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ECONOMY IN USING FERTILIZERS FOR RAISING  
POTATOES.

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L. L. VAN SLYKE.

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GENEVA, N. Y.

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\*Connected with Branch Station in Second Judicial Dept.

†Connected with Fertilizer Control.

NEW YORK AGRICULTURAL EXPERIMENT STATION, }  
Geneva, N. Y., Nov. 25th, 1896. }

HON. CHARLES A. WIETING,

*Commissioner of Agriculture, Albany, N. Y.*

*Sir*:—I have the honor to submit for publication under the laws of 1896, Chapter 231, the results of an experiment concerning the "Economy of using Fertilizers in Raising Potatoes." This subject is a matter of great importance to the farmers of Long Island and the investigation was undertaken at their request.

W. H. JORDAN, Director.

ECONOMY IN USING FERTILIZERS FOR RAISING  
POTATOES.

BY L. L. VAN SLYKE.

SUMMARY.

In 1895 fertilizers were applied at the rate of 1,000 and 2,000 pounds an acre in raising potatoes. A second crop of potatoes was raised on the same ground in 1896 without using fertilizers in order to ascertain to what extent the fertilizers applied in 1895 would benefit the crop of 1896.

The application of 1,000 pounds of fertilizer increased the crop of marketable potatoes 48.4 bushels an acre in 1895 and 39.6 bushels in 1896, the total increase for the two years being 88 bushels. The use of 2,000 pounds of fertilizer increased the yield over the foregoing to the extent of 4.4 bushels in 1895 and 14.1 bushels in 1896, the total increase for the two years being 18.5 bushels.

The application of 1,000 pounds of fertilizer increased the proportion of marketable potatoes 6.8 per cent. in 1895 and 9 per cent. in 1896; while the use of an additional half ton of fertilizer increased the percentage of marketable potatoes over the foregoing to the extent of 1.3 per cent. in 1895 and 2.6 per cent. in 1896.

The use of 1,000 pounds of fertilizer an acre produced an increased yield of marketable potatoes, which, at 50 cents a bushel, made a net gain of \$27.58 in income

during the two years. The use of 2,000 pounds of fertilizer yielded in net increase of income during the two years \$7.12 less than did the application of 1,000 pounds.

In using 1,000 pounds of fertilizer there were added to an acre of soil, on an average, 36.4 pounds of nitrogen, 76.9 pounds of available phosphoric acid, and 90.6 pounds of potash; and twice these amounts in using 2,000 pounds of fertilizer. Adding to these the amount of plant-food already known to be present in the soil and then deducting the quantities removed by the two crops grown, we find that excessive amounts of nitrogen, potash and, particularly, phosphoric acid, were left unused when 2,000 pounds of fertilizer were applied.

Phosphoric acid is probably applied often in uselessly large quantities in raising potatoes, as compared with potash and nitrogen.

The use of over 1,000 pounds of fertilizer an acre under the conditions tried was attended with loss, as compared with the results obtained in using 1,000 pounds of fertilizer.

## INTRODUCTION.

In 1895 several different commercial fertilizers were used in an experiment which had for its object a comparison of these fertilizers for use in raising potatoes and especially a comparison of results obtained by using different amounts of fertilizer. The results were given in detail in Bulletin 93. It was found that the application of 2,000 pounds of fertilizer gave in no case as economical results as did the use of 1,000 pounds.

It was further designed to raise potatoes on this same field in 1896, without use of additional fertilizers, in order to ascertain to what extent the fertilizing materials remaining unused in the soil could be utilized during the second season. The soil is peculiarly adapted to leaching, consisting of light loam, two or three feet deep, underlaid by sand and gravel extending down indefinitely.

The field is located at Northville, L. I. The details of the work were in the hands of Mr. H. L. Hallock, under the supervision of Messrs. Stewart and Serrine, of Jamaica, as representatives of the Station. The same methods were used in growing the crop as in the preceding year.

We will now consider in order the following points :

1. Yield of potatoes.
2. Proportion of marketable potatoes.
3. Relation of yield to cost of fertilizer used.
4. Relation of plant-food applied to that removed by crop.

The table below gives the detailed results secured from each plot with reference to yield and proportion of marketable potatoes during the two years of the experiment.

TABLE SHOWING YIELD OF POTATOES DURING TWO YEARS.

