. Mapes' Orange Tree Manure.

The last three samples are from the stock of P. M. Augur & Sons, Middlefield. Sampled and sent by P. M. Augur.

805. Baker's A. A. Ammoniated Superphosphate. From stock of Wilcox & Judd, Bristol. Sampled by the Station Agent.

802. Preston & Sons' Ammoniated Bone Superphosphate. Made by Preston & Sons, Green Point, N. Y. From stock of E. M. Pierce & Co., Plainville. Sampled by the Station Agent.

808. Americus Ammoniated Bone Superphosphate. Made by Williams, Clark & Co., 109 Pearl St., New York. Sampled by Station Agent, from stock of O. F. Strunz, Bristol.

ANALYSES AND VALUATIONS.

| | 767 | 787 | 788 | 780 | 782 | 789 | 815 | 814 | 816 | 805 | 802 | 808 |
|--------------------------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Nitrogen as nitrates..... | 2.60 | 2.48 | 1.52 | 1.09 | 1.66 | 1.00 | 1.44 | 1.46 | 2.22 | | | |
| Nitrogen as ammonia salts..... | 2.35 | 2.46 | 1.68 | 3.32 | 1.96 | 2.36 | 1.71 | 1.30 | | 1.16 | | |
| Organic nitrogen..... | 0.91 | 0.66 | 0.42 | 0.35 | 0.83 | 0.17 | 0.87 | 1.18 | 1.18 | 1.51 | 2.36 | 2.50 |
| Soluble phosphoric acid..... | 3.40 | 4.76 | 5.44 | 2.48 | 5.34 | 7.88 | 4.93 | 3.25 | 2.85 | 8.30 | 7.06 | 9.79 |
| Reverted phosphoric acid..... | 4.12 | 2.77 | 2.33 | .18 | .31 | 3.78 | 4.67 | 4.61 | 4.60 | 1.58 | 1.79 | .71 |
| Insoluble phosphoric acid..... | 2.30 | 2.14 | 1.64 | .02 | .20 | 1.25 | 2.15 | 2.18 | 2.53 | .52 | 3.53 | .77 |
| Potash..... | 4.36 | 4.37 | 9.03 | 8.56 | 7.95 | 7.17 | 6.91 | 6.10 | 3.77 | 3.04 | | 2.42 |
| Chlorine..... | 1.24 | .28 | 1.72 | 9.98 | 5.61 | 6.29 | 7.45 | 4.88 | 1.14 | 3.03 | | 1.45 |
| Cost per ton..... | \$54.00 | 54.00 | 54.00 | 50.00 | 50.00 | 51.00 | 50.00 | 51.00 | 42.00 | 42.00 | 40.00 | 40.00 |
| Estimated value per ton..... | \$56.30 | 55.92 | 52.05 | 41.60 | 46.08 | 54.86 | 51.82 | 45.94 | 40.93 | 41.23 | 36.44 | 41.10 |

GROUND BONE.

801. Preston & Sons' Ground Bone.

804. Ground Bone. Manufactured by Geo. Richardson & Son, Unionville.

Both the above are from the stock of E. M. Pierce & Co., Plainville, and were taken by the Station Agent.

817. Marine Bone.

818. Pure Ground Bone, Grade AX.

The last two samples are manufactured and sold by the Rogers & Hubbard Co., Middletown, and were taken by Charles Fairchild, Middletown.

MECHANICAL ANALYSES.

| | 801 | 804 | 817 | 818 |
|--|------------|------------|------------|------------|
| Fine, smaller than $\frac{1}{30}$ inch----- | 43 | 6 | 33 | 31 |
| Fine-medium, smaller than $\frac{1}{25}$ inch -- | 21 | 20 | 55 | 25 |
| Medium, smaller than $\frac{1}{12}$ inch----- | 15 | 29 | 12 | 23 |
| Coarse medium, smaller than $\frac{1}{8}$ inch-- | 12 | 29 | -- | 21 |
| Coarse, larger than $\frac{1}{8}$ inch ----- | 9 | 16 | -- | -- |
| | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |

CHEMICAL ANALYSES AND VALUATIONS.

| | 801 | 804 | 817 | 818 |
|------------------------------|---------|-------|-------|-------|
| Nitrogen----- | 1.93 | 3.54 | 4.61 | 3.94 |
| Phosphoric acid----- | 10.47 | 16.35 | 22.89 | 22.50 |
| Cost per ton----- | \$35.00 | 33.00 | ---- | 35.00 |
| Estimated value per ton----- | \$17.12 | 25.51 | 39.99 | 35.80 |

POTASH SALTS.

775. Double Sulphate of Potash and Magnesia from stock of H. J. Lothrop, Suffield. Sampled and sent by W. F. Fuller, Suffield.

798. Sent by J. H. Lothrop, Suffield. Stated to have been taken from a bag, also sent, on which, besides one word too indistinct to make out, the following was printed:

"Actual Sulphate of Potash. Patented by Dr. F. Dupre and C. H. Hake, Germany and America. Manufactured by the Stassfurter Chemische Fabrik, Stassfurt. J. H. Salmon, New York, Agent."

On analysis were obtained:—

| | 775 | 798 |
|---------------|------------|------------|
| Potash..... | 25.86 | 24.80 |
| Magnesia..... | 11.93 | 13.01 |
| Chlorine..... | .90 | 3.93 |

From the above results the following composition is calculated:

| | | |
|---------------------------------|---------------|---------------|
| Sulphate of potash..... | 47.82 | 45.85 |
| “ “ magnesia..... | 35.79 | 39.03 |
| Soda, chlorine, water, &c..... | 16.39 | 15.12 |
| | <u>100.00</u> | <u>100.00</u> |
| Price per ton..... | \$ 8.00 | \$35.00 |
| 100 pounds of potash cost*..... | \$7.34 | \$7.05 |

* Making no allowance for sulphate of magnesia.

Sulphate of magnesia is now offered for agricultural use in “Kieserite” which contains about 80 per cent. and is quoted at \$4.50 to \$5.25 per ton wholesale. Adding to the highest of these figures 20 per cent., we have \$6.30 as a fair retail price. The samples **775** and **798** which contain 36 to 40 per cent. of sulphate of magnesia have, accordingly, about \$3.00 worth of that substance per ton: allowing for it, 100 pounds of potash in **775** cost \$6.77 and in **798** cost \$6.45.

The analyses show that the two brands “Double Sulphate of Potash and Magnesia,” and “Actual Sulphate of Potash,” are practically the same thing.

S. W. JOHNSON, *Director.*