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THE STATUS OF FERTILIZER TRIALS WITH CORN IN JAMAICA

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ABSTRACT

A summary is given of all the fertilizer investigations on corn which have been carried out in Jamaica from 1938 to 1968. A great deal more experimental detail is included than is usual for a review paper, since little published work is available.

Investigations by Government, the University of the West Indies and the Fertilizer Industry are grouped according to soil type, which forms the basis for discussion and evaluation. The majority of corn fertilizer trials have been located on the bauxite soils — St-Ann Clay Loam and Chudleigh Clay. However, information is also given for corn fertilizer trials on Deepdene Clay, Wirefence Clay Loam, Brysons Clay Loam, Newell Loam, Carron Hall Clay, Belfield Clay, Caymanas Sandy Loam and Caymanas Clay Loam.

INTRODUCTION

Little published information is available on the fertilizer requirements of corn grown in Jamaica. What information is available is usually in the form of Annual Reports or bulletins, no single volume of which gives a complete picture of a fertilizer trial or series of trials.

This paper attempts to summarize and discuss all the fertilizer investigations with corn which have been carried out in Jamaica for the period 1938 to 1968. Because of the scarcity of published material, considerably more experimental detail is included than is usual or desirable for a review paper. The majority of investigations have been undertaken by departments of the Ministry of Agriculture and Lands such as the Agricultural Chemistry Division and Agronomy Division. More recently, however, the Faculty of Agriculture of the University of the West Indies and fertilizer industry representatives have also contributed. Since the soil types upon which corn fertilizer trials have been located vary widely in their method of origin, and in their physical and chemical properties, it would appear advisable that the results should be discussed in relation to soil type. Accordingly, regardless of source of material, all

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investigations on the fertilizer requirements of corn are grouped according to soil type, even though this approach sometimes requires the segmentation of a particular series of investigations involving more than one soil type.

CORN FERTILIZER TRIALS GROUPED ACCORDING TO SOIL TYPE

Fertilizer experiments with corn were first started in Jamaica in 1938, following inception of the Colonial Development Fund Scheme for Fertilizer Investigations with Food Crops. The first information to become available applied to the « red dirt » or bauxite soils of limestone areas.

CHUDLEIGH CLAY LOAM, NO. 73

In experiments conducted at Grove Place in 1938 and 1939, INNES (1) found that only applications of potash gave significant increases in the yield of corn (Appendix 1, Table 1 *a*). The optimum potash application was 2 cwt sulphate of potash per acre, no further increase in yield being given by 4 cwt sulphate of potash per acre.

The influence of potash manuring on yield of corn was partly explained by its effect on increasing the proportion of plants which produced cobs (Appendix 1, Table 1 *b*).

With the decreasing availability of sulphate of potash, interest shifted to the use of muriate of potash. In 1940, an experiment showed that significant increases in yield resulted from an application of 1 cwt muriate of potash per acre (Appendix 1, Table 2). In the same year, subt-reatments of a spacing trial (2) compared sulphate of potash and muriate of potash as sources of potassium. The sub-treatments were (*a*) no manure (*b*) muriate of potash at 200 lb/acre (*c*) sulphate of potash at 240 lb/acre. Statistical analysis (Appendix 1, Table 3) showed that the yield of shelled corn per acre was increased by potassium, but that there was no difference between the effect of muriate of potash and that of sulphate of potash.

No further trials were laid down on this soil type until 1944, when an attempt was made to estimate the effect of farmyard manure (F. Y. M.) applied at different rates and at différent times on a Soya Bean — Corn rotation at Grove Place (3). There were 8 main F. Y. M. treatments, each of which was split to test ploughing in against leaving on the surface. Each treatment was again split to test the effect of adding a fertilizer dressing. The trial was continued for two cycles, the first lasting from 1944 to 1947 and the second from 1948 to 1951. Data for the first cycle are shown in Appendix 1, Tables 4 *a* and 4 *b*. Results from the second cycle confirmed those of the first. It was found that the application of F. Y. M. at rates equivalent to 6,8 or 12 tons per acre per year increased the average yields of corn by 100 to 200 %. There was no apparent advantage gained from ploughing in the manure as compared to leaving it on the surface. Yearly applications of F. Y. M. gave better results than 1 1/2 yearly, 2 yearly or 4 yearly applications of the same total dosage. An NPK mixture of fertilizer (consisting of 4 cwt sodium nitrate, 2 cwt 18 % superphosphate and 1 1/2 cwt muriate of potash per acre annually) gave increases of nearly 200 % in the absence of F. Y. M., and even in the presence of F. Y. M. it gave increases of the order of 50-75 %.

During the period 1951-53, a series of corn fertilizer demonstration experiments was carried out under the supervision of the Agricultural Chemistry Division of the Department of Agriculture (4). There were 5 treatments at each site, as shown in Table 1.

TABLE 1

Treatments used in Corn Fertilizer Demonstration Experiments

Treatment	Nutrients supplied per acre (lb)		
	N	P_2O_5	K_2O
$N_0P_0K_0$	0	0	0
$N_0P_1K_1$	0	108	176
$N_1P_0K_1$	127	0	176
$N_1P_1K_0$	127	108	0
$N_1P_1K_1$	127	108	176

The number of sites on each soil type represented the number of replicates for that soil.

