

# New York Agricultural Experiment Station.

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POPULAR EDITION

OF

BULLETIN No. 137.

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PROFITABLE POTATO FERTILIZING.

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DECEMBER, 1897.

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GENEVA, N. Y.

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The Bulletins published by the Station will be sent free to any farmer applying for them.

\*Connected with Second Judicial Department Branch Station.

†Connected with Fertilizer Control.

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PROFITABLE POTATO FERTILIZING.

F. H. HALL.

It is rare, indeed, that the scientist feels it necessary to warn the farmers against using **Too liberal** soil **enrichment.** too much commercial fertilizer. Most frequently, science must convince practice that the use of judiciously selected fertilizers is essential to securing the best results from the soil, and must make repeated experiments proving the financial benefit derived from fertilizers upon a particular crop before their application to that crop becomes general. Experiments made by this Station, however, furnish strong evidence that the potato growers of Long Island are annually wasting large quantities of valuable fertilizing ingredients. In this section of the State, near its metropolis and other large cities, market gardening and farming practice is of the most intensive character and the fertility of the somewhat poor soil is supplemented by the use of surprisingly large quantities of commercial fertilizers, an outlay of \$20 an acre for plant food of this character being not uncommon.

Potato growers frequently apply one ton of high grade superphosphate per acre, while in Station experiments made in 1895 and 1896 (Bulletins 93 and 112) the most profitable result each year was secured by the use of only one half this quantity of fertilizer and the residual, or second years' effect was practically the same with 1,000 lbs. as with 2,000 lbs.

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\* This is a brief review of Bulletin No. 137 of this Station on Commercial Fertilizers for Potatoes, by W. H. Jordan. Anyone specially interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete Bulletin,

Heavier yields resulted from heavier applications, it is true, but the additional gain from the use of more than 1,000 lbs. of fertilizer was at a greatly increased cost per bushel.

In order to ascertain more fully whether the **Plan of 1897** heavier applications, although not profitable **experiment.** in the returns from a single year, might not be so in an entire rotation, and to avoid the errors liable in a limited test, a series of fertilizer experiments, upon an extensive scale and to continue during a series of years, was begun in 1897. Eighty tenth-acre plats, twenty upon each of four widely separated farms on Long Island, were selected, the soil in each case being uniform and without manure for several years. To these plats were applied fertilizers mixed according to four different formulas, five plats on each farm being devoted to each formula; and potatoes were planted on all plats.

In these experiments the answers were sought **Fertilizers** to three questions relative to: (1) the profitable amount of fertilizers, (2) the proper proportions of the several fertilizer ingredients, and (3) the comparative effect of sulphate and muriate of potash. The fertilizers used were nitrate of soda, high grade dried blood, acid phosphate, muriate or sulphate of potash and land plaster, the ingredients being so combined in the different formulas that the conditions were obtained which were necessary to answer the questions proposed.

**used.** Formula 1 was based upon the composition of the potato itself, an attempt being made to approximate the proportions of fertilizer ingredients removed from the soil by the potato tubers. It contained about 6.5 per cent of nitrogen, nearly 5 per cent of available phosphoric acid and 10 per cent of potash as muriate. Formula 2 contained the same proportions of ingredients but the potash was in the form of sulphate. Formula 3 was a mixture very commonly used on Long Island and contained 4 per cent of nitrogen, 8 per cent of phosphoric acid and 10 per cent of potash as muriate. Formula 4 was like formula 3 using sulphate of potash instead of muriate.

**Condition of crops.** The general care of the crops was left to the owners of the farms. Planting, cultivation and care were to be as uniform as possible and the vines were to be sprayed when necessary to prevent injury by insects and plant diseases. The seed used was somewhat inferior so that the plants started slowly and appeared rather sickly at first. The vine growth improved with the season, except on one farm, where early blight or dry weather caused almost complete death of the vines by August 7. The vines upon this farm were sprayed but twice, and upon a second farm, upon which only one spraying was given, the crop was badly affected by rot. Upon the other two farms, the potatoes, sprayed five or six times, were but little affected by blight or rot and yielded well, though not heavily owing to the dry weather. Because of the unfavorable conditions affecting the crops of the former two farms, their yields are not tabulated, but the results were similar to those of the plats given, though less striking.