No. of plot.	Pounds of fertilizer used per acre.	Yield of potatoes per acre.		Per cent. of marketable potatoes.		Per cent. of culls.	
		In 1895.	In 1896.	In 1895.	In 1896.	In 1895.	In 1896.
		Bushels.	Bushels.				
1	None.	150.6	113.6	83.8	75.2	16.2	24.8
2	1000	197.3	148.2	88.4	81.8	11.6	18.2
3	1500	188.4	172.7	91.0	83.4	9.0	16.6
4	2000	216.3	167.0	91.6	85.2	8.4	14.8
5	1000	207.5	154.1	91.0	82.8	9.0	17.2
6	1500	197.1	174.9	91.6	85.6	8.4	14.4
7	2000	199.8	149.1	92.3	86.3	7.7	13.7
8	1000	180.0	177.8	88.9	83.4	11.1	16.6
9	2000	183.3	170.3	92.6	86.3	7.4	13.7
10	1000	193.4	160.4	89.2	83.0	10.8	17.0
11	2000	219.2	174.6	92.6	86.2	7.4	13.8
12	1000	204.0	155.8	92.0	85.7	8.0	14.3
13	2000	169.4	170.7	92.3	88.0	7.7	12.0
14	1000	194.5	146.0	91.5	85.6	8.5	14.4
15	2000	187.5	154.7	90.5	85.4	9.5	14.6
16	1000	189.8	140.9	90.6	83.1	9.4	16.9
17	2000	196.3	154.5	92.0	86.1	8.0	13.9
18	1000	193.7	129.0	90.5	83.0	9.5	17.0
19	2000	191.4	150.9	91.7	85.9	8.3	14.1
20	1000	156.9	140.1	89.5	85.8	10.5	14.2
21	2000	158.4	159.9	91.9	89.6	8.1	10.4
22	1000	200.5	140.0	91.5	87.1	8.5	12.9
23	2000	233.1	167.0	92.0	88.6	8.0	11.4
24	1000	201.8	139.4	93.0	85.0	7.0	15.0
25	2000	187.9	144.0	91.5	87.5	8.5	12.5

## I. Yield of Potatoes.

That portion of the foregoing table relating to yield of crop can be summarized in the following manner, taking the average of those plots receiving 1,000 pounds of fertilizer and the average of those receiving 2,000 pounds.

TABLE SHOWING YIELD OF POTATOES FOR TWO YEARS.

Pounds of fertilizer applied per acre.	Bushels of potatoes produced per acre in 1895.			Bushels of potatoes produced per acre in 1896.			Bushels of potatoes produced per acre in two years.		
	Total.	Marketable.	Culls.	Total.	Marketable.	Culls.	Total.	Marketable.	Culls.
	0	150.6	<b>126.2</b>	24.4	113.6	<b>85.4</b>	28.2	264.2	<b>211.6</b>
1000	192.7	<b>174.6</b>	18.1	148.4	<b>125.0</b>	23.4	341.1	<b>299.6</b>	41.5
2000	194.8	<b>179.0</b>	15.8	160.2	<b>139.1</b>	21.1	355.0	<b>318.1</b>	36.9

From this summarized tabular statement, it can be seen that,—

(1st.) In general terms, the unfertilized land produced the smallest crop; the land receiving 1,000 pounds of fertilizer produced a considerably larger crop; and the land receiving 2,000 pounds of fertilizer produced a little larger crop than the one receiving 1,000 pounds.

(2d.) The use of 1,000 pounds of fertilizer increased the whole crop 42.1 bushels per acre in 1895 and 34.8 bushels in 1896, the total increase for the two years being 76.9 bushels.

(3d.) The use of 2,000 pounds of fertilizer increased the yield over the crop receiving 1,000 pounds of fertilizer to the extent of 2.1 bushels per acre in 1895 and 11.8 bushels in 1896, the total increase for the two years being 14 bushels for the additional application in 1895 of 1,000 pounds of fertilizer.

In order to study the effect of the application of fertilizers upon the proportion of marketable potatoes produced, we summarize the detailed results given above in the following tabulated statement.

## 2. Proportion of Marketable Potatoes.

TABLE SHOWING PROPORTION OF MARKETABLE POTATOES PRODUCED.