On Chudleigh Clay Loam there were 23 experimental sites which provided data which were considered reliable ([1]). Results are shown in Appendix 1, Table 5. A seasonal difference in the response to nitrogen was apparent, a significant yield increase being obtained in Spring but not in Fall plantings. The application of phesphate fertilizer decreased the yields in the Fall planting of 1953 and may also have resulted in a slight decrease in yield in Spring 1952. The application of potash resulted in a considerable increase in yield. In 1956-57, in an experiment at Grove Place ([2]), the yields of sulphate of ammonia plots were higher than those of urea plots (Appendix 1, Table 6). A later trial on Bryson Clay Loam, however, showed no difference between urea and sulphate of ammonia (Appendix 3, Table 3 *a*).

In the Fall of 1963, a comparison was carried out at Grove Place (7) between corn yields from the standard fertilizer recommended by the Agricultural Chemist (2 cwt each of sulphate of ammonia and muriate of potash) and yields from 500 lb of a 12-18-8 fertilizer (to which 20 lb magnesium and 40 lb manganese were added) plus 150 lb sulphate of ammonia and 150 lb muriate of potash per acre. There was no difference in yield resulting from a difference in fertilizer treatments.

During the 1967-68 season, three experiments were carried out on this soil type as part of the University of the West Indies Regional Field experimental Programme ([3]). The objective of the trials was to asses the response of maize to the application of fertilizers and also to obtain information for the development of soil fertility vs. crop response correlation curves. The variety X304, developed by Pioneer Hi-

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([1]) Unpublished. C. W. HEWITT, V. A. L. SARGEANT and H. PAYNE. Report on Corn Fertilizer Demonstration Experiments in Jamaica. Department of Agriculture, Jamaica

([2]) Unpublished. Department of Agriculture, Jamaica.

([3]) Unpublished. G. W. MORGAN. Report on the U. W. I. Maize Soil Fertility Experiments, Jamaica. Regional Field Experimental Programme, Department of Soil Science.

Bred Corn Company was used at all sites. The design was a central composite type with 17 treatments.

The levels of nitrogen, phosphorus and potassium tested are shown in Table 2.

TABLE 2*

Nitrogen		Phosphorus		Potassium	
Level	Lb N/Ac.	Level	Lb P_2O_5/Ac.	Level	Lb K_2O/Ac.
N_0	0	P_0	0	K_0	0
N_1	10.4	P_1	7.0	K_1	14.4
N_2	40.0	P_2	27.0	K_2	55.0
N_3	69.6	P_3	47.0	K_3	95.7
N_4	80.0	P_4	54.0	K_4	110.0

Statistical analyses were only possible for two of the experiments on this soil type. Results of the experiments at Keynsham and at Grove Place are shown in Appendix 1, Table 7.

No real difference in yield could be related to any treatment.

DISCUSSION

The application of potassium appears to be the main requirement for increased yields of corn on the brown bauxite soil, Chudleigh Clay Loam. This conclusion is in agreement with the low levels of extractable potassium usually obtained with this soil. The most economic level of application has not been closely fixed, but would appear to lie between 67 and 134 lb K_2O per acre.

Response to nitrogen is less frequent and more variable. One series of trials indicates that response is influenced by season, increased yields being obtained in Spring but not in Fall plantings.

In no trial has a response been obtained from application of phosphorus, and in one series of trials a significant depression in yield was obtained. Lack of response to applied phosphorus, despite medium-low extractable soil phosphorus levels, may be explained by fixation of the applied phosphorus in the surface soil by iron and aluminium, since in all trials phosphorus was applied to the soil surface usually several weeks after planting. It is difficult, however, to explain a depression in yield, unless the applied phosphorus reacted with another nutrient, for example zinc, to reduce its availability below a critical level. Despite the relatively large number of trials with corn on this soil type, it might be desirable to lay down additional trials involving the placement of phosphate at time of planting.

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* Adapted from « Report on the 1967 U. W. I. Maize Fertility Experiments, Jamaica », by G. W. MORGAN.

During the period 1951-53, reliable data were obtained for 60 sites where corn fertilizer demonstration plots were laid down on this red bauxite soil ([1]). The treatments used on these plots are shown in Table 1. Appendix 2, Tables 1 *a* and 1 *b* contain yield data tabulations and significant differences for acid and alkaline red bauxite soils respectively. The relationship between the original nutrient status of the soil and response to fertilizer is also indicated in these Tables.

On acid red bauxite soils there was no response to the application of nitrogen. On Alkaline soils, however, nitrogen increased the yield of shelled corn. On acid soils, the application of phosphorus was associated with a highly significant increase in the yield of corn. This yield increase was independent of the initial phosphate status of the soil. On alkaline soils, however, the effect of phosphate fertilizer seemed to be related to the initial phosphate status of the soil. Alkaline soils with extractable phosphorus within the limits 0-30 p. p. m. P_2O_5 (Truog's Method) responded well to applications of phosphate fertilizer. The yield of corn on alkaline soils with a higher phosphate status (30-60 p. p. m. P_2O_5) was not influenced by the application of phosphorus. If the data for all alkaline soils are considered together, the yield of corn is not related to applications of phosphate fertilizer.