**Medium application most profitable.** The tables show the influence of the quantity of fertilizer upon the yield and also the difference in effect of the formula based upon the composition of the potato and that based upon the common 4-8-10 combination used by the Long Island farmer :

EFFECT UPON POTATOES OF FERTILIZER IN DIFFERENT QUANTITIES.

Amount of fertilizer per acre.	Number of plats averaged.	Yield per acre.	Total increase.	Increase large tubers.
		<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>
None.....	8	113.1		
500 lbs.....	8	144.7	31.6	34.1
1000 ".....	8	175.4	62.3	69.1
1500 ".....	8	178.2	65.1	77.5
2000 ".....	8	184.4	71.3	78.7

From these figures it will be seen that the first 500 lbs. of fertilizer increased the yield of large tubers 34.1 bu. and the second 500 lbs. 35 bu. while the addition of 500 lbs. to the

medium application of 1,000 lbs. gave an increase of only 8.4 bu. or only one fourth of the gain from the preceding 500 lbs. and the increase to a full ton added but 1.2 bu. to the yield from 1500 lbs. or 8.6 bu. to the yield from 1,000 lbs. Assuming that the fertilizer cost \$25 a ton, the increased yield of large tubers from the first 500 lbs. of fertilizer cost 18 cts. a bushel, from the second 500 lbs. the same, from the third 500 lbs. 75 cts. a bushel and from the fourth \$5.25 a bushel. The use of 1000 lbs. of fertilizer per acre thus proved highly profitable, for the increase cost less than 20 cts. a bushel and sold in market for 75 cts. Of course this is a good price for potatoes, but there would have been profit in selling them for 40 cts. Larger amounts of fertilizer, however were applied at a loss, for the fertilizer cost alone of the increase from the application of 1500 lbs. per acre was greater than the selling price and for 2000 lbs. was much greater.

EFFECT UPON POTATOES OF FERTILIZERS OF DIFFERENT COMPOSITION.

Amount of fertilizer per acre.	Potato formula.		Long Island formula.		Excess from Long Island formula.
	Plats.	Yield per acre.	Plats.	Yield per acre.	
		<i>Bu.</i>		<i>Bu.</i>	<i>Bu.</i>
None.....	8	113.1	8	113.1	
500 lbs. ....	4	125.5	4	163.8	38.3
1000 " .....	4	166.2	4	184.7	18.5
1500 " .....	4	166.8	4	189.5	22.7
2000 " .....	4	178.4	4	190.4	12.0
Average.....	16	159.2	16	182.1	22.9

**Long  
Island  
formula  
best.**

From the second table it appears that the Long Island formula gave better results with each quantity of fertilizer and produced an average of nearly 23 bu. per acre more than did the formula based upon the composition of the tubers. The difference between the two fertilizers was strikingly shown by the appearance of the vines, also; for those upon the Long Island formula plats were one-fourth larger than those receiving the other formula, and in at least one instance the vines were

of a darker green. The two fertilizers differed in the proportions of two ingredients only, the "potato" formula being richer in nitrogen and poorer in phosphoric than the Long Island formula, potash being the same in each. The variation in effect of the two combinations seemed greatest where the smaller quantities were applied which may indicate either that the potato formula did not, in small quantity, furnish enough phosphoric acid or that, in large amounts, it contained an undesirable quantity of nitrogen compounds. "In either case, if future experiments substantiate the results for 1897 the claim that the composition of the crop should be the guide in mixing special fertilizers will be discredited."

**Form of potash.** It has been thought, and sometimes supported by experimental evidence that the use of liberal quantities of muriate of potash tends to

lower the percentage of starch and dry matter in the potato; so chemical analyses were made of tubers from each plat and comparisons made of those receiving potash in the two forms in the hope that light might be thrown upon the question. Taking the average of 16 plats for each manner of treatment, it was found that where sulphate of potash had been used the potatoes produced more of both dry matter and starch than where muriate had been applied. The significance of these results, however, striking as they were, was utterly nullified by the fact that the tubers from the unfertilized plate adjacent to those differently fertilized differed in the same way and to almost exactly the same extent.