Pounds of fertilizer applied per acre in 1895.	Per cent. of marketable potatoes produced in 1895.	Per cent. of marketable potatoes produced in 1896.	Average per cent. of marketable potatoes produced in two years.	Average per cent. of culls produced in two years.
0	83.8	75.2	79.5	20.5
1000	90.6	84.2	87.4	12.6
2000	91.9	86.8	89.4	10.6

This tabulated summary indicates that,—

(1st.) In general, the proportion of marketable potatoes increased with the amount of fertilizer used.

(2d.) The use of 1,000 pounds of fertilizer increased the proportion of marketable potatoes 6.8 per cent. in 1895 and 9 per cent. in 1896, the average increase for the two years being about 8 per cent.

(3d.) The use of an additional half ton of fertilizer (or 2,000 pounds an acre) increased the percentage of marketable potatoes slightly over the crop produced by the use of 1000 pounds of fertilizer, the increase being 1.3 per cent. in 1895 and 2.6 per

cent. in 1896, the average increase for the two years being about 2 per cent.

### 3. Relation of Yield to Cost of Fertilizer Used.

We have seen above that the application of fertilizers produced an increased crop having a larger proportion of marketable potatoes. Considered from the standpoint of economy, it is essential that we know how much the increased production cost and whether it was made at a profit or loss. We present only a summarized form of our results covering the two years of work.

TABLE SHOWING FERTILIZER COST OF POTATO CROP.

Pounds of fertilizer applied per acre.	Average cost of fertilizer.	Increased number of bushels of marketable potatoes resulting from use of fertilizer during two years.	Cost of each bushel of marketable potatoes resulting from use of fertilizers.	Bushels of marketable potatoes produced in two years.	Value of marketable portion of crop at 50 cents a bushel.	Net gain from use of fertilizer.
0	0	0	Cents. 0	211.6	\$105.80	—
1000	\$16.37	88	18.6	299.6	\$149.75	\$27.58
2000	\$32.74	106.4	30.8	318.1	\$159.00	\$20.46

The foregoing tabulated results enable us to make the following statements :

(1st.) During the two years the use of 2,000 pounds of fertilizer an acre increased the yield of potatoes 18½ bushels over the yield produced by the use of 1,000 pounds of fertilizer.

(2d.) This increase of 18½ bushels cost \$16.37 or 88½ cents a bushel and was produced at a marked loss.

(3d.) The use of 1,000 pounds of fertilizer an acre increased the crop during two years by about 88 bushels of marketable potatoes over the unfertilized portions.

(4th.) Deducting the cost of 1,000 pounds of fertilizer, we find that there was a net gain of \$27.58 an acre for the two years.

(5th.) The use of 2,000 pounds of fertilizer an acre, as compared with the use of no fertilizer, gave a net gain, during the two years, of \$20.46 an acre.

#### 4. Relation of Plant-Food Supplied to That Removed by the Two Crops.

In the table below we have indicated the amounts of nitrogen, phosphoric acid, and potash applied to each plot and have also calculated the amounts removed by the crop during each of the two years. The amounts of plant-food removed by the crops from plot No. 1, which received no fertilizer, can be regarded as representing the quantity of plant-food in the soil available, under the conditions present, for the potato crop. In discussing the results presented we shall consider each form of plant-food by itself, summarizing the detailed results.

TABLE SHOWING AMOUNTS OF PLANT-FOOD SUPPLIED AND USED DURING TWO YEARS.