Potash fertilization increased the yield of corn on both acid and alkaline red bauxite soils. Regardless of soil reaction, applied potash increased yields to a greater extent on soils containing less than 80 p. p. m. K_2O than on soils with a higher potash status.

In the 1958-59 season, a fertilizer trial was carried out at Goshen on St-Ann Clay Loam, one of the two arable soils present on this farm (6). This experiment was one of a series of trials planned to determine the fertilizer requirements of the farm on which yields were poor despite the use of fertilizer. The design was a 3 (^{3}) NPK factorial one, with plots split for nitrogen applied all at planting or nitrogen applied half at planting and half at the early tasselling stage. Results are contained in Appendix 2, Table 2. The population at reaping for the upper level of application of potash was lower than that of both the control level and the lower level. The number of ears reaped was greater for the upper level of phosphate application than for the nophosphorus level. However, there were no apparent responses in either the weight of ears or the weight of grain to any of the levels of application of the fertilizer used. There was no response in terms of any of the factors measured to the method of application of nitrogen. There was no indication of a significant interaction either between the fertilizers or between the method of application and the fertilizers.

In the Spring of 1959, a trial was laid down at Southampton on land owned by Kaiser Bauxite Company (6). The design was the same as for the Goshen trial. Results are contained in Appendix 2, Table 3. Despite low yields resulting from a severe outbreak of the Fall armyworm, highly significant yield increases were obtained from the application of either 1 or 2 cwt muriate of potash per acre ; however, there was no difference between the yields at these two levels of potash. There was no

([1]) Unpublished. C. W. HEWITT, V. A. L. SARGEANT and H. PAYNE. Report on Corn Fertilizers Demonstration Experiments in Jamaica. Department of Agriculture, Jamaica.

response to applications of nitrogen or phosphate, and there was no yield difference resulting from putting on nitrogen in one or in two applications.

In the Fall of 1967, 3 experiments were laid down on this soil type as part of the U. W. I. Regional Field Experimental Programme (1). The objectives design and treatments used were the same as for Chudleigh Clay Loam. Statistical analyses were only possible for two of the experiments on this soil type (Appendix 2, Table 4) and no real differences could be related to any treatment.

Discussion

Additional potassium appears to be the major mutrient requirement for corn grown on the red bauxite soil, St-Ann Clay Loam. As with brown bauxite soils, the most economic potash application would seem to lie between 67 and 134 lb K_2O per acre.

Yield responses to nitrogen and phosphorus have only been obtained in the corn demonstration series. In the case of nitrogen, response appears to have been restricted to the alkaline sites of this soil type, while in the case of phosphorus, response was largely limited to the acid sites.

The soil is low in extractable phosphorus and symptoms of phosphorus deficiency are often observed in the field especially in the early stages of growth. Lack of consistent yield response to phosphorus is difficult to explain, despite the high phosphate-fixing capacity of the soil, since in some of the trials e. g. those at Goshen and Southampton, the phosphate was placed in a band near the root zone. Other crops on the same soil type have responded greatly to the application of phosphate.

Deepdene clay, no. 98

In the Fall of 1966 an experiment was laid down on a soil tentatively mapped as Deepdene Clay as part of a co-operative programme between Trelawny Estates and Antilles Chemical Company.

The design was a 3 (3) NPK factorial. The levels of fertilizer used are shown in Table 3.

TABLE 3

Levels of Nitrogen, Phosphorus and Potassium

Lbs N/Per acre			Lbs P_2O_5 Per acre			Lbs K_2O Per acre		
N_1 0	N_2 50	N_3 100	P_1 0	P_2 50	P_3 100	K_1 0	K_2 67	K_3 134

(1) Unpublished. G. W. Morgan. Report on the 1967 U. W. I. Maize Soil Fertility Experiments, Jamaica. Regional Field Experimental Programme, Department of Soil Science.

The total yields for each factor level (Bushels of shelled corn per acre) are contained in Appendix 3, Table 1 *a*.

Analysis of variance showed that the application of 50 lbs N per acre and 100 lbs N per acre resulted in higher yields than the no-nitrogen level. Yield from the application of 100 lbs P_2O_5 per acre was greater than that from 50 lbs P_2O_5 per acre, which in turn was greater than that from the no-phosphorus level. The upper level of potash was associated with higher yields than the lower potash level. There was a significant interaction between nitrogen and phosphorus.

This trial was followed in the 1967-68 season by another experiment (1) on an associated soil which appears transitional between Deepdene Clay and Bryson Clay Loam, Map No. 207. The design was a 3 (3) NPK factorial, and the levels of fertilizer used are shown in Table 4.

TABLE 4

Levels of Nitrogen, Phosphorus and Potassium

Lbs N per acre			Lbs P_2O_5 per acre			Lbs K_2O per acre		
N_1 60	N_2 90	N_3 120	P_1 50	P_2 100	P_3 150	K_1 0	K_2 70	K_3 140

The results are contained in Appendix 3, Table 1 *b*. The analyses of variance disclosed no significant differences in yield between the levels of nitrogen, phosphorus and potassium, nor between the NP, NK, PK and NPK interactions. Duncans Multiple Range Test was also done for all factors and no significant differences were found.

In this second trial, the mean yields of shelled corn for all treatments were very low, ranging from 23.7 bushels to 33.1 bushels per acre. The low yields and lack of response to treatment may be attributed to severe drought conditions during the 7th to 31st days after planting and again during the 54th to 85th days after planting.

WIREFENCE CLAY LOAM, MAP NO. 32

In the Fall of 1967, two experiments were laid down on Wirefence Clay Loam as part of the U. W. I. Regional Field Experimental Programme (2). The objectives, design and treatments used are the same as for Chudleigh Clay Loam. Statistical analysis was only possible for the site at Harewoods, and the results are contained in Appendix 3, Table 2. No real difference could be related to any treatment.

(1) Unpublished. H. PAYNE. Corn Fertilizer Trials at Trelawny Estates. Antilles Chemical Company Jamaica.

(2) Unpublished. G. W. MORGAN. Report on the 1961 U. W. I. Maize Soil Fertility Experiments, Jamaica. Regional Field Experimental Programme, Department of Soil Science.

BRYSON CLAY LOAM, MAP NO. 207

Sow corn yields on this soil type at Goshen, despite the use of fertilizers, led to a fertilizer trial in the 1956-57 season comparing 4 levels on nitrogen and 2 levels of potash. The plots were split for source of nitrogen, urea being compared with sulphate of ammonia.

No differences in yield resulted from differences in fertilizer treatment (Appendix 3, Table 3 *a*). The source of nitrogen did not influence yield, there being no difference in the dry cob weights of the urea and sulphate of ammonia plots.

Continued lack of response to fertilizer led to another trial in the 1957-58 season, testing 3 levels each of nitrogen, phosphorus, potassium, calcium and magnesium [1]. The calcium was harrowed in before planting, while, N, P, K and Mg were applied at planting in a band a few inches from the plants.

Extremely poor yields and high standard error caused this trial to be most inconclusive, although the yield at the highest nitrogen level was 119 % of that of the control (Appendix 3, Table 3 *b*).

In order to test whether a micronutrient deficiency might be limiting yields on this soil type, a green-house pot culture experiment using corn as the indication plant was laid down in the Fall of 1959 [2]. The subtractive techniques used by Webb in Gambia was adopted. There were 14 treatments each replicated 4 times. The objective of this trial was to determine the potential of the soil type Bryson Clay Loam to supply each of 12 essential mineral elements, so as to make possible the national planning of corn fertilizer field trials at Goshen. The influence of any particular nutrient or yield of corn was tested by the omission of that nutrient from a complete nutrient solution.

The results of statistical analysis are shown in Appendix 3, Table 3 *c*. Phosphorus was the nutrient, the omission of which was associated with the greatest reduction in weight of the whole corn plant. Other nutrients the omission of which appeared to be associated with yield reductions were nitrogen, molybdenum, and possibly also boran, zinc and potassium.

The results of this greenhouse works have not yet been tested in the field. It is suggested that future trials on Bryson Clay Loam should involve the testing of the elements listed.

NEWELL LOAM, MAP NO. 67

In the Spring of 1959, a corn fertilizer trial was laid down on this soil type at Southampton, property of Kaiser Bauxite Company (6). A 3 [3] N, P, K factorial design was adopted, with plots split for nitrogen applied all at planting or nitrogen applied half at planting and half at the early tasselling stage.

Results of statistical analysis are shown in Appendix 3, Table 4.

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[1] Unpublished data. Agricultural Chemistry Division, Ministry of Agriculture and Lands, Jamaica.

[2] Unpublished data. H. Payne and R. Chen. Pot Culture Experiment with Corn on Bryson Clay Loam. Agricultural Chemistry Division, Ministry of Agriculture and Lands, Jamaica.

The plant population at reaping was significantly higher in the presence of applied potash, but was not affected by either nitrogen or phosphate. Application of both phosphate and potash increased the number of cobs per acre, the weight of cobs per acre and the weight of shelled corn per acre. There was no advantage in increasing the phosphorus and potassium levels above 1 1/2 cwt of 18 % superphosphate and 1 cwt of muriate of potash respectively. There was no response to the application of nitrogen. However, nitrogen applied in two applications appeared to give a greater number and weight of cobs, as well as weight of grain, than nitrogen applied in one application only at planting. There was no evidence of interaction between any of the treatments.

Carron Hall clay, MPA No. 94

In the 1951-53 corn fertilizer demonstration series [1], highly significant increases in the yield of corn were obtained by the application of nitrogen and phosphate fertilizers (Appendix 3, Table 5). There was no response to potash on this soil type, soil analytical data for which indicate a high to medium potash status and a low to medium low phosphate status.

Belfield clay, Map No. 41

In the 1951-53 corn fertilizer demonstration series, the application of phosphate fertilizers resulted in a considerable increase in corn yields (viz. at 1 % Level). An increase in yield was also obtained by the use of nitrogen (viz. at 5 % Level) — Appendix 3 Table 6. There was no response to potash on this soil, analytical data for which indicate a medium high to medium potash status and low to medium phosphate status.