No. of plot.	Pounds of nitrogen applied per acre.	Pounds of nitrogen used per acre.		Pounds of available phosphoric acid applied per acre.	Pounds of phosphoric acid used per acre.		Pounds of potash applied per acre.	Pounds of potash used per acre.	
		In 1895.	In 1896.		In 1895.	In 1896.		In 1895.	In 1896.
1	0	24.8	18.7	0	15	11.4	0	46.7	35.2
2	40	32.6	24.5	83.7	19.7	14.8	105.4	61.2	45.9
3	60	31.1	28.5	125.5	18.8	17.3	158.	58.4	53.5
4	80	35.7	27.6	167.4	21.6	16.7	210.8	67	51.8
5	40	34.2	25.4	83.7	20.7	15.4	105.4	64.3	47.8
6	60	32.5	28.9	125.5	19.7	17.5	158	61.1	54.2
7	80	33	24.6	167.4	20	14.9	210.8	62	46.2
8	45	29.7	19.3	62.1	18	17.8	115.5	55.8	55.1
9	90	30.2	28.1	124.2	18.3	17	231	56.8	52.8
10	35.5	31.9	26.5	77.5	19.3	16	75	60	49.7
11	71	36.2	28.8	155	21.9	17.5	150	68	54.1
12	39.5	33.7	25.9	79.2	20.4	15.7	107.5	63.2	48.6
13	79	28	28.2	158.4	16.9	17.1	215	52.5	52.9
14	38.7	32.1	24.1	80.6	19.5	14.6	110	60.3	45.2
15	77.4	30.9	25.5	161.2	18.8	15.5	220	58.1	48
16	33.1	31.3	23.2	58.5	19	14.1	81.2	58.8	43.7
17	66.2	32.4	25.5	117	19.6	15.5	162.4	60.9	47.9
18	36.7	32	21.3	79.2	19.4	12.9	96.7	60	40
19	73.4	31.6	24.9	158.4	19.1	15.1	193.4	59.4	46.8
20	26.1	25.9	23.1	97.8	15.7	14	71.2	49.6	43.4
21	52.2	26.1	26.4	195.6	15.8	16	142.4	49.1	49.6
22	32.9	33.1	23.1	83.5	20	14	61.5	62.2	43.4
23	65.8	38.5	27.6	167	23.3	16.7	123	72.3	51.8
24	32.7	33.3	23	60.4	20.2	13.9	67.1	62.6	43.1
25	65.4	31	23.8	120.8	18.8	14.4	134.2	58.2	44.6

## AMOUNTS OF NITROGEN APPLIED AND REMOVED.

Pounds of fertilizer applied per acre in 1895.		Pounds of nitrogen supplied per acre in fertilizer.	Pounds of nitrogen removed by crop in 1895.	Pounds of nitrogen removed by crop in 1896.	Total number of pounds of nitrogen removed by crops in two years.
None.		None.	24.8	18.7	43.5
1000	Least . . .	26.1	25.9	21.3	—
1000	Greatest .	45.0	34.2	29.3	—
1000	Average .	36.4	31.8	24.5	56.3
2000	Least . . .	52.2	26	23.8	—
2000	Greatest .	90.0	38.5	28.8	—
2000	Average .	72.8	32.1	26.5	58.6

The results which this summarized table present are of exceeding interest and we call attention to the following points :

(1st.) On the plot where no fertilizer was applied, the crop removed from one acre of soil 24.8 pounds of nitrogen the first year and 18.7 pounds the second year, making a total of 43.5 pounds for the two years. This practically represents the amount of nitrogen in the soil available for the potato crop at the time under the conditions prevailing.

(2d.) On the various plots where we applied 1,000 pounds of fertilizer in 1895, we supplied from 26.1 to 45 pounds of nitrogen, the average being 36.4 pounds. In 1895 the crop used from 25.9 to 34.2 pounds of nitrogen, the average being 31.8 pounds. In 1896 the crop used from 21.3 to 29.3 pounds, the average being 24.5 pounds. The total amount of nitrogen removed by these two successive crops amounted to 56.3 pounds an acre.

(3d.) On the various plots where we applied per acre 2,000 pounds of fertilizer in 1895, we supplied from 52.2 to 90 pounds of nitrogen, the average being 72.8 pounds. In 1895 the crop used from 26 to 38.5 pounds of nitrogen, the average being 32.1 pounds; and in 1896 the crop used from 23.8 to 28.8 pounds, the average being 26.5 pounds. The total amount of nitrogen removed by these two successive crops amounted to 58.6 pounds an acre.

(4th.) In the two years the application of 36.4 pounds of ni-

trogen in 1,000 pounds of fertilizer caused a sufficiently increased crop to remove about 13 more pounds of nitrogen than did the crop from the unfertilized soil. More nitrogen was removed during the two years than was added in the fertilizer by about 20 pounds.

(5th.) The application of 72.8 pounds of nitrogen, contained in 2,000 pounds of fertilizer, caused during the two years an increase of crop sufficient to use only 2.3 pounds more of nitrogen than in the case where half the amount was applied. Less nitrogen was removed than was applied by about 14 pounds, leaving about 58 pounds of nitrogen unused, including the soil-nitrogen.

(6th.) If we add the available nitrogen contained in the soil, to that supplied in the fertilizer and then indicate the amounts used each year, we can prepare the following interesting table.