Soil regions

The 1951-53 corn fertilizer demonstration series also provided information on the fertilizer requirements of soil regions in Jamaica where there was an insufficient number of plots on any particular soil type for statistical analyses to be carried out for each soil. For example, striking responses to application of potash were obtained in the Lower Trelawny regions, in the Duncans — Clarks Town — Duanvale districts (4).

Caymanas sandy loam, Map No. 128 and Caymanas clay loam, Map No. 127

Until recently, no fertilizer trials with corn had been carried out on irrigated recent alluvial soils. In the Spring of 1965, an experiment with Sweet Corn was laid

[1] Unpublished. C. W. Hewitt, V. A. L. Sargeant and H. Payne. Report on Corn Fertilizer Demonstration Experiments in Jamaica. Department of Agriculture, Jamaica.

down at Twickenham Park on the soil type Caymanas Sandy Loam ([2]). The design was a 2^4 factorial, testing Zinc, manganese, magnesium and phosphorus, and a blanket application of nitrogen and potassium was applied. Results are contained in Appendix 3, Table 7. The application of 12 lb. Zinc Sulphate per acre was the only treatment to influence yields, increasing the total number and the total weight of ears obtained at the first reaping.

In the Fall of 1966 and of 1967, two trials were laid down at the Tropical Research Station of Pioneer Hi-Bred Corn Company on the recent alluvial soils Caymanas Sandy Loam and Caymanas Clay Loam respectively ([1]). These trials were carried out as a co-operative project between Pioneer Hi-Bred Corn Company and Antilles Chemical Company. The variety of field corn used was the Pioneer hybrid, X304.

In the first trial, three levels each of nitrogen, phosphorus and potassium were tested, each plot being split for the presence and absence of zinc. The levels of each factor are shown in Table 5.

TABLE 5

Lbs N per acre			Lbs P_2O_5 per acre			Lbs K_2O per acre			Lbs $ZnSO_4$/ac.	
N_1 75	N_2 125	N_3 175	P_0 0	P_1 50	P_2 100	K_0 0	K_1 67	K_2 134	Zn_0 0	Zn_1 15

The results of statistical analysis are contained in Appendix 3, Table 8 *a*.

Higher yields were obtained from the application of 125 lb and 175 lb of nitrogen than from 75 lb of nitrogen. There was no advantage in increasing the nitrogen application above 125 lb N. There were no responses to phosphorus, potassium nor zinc.

The second trial involved the testing of four levels of nitrogen and two each of phosphorus and potassium, each plot being split for two methods of application of fertilizer. The levels of each factor are shown in Table 6.

TABLE 6

Lbs N/acre				Lb P_2O_5/acre		Lb K_2O/acre		Method of Fertilizer Application	
N_1 125	N_2 150	N_3 175	N_4 200	P_1 0	P_2 77	K_1 0	K_2 67	M_1 Single Preplant Broadcast of P & K	M_2 2 Applications. Preplant Broadcast & in row @ planting

([2]) Unpublished Report H. PAYNE. Nutritional Studies on Caymanas Sandy Loam. Agricultural Chemistry Division, Ministry of Agriculture and Lands, Jamaica.

([1]) Unpublished data. H. PAYNE, Antilles Chemical Company, and S. SEHGAL, Pioneer Hi-Bred Corn Company.

The results of statistical analysis are contained in Appendix 3, Table 8 *b*.

The analysis of variance showed no significant differences in yield between the levels of nitrogen, phosphorus and potassium, nor between the methods of application of the fertilizer. There was no significant interaction between any of the treatments.

Discussion and conclusions

The response of corn to applications of fertilizer has varied greatly according to soil type.

Nitrogen applications as high as 125 lb N per acre may be economic on recent alluvial soils, but 50-75 lb N per acre would appear adequate for the majority of soils. Response to nitrogen varies a great deal, and may depend on a number of factors such as variety of corn, season of planting, period of cultivation and whether land has been in pasture. There may be little or no response to nitrogen under certain conditions.

With the exception of the recent alluvial soils, the majority of soils upon which experiments have been located are low in extractable soil phosphorus and might be expected to respond to phosphorus. Response to phosphate application, however, has been inconsistent.

Although responses have occurred on soils such as Belfield Clay and Carron Hall Clay, there has been no response on the brown bauxite soil and only occasional response on red bauxite soils. It is significant that in the majority of trials, phosphorus has been applied to the soil surface several weeks after planting. Under these conditions, response to phosphorus is unlikely on soils of high phosphate-fixing capacity. It is suggested that additional trials on soils high in iron and aluminium should be carried out, involving the placement of phosphorus near the root zone at time of planting. It is also possible that greater response to nitrogen may be obtained on these soils if phosphate is placed, because of a nitrogen-phosphorus interaction.

Response to potassium has followed the anticipated trend, soils testing low in this nutrient generally respond well.

Acknowledgments

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APPENDIX I

Data for Fertilizer Trials on Chudleigh Clay Loam, Map No. 73

TABLE 1 *a*

Manurial treatment	Yield in Bushels per acre			
	Spring '38	Autumn '38	Spring '39	Total increase over three crops
Control (No Potash)	20.0	12.0	10.5	—
2 cwt Sulphate of Potash/Ac.	26.0	16.6	53.0	53.1
4 cwt — —	25.0	16.4	56.0	54.9
Significant Difference	5.2	3.3	3.7	—

TABLE 1 *b*

Manurial Treatment	No. of plants/plot		No. of plants produced as % of seed sown	No. of cobs/plot	No. of cobs per plot as % of seed sown
	Theoretical	Actual			
No Potash	506	222	43.8	74	19.5
2 cwt Sulphate of Potash/acre	506	349	68.9	228	60.2
4 cwt — —	506	340	67.1	222	58.6
Significant Difference		24	4.7	23	4.6

TABLE 2

Manurial treatment (cwts Muriate of Potash/acre)	Yield of maize (Bushels per acre)
0	35.8
1	46.1
3	43.1
Significant Difference	6.3

TABLE 3

Manurial treatment	No. of cobs/acre	Net yield of shelled corn (Bushels/acre)
No Manure	9 080	31.6
Muriate of Potash	10 248	41.2
Sulphate of Potash	10 097	42.2
Significant Difference (.05 Level)	629	2.8

TABLE 4 *a*

F. Y. M. treatment	Yield of corn (lb/acre)
1) 6 Tons/acre each year	2 824
2) 48 Tons/acre every 4 years	2 808
3) 24 Tons/acre every 2 years	2 597
4) 18 Tons/acre every 1 1/2 years	2 540
5) 12 Tons/acre every 1 1/2 years	2 410
6) 24 Tons/acre every 4 years	2 408
7) 12 Tons/acre every 2 years	2 328
8) Control	1 918

TABLE 4 *b*

Fertilizer treatment	Yields (Bushels/acre) Method of applying F. Y. M.		Total
	Ploughed In	Left on Surface	
No Fertilizer	34.09	31.10	32.59
With Fertilizer	50.83	48.61	49.72
Total	42.46	39.86	41.16

Minimum difference for significance between methods of applying farmyard manure = 2.08 bushels.

TABLE 5

Mean Yield of Dry Shelled Corn in Bushels per Acre

Soil group : Potash status 0-90 p. p. m. K_2O	N_0	N_1	P_0	P_1	K_0	K_1	Sig. Dif.	
							.05 Level *	.01 Level **
All 3 Seasons	42.80	48.47	48.47	42.99	38.84	52.42**	6.01	8.00
Spring 1952	42.16	52.19**	48.02	46.33	42.83	51.52**	6.62	8.89
Fall 1953	46.38	47.34	53.15	40.58*	40.29	53.43*	11.01	15.23

TABLE 6

Yield in lb/acre		Significant Difference	
Sulphate of ammonia	Urea	.05 Level	.01 Level
3 844	3 436	274	377

Table 7

Results of 1967 U. W. I. Maize Soil Fertility Experiments at Keynsham and Grove Place

Treatment NPK Levels	Yield of shelled maize (15.5 % moisture) (lb/acre)	
	Keynsham	Grove place
111	2 596	2 850
113	3 685	2 850
131	3 430	3 920
133	3 703	3 394
311	2 495	3 975
313	3 340	4 501
331	2 487	3 902
333	3 067	3 884
022	3 703	4 138
422	2 813	3 666
202	2 360	4 048
242	3 285	4 257
220	2 565	3 848
224	3 013	3 594
222	2 686	3 503
222	3 503	4 229
222	2 105	3 430

Appendix 2

Data for Fertilizer Trials on St. Ann. Clay Loam, Map, N_o 78

Table 1 *a*

Acid Soils-Mean Yield of shelled Corn (Bushels per Acre)

Soil group	N_0	N_1	P_0	P_1	K_0	K_1	Sig. Dif.	
							.05 Level *	.01 Level **
All Acid Soils..................	26.49	25.98	22.95	29.52**	22.40	30.07**	4.14	5.50
Acid Soils with Potash status 35-80 p. p. m. K_2O	26.83	25.90	24.53	29.20*	21.04	31.69*	5.53	7.50
Acid Soils with Potash status 80-160 p. p. m. K_2O	29.88	32.44	24.87	36.46*	30.21	32.12	7.83	10.82
Acid Soils with Phosphate status 0-30 p. p. m. P_2O_5..............	24.92	23.85	21.14	27.63*	20.79	27.99**	5.03	6.69
Acid Soils with Phosphate Status 30-60 p. p. m. P_2O_5............	25.40	24.04	20.04	29.40*	20.00	29.44**	8.44	11.83

TABLE I b

Alkaline Soils-Mean Yield of Shelled Corn (Bushels per Acre)

Soil group	N_0	N_1	P_0	P_1	K_0	K_1	Sig. Dif. .05 Level *	Sig. Dif. .01 Level **
All Alkaline Soils	27.51	34.25**	29.38	32.38	27.16	34.60**	4.12	5.46
Alkaline Soils with Potash Status 35-80 p. p. m. K_2O	27.01	31.23*	27.19	31.05	25.00	33.24**	4.04	5.37
Alkaline soils with Potash Status 80-160 p. p. m. K_2O	32.40	50.40*	43.00	39.80	37.08	45.72	16.90	23.70
Alkaline Soils with Phosphate Status 0-30 p. p. m. P_2O_5	26.86	32.57*	26.54	32.89*	27.39	32.04	4.78	6.38
Alkaline Soils with Phosphate Status 30-60 p. p. m. P_2O_5	29.56	34.96	34.35	30.17	23.21	41.31*	13.69	19.19