Pounds of fertilizer applied per acre.	Pounds of nitrogen for use of crop at beginning of first year.	Pounds of nitrogen used by first year's crop.	Pounds of nitrogen left for second crop.	Pounds of nitrogen used by second year's crop.	Pounds of nitrogen remaining unused after second year.
0	<b>43.5</b>	24.8	<b>18.7</b>	18.7	<b>0</b>
1000	<b>79.9</b>	31.8	<b>48.1</b>	24.5	<b>23.6</b>
2000	<b>116.3</b>	32.1	<b>83.5</b>	26.5	<b>57.0</b>

It is more than probable that the unfertilized soil would still contain some available nitrogen and would not be completely exhausted, but how much remains we could only tell by further investigation. The amount of nitrogen supplied in 1,000 pounds of fertilizer is not greatly in excess of the crop's needs for two years; but, it is safe to say, more economical results would have been obtained by applying one-half of the amount during each of two years than the whole amount during the first year, particularly on soil which is so apt to lose nitrogen by leaching. Much more, then, would the foregoing statement apply to the case, where we used 2,000 pounds of fertilizer and supplied three times as much as the first crop used. At the end of two years it is almost certain that very little of the applied nitrogen remained within reach of the plant and most of the remaining 57 pounds had been carried far down into the subsoil.

## AMOUNTS OF PHOSPHORIC ACID APPLIED AND REMOVED.

Pounds of fertilizer applied per acre in 1895.		Pounds of available phosphoric acid applied per acre in fertilizer.	Pounds of phosphoric acid removed by crop in 1895.	Pounds of phosphoric acid removed by crop in 1896.	Total number of pounds of phosphoric acid removed by crops in two years.
None	—	None	15.0	11.4	26.4
1000	Least....	58.5	15.7	12.9	—
1000	Greatest.	97.8	20.7	17.8	—
1000	Average.	76.9	19.2	14.8	34.
2000	Least....	117	15.8	14.4	—
2000	Greatest.	195.6	23.3	17.5	—
2000	Average.	160.2	19.5	16.0	35.5

Summarizing this table, we can make the following statements:

(1st.) When no fertilizer was applied, the crop removed from the soil 15 pounds of phosphoric acid the first year, and 11.4 pounds the second year, or a total of 26.4 pounds for the two years. Under the conditions present, this total represents the amount of phosphoric acid available for the potato crops at the time and under the prevailing conditions.

(2d.) When an application was made in 1895 of 1,000 pounds of fertilizer, an average amount of 76.9 pounds of available phosphoric acid was supplied per acre. In 1895, the crop used 19.2 pounds of phosphoric acid and in 1896, 14.8 pounds, making a total of 34 pounds an acre for the two years.

(3d.) When an application was made in 1895 of 2,000 pounds of fertilizer, an average amount of 160.2 pounds of available phosphoric acid was supplied per acre. The first year, the crop removed 19.5 pounds an acre, and the second year, 16 pounds; and, during the two years, 35.5 pounds.

(4th.) When 76.9 pounds of available phosphoric acid were added to the soil, the crop used only 34 pounds or less than half the amount added and only 7.6 pounds more than the amount used by the crop grown on unfertilized soil.

(5th.) When the amount of phosphoric acid applied was increased to 160 pounds an acre, the crop used only 35.5 pounds,

less than one-fourth the amount applied and only 9 pounds more than was removed when no phosphoric acid was added.

(6th.) We will assume that at the beginning of the two years the soil contained not less than 26.4 pounds of available phosphoric acid. Adding this to the applied amounts we can prepare the following tabulated statement :

Pounds of fertilizer applied per acre.	Pounds of phosphoric acid for use of crop at beginning of first year's crop.	Pounds of phosphoric acid used by first year's crop.	Pounds of phosphoric acid left for second year's crop.	Pounds of phosphoric acid used by second crop.	Pounds of phosphoric acid remaining unused after second year.
0	<b>26.4</b>	15	<b>11.4</b>	11.4	<b>0</b>
1000	<b>103.3</b>	19.2	<b>84.1</b>	14.8	<b>69.3</b>
2000	<b>186.6</b>	19.5	<b>167.1</b>	16.0	<b>151.1</b>

While the data do not probably express the complete truth regarding the amount of available phosphoric acid in the unfertilized soil, it is the fertilized soil to which our attention here is called. When we applied 1,000 pounds of fertilizer, we had in the soil nearly six times as much as the first crop used. At the beginning of the second year there was remaining about six times as much as the second crop actually used, and at the end of two years, twice as much phosphoric acid still remained unused as had been used by two crops. When an application was made of 2,000 pounds of fertilizer an acre, there was present for the use of the crop about ten times as much as was used by the first crop. There was left for the second crop ten times as much as it used, and after the removal of two crops, there remained over four times as much phosphoric acid as had been used by two whole crops. The amount of phosphoric acid furnished by the average potato-fertilizer found in the market would, from these considerations, be regarded as containing phosphoric acid in excessive amounts as compared with the actual needs of the crop.