TABLE 2

Corn fertilizer Trial-Goshen

	N_0	N_1	N_2	P_0	P_1	P_2	K_0	K_1	K_2	Sig. Dif. .05 level	Sig. Dif. .01 level	A_1	A_2	Sig. Dif. .05 level	Sig. Dif. .01 level
Population at reaping Plants/acre	17 289	17 276	16 691	17 188	16 805	17 262	17 457 *	17 316 *	16 482 *	720	1 090	17 177	16 993	806	1 099
No of ears reaped per acre	10 332	10 177	9 808	9 579 *	10 144	10 594 *	9 774	10 715	9 828	959	1 453	10 280	9 931	597	814
Weight of ears reaped cwts/acre	33.76	33.21	32.85	31.95	33.25	34.62	31.45	34.74	33.63	3.30	4.84	33.67	32.90	1.56	2.12
Weight of grain corrected to 13 % moisture contents (cwts/acre)	22.04	21.73	21.13	20.78	21.38	22.74	20.57	22.42	21.91	2.12	3.21	21.76	21.50	1.08	1.47

* Indicate difference significant at .05 level.

TABLE 3

Corn Fertilizer Trial on St-Ann Clay Loam-Southampton

	N_0	N_1	N_2	P_0	P_1	P_2	K_0	K_1	K_2	Sig. Dif. .05 *	Sig. Dif. .01 **	A_1	A_2	Sig. Dif. .05	Sig. Dif. .01
Population at reaping plants/acre	12 573	12 015	12 139	12 181	12 294	12 251	11 415	12 387	12 926	950	1 439	12 113	12 361	664	904
No of cobs/acre	6 266	6 483	6 256	5 883	6 287	6 835	3 185	8 045**	7 776**	2 228	3 375	6 435	6 229	1 026	1 403
Weight of cobs cwt/acre	9.47	9.93	8.54	8.10	9.04	10.82	3.15	12.38**	12.42**	2.74	4.15	9.07	9.56	1.72	2.35
Weight of grain cwt/acre	7.30	7.88	6.79	6.27	6.93	8.78	2.55	9.51**	9.91**	2.63	3.97	7.28	7.37	1.68	2.29

Table 4

Results of 1967 U. W. I. Maize soil fertility experiments at Lawrence Park & Cobbla

Treatment NPK Levels	Yield of shelled maize (15.5 % moisture) in lb per acre	
	Lawrence park	Cobbla
111	1 216	653
113	1 144	908
131	1 125	1 343
133	1 851	1 561
311	563	1 924
313	1 144	708
331	998	1 089
333	1 016	1 198
022	799	1 398
422	1 053	1 307
202	962	2 432
242	1 261	1 688
220	1 398	1 615
224	1 397	1 180
222	1 271	1 016
222	599	1 398
222	1 198	1 543

Appendix 3

Data For Fertilizer Trials on Miscellaneous Soil Types

Table 1 *a*

Data for Deepdene Clay, Map No. 98
Total Yields for each factor level (Bushels of shelled Corn per acre)

N_1	N_2	N_3	P_1	P_2	P_3	K_1	K_2	K_3	Sig. Dif. .05 *	Sig. Dif. .01 **
1 281.5	1 710.0**	1 848.6**	1 086.9	1 699.2**	2 054.0**	1 581.1	1 530.8	1 728.2*	154.03	204.28

Table 1 *b*

Data for Deepdene Clay-Bryson Clay Loam (Transition Soil)
Total yields for each factor level (Bushels of shelled corn per acre)

N_1	N_2	N_3	P_1	P_2	P_3	K_1	K_2	K_3	Sig. Dif. .05	Sig. Dif. .01
1 024.90	986.80	1 055.30	1 008.20	1 017.70	1 041.10	1 010.70	980.80	1 075.50	101.59	134.37

TABLE 2

Data for Wirefence Clay Loam, Map No. 32
Results of 1967 U. W. I. Maize Soil Fertility Experiment at Harewoods

Treatment NPK Levels	Yield of shelled maize (15.5 % moisture) in lb per acre
111	2 015
113	2 559
131	2 105
133	2 015
311	3 539
313	2 233
331	2 759
333	3 176
022	1 634
422	1 978
202	1 035
242	3 412
220	3 158
224	1 797
222	3 322
222	2 142
222	3 322

TABLE 3 *a*

Data for Bryson Clay Loam, Map. No. 207
Urea vs. Sulphate of Ammonia Trial on Corn
Dry Yield on Cob in lbs per acre

N_0	N_1	N_2	N_3	Sig. Dif.		K_0	K_1	Sig. Dif.		Sulphate of Amm.	Urea	Sig. Dif.	
				.05	.01			.05	.01			.05	.01
1 908	1 667	1 969	1 754	301	411	1 747	1 902	213	219	1 827	1 822	176	239