## AMOUNTS OF POTASH APPLIED AND REMOVED.

Pounds of fertilizer applied per acre in 1895.		Pounds of potash applied per acre in fertilizer.	Pounds of potash removed by crop in 1895.	Pounds of potash removed by crop in 1896.	Total number of pounds of potash removed by crops in two years.
None	—	None	46.7	35.2	81.9
1000	Least. . . .	61.5	48.6	40	—
1000	Greatest. .	110.0	64.3	55.1	—
1000	Average.	90.6	59.7	45.1	104.8
2000	Least. . . .	123	49.1	44.6	—
2000	Greatest. .	220	72.3	54.1	—
2000	Average.	181.2	60.4	49.7	110.1

Attention is called to the following points in connection with the table above :

(1st.) When no fertilizer was applied, the crop removed from one acre of soil 46.7 pounds of potash the first year and 35.2 pounds the second year, or a total of 81.9 pounds for the two years. We are justified in saying that this amount represents the minimum amount of potash available for the potato crops at the time grown and under the conditions existing.

(2d.) When an application was made in 1895 of 1,000 pounds of fertilizer, an average amount of 90.6 pounds of potash was supplied per acre. In 1895 the crop used 59.7 pounds of potash and in 1896, 45.1 pounds, making a total of 104.8 pounds an acre for the two years. The two crops removed about 15 pounds more than was applied.

(3d.) When an application was made in 1895 of 2,000 pounds of fertilizer, an average amount of 181.2 pounds of potash was supplied per acre. The first year's crop removed 60.4 pounds of potash, the second crop, 49.7 pounds, and the two crops, 110.1 pounds. The amount of potash applied exceeded that used in two years by over 70 pounds.

(4th.) When we added to the soil 90.6 pounds of potash, the two crops used 23 pounds more potash than when none was applied.

(5th.) When the amount of potash applied was increased to

181.2 pounds an acre, the two crops used only 5 pounds more than when half the amount was applied.

(6th.) During the two years the crops on the unfertilized soil used 81.9 pounds of potash and we will call this the amount available at the beginning of the two years. Adding this amount to the applied amounts and indicating how much was removed and left each year, we can prepare the following tabulated statement :

Pounds of fertilizer applied per acre.	Pounds of potash for use of crop at beginning of first year	Pounds of potash used by first year's crop.	Pounds of potash left for second year's crop.	Pounds of potash used by second crop.	Pounds of potash remaining unused after second year.
0	81.9	46.7	35.2	35.2	0
1000	172.5	59.7	112.8	45.1	67.7
2000	263.1	60.4	202.7	49.7	153.0

When we applied 1,000 pounds of fertilizer, we had in the soil about three times as much potash as the first crop used. At the beginning of the second year, there was more than twice as much as the second crop actually used, and at the end of two years enough still remained unused to meet the demands of another good crop. When we applied 2,000 pounds of fertilizer an acre, there was present for the use of the crop about four-and-one-half times as much as was used by the crop the first season. There was left for the second crop about four times as much as it used ; and after the removal of the second crop, there remained about three times as much as would be required to meet the demands of another crop. We notice that the excessive application of potash was not so great as that of phosphoric acid, but still, in the application of 2,000 pounds of an average potato fertilizer, there is apt to be applied very much more potash than the single crop can possibly use.

When we consider that some farmers on Long Island are in the habit of applying a ton of commercial fertilizer per acre every year in growing potatoes and frequently on the same field for some years succession, we see that one of two results must inevitably follow : First, there will be an accumulation of plant-food, rendering further fertilization unnecessary for a period ; or, second, the unused portions of plant-food will be more or less largely lost by leaching. From the general experience gathered it would appear that the latter result most often occurs.