TABLE 3 *b*

Data for Bryson Clay Loam, Map. No. 907
Corn Fertilizer Experiment-Goshen

	N_0	N_1	N_2	P_0	P_1	P_2	K_0	K_1	K_2	Ca_0	Ca_1	Ca_2	Mg_0	Mg_1	Mg_2	Sig. Dif.	
																.05 *	.01
Yield in cwt/acre (on cob)	2.63	2.93	3.13*	2.90	2.88	2.92	2.89	2.87	2.93	2.93	2.82	2.95	2.85	3.07	2.78	.46	.63
Yiled expressed as percentage of control yield	100	111	119	100	92	101	100	99	101	100	96	101	100	108	98		

TABLE 3 c

Pot Culture Experiment with corn on Bryson Clay Loam

	-S	-Ca	-Cu	-Fe	-Mg	-B	-Zn	-Mo	-K	O (Complete (Nutrient)	-N	W (Water) only	-P	Sig. Dif.	
														.05	.01
Fresh Weight (g/pot)	158.53	150.08	139.10	133.58	133.13	116.50	115.98	109.30	108.23	101.63	73.88	38.33	35.95	45.27	58.61
Oven Dry Wt. (g/pot)	31.05	32.33	28.55	26.83	29.58	23.33	23.95	23.35	24.13	23.20	17.70	8.38	7.65	8.98	11.62

TABLE 4

Corn Fertilizer Trial on Newell Loam-Southampton

	N_0	N_1	N_2	P_0	P_1	P_2	K_0	K_1	K_2	Sig. Dif.		A_1	A_2	Sig. Dif.	
										.05	.01**			.05*	.01**
Population at reaping plants/acre	12 863	12 139	11 912	11 808	12 977	12 129	9 771	13 597**	13 545**	1 529	2 316	12 113	12 485	1 042	1 421
No. of cobs/acre........	6 752	6 587	5 832	4 353	7 310**	7 507**	2 192	8 954**	8 024**	1 069	1 619	5 670	7 104**	929	1 267
Weight of cobs cwt/acre.	9.59	9.89	8.50	5.31	11.44**	11.22**	2.35	13.58**	12.05**	2.37	3.59	8.45	10.20**	1.27	1.74
Weight of grain cwt/acre	7.91	7.90	6.86	4.10	9.66**	8.91**	2.13	11.00**	9.54**	2.35	3.56	6.86	8.25*	1.19	1.63

A_1 Nitrogen put on in one application, i. e. the full amount at time of planting.
A_2 Nitrogen put on in two applications, i. e. half at time of planting and the other half at tasselling.

TABLE 5

Data for Carron Hall Clay, Map. No. 94
Mean Yield of Dry Shelled Corn in Bushels/acre

N_0	N_1	P_0	P_1	K_0	K_1	Significant Difference	
						.05 Level*	.01 Level**
33.00	46.96**	30.79	49.17**	41.78	38.19	7.26	9.72

TABLE 6

Data for Belfield Clay, Map. No. 41

N_0	N_1	P_0	P_1	K_0	K_1	Significant Difference	
						.05 Level*	.01 Level**
25.94	37.90*	25.25	38.60**	35.30	28.55	9.77	13.19

TABLE 7

Data for Caymanas Sandy Loam
Yield of Sweet Corn at two levels each of Zn, Mn, Mg and P

Assessment (Per acre)	Treatments								Sig. Dif.	
	Zn_0	Zn_1	Mn_0	Mn_1	Mg_1	Mg_0	P_0	P_1	.05	.01
1. No. of Experimental Plants	41 200	41 110	41 609	40 701	41 200	41 110	41 382	40 928	1 260	1 696
2. No. of Gr. 1 Ears : 1st Reaping	9 846	12 478	11 934	10 391	11 934	10 391	12 115	10 209	2 987	4 023
3. No. of Gr. 1 Ears : 2nd Reaping	1 906	1 588	2 133	1 361	1 770	1 724	1 770	1 724	1 014	1 366
4. No. of Gr. 1 Ears : 1st & 2nd Reaping	11 752	14 066	14 066	11 752	13 703	12 115	13 885	11 934	3 527	4 749
5. Wt. of Gr. 1 Ears (lb) : 1st Reaping	3 653	4 542	4 424	3 771	4 379	3 816	4 474	3 721	1 151	1 551
6. Wt. of Gr. 1 Ears (lb) : 2nd Reaping	707	611	818	500	705	613	616	702	385	519
7. Wt. of Gr. 1 Ears (lb) : 1st & 2nd Reaping	4 360	5 153	5 242	4 271	5 084	4 429	5 090	4 423	1 340	1 805
8. Total No. of Ears : 1st Reaping	15 291	19 194	17 560	16 925	18 740	15 745	17 651	16 834	3 526	4 748
9. Total No. of Ears : 2nd Reaping	7 623	6 942	7 941	6 625	7 623	6 942	7 759	6 806	1 575	2 121
10. Total No. of Ears : 1st & 2nd Reaping	22 914	26 136	25 501	23 550	26 363	22 688	25 410	23 640	4 528	6 098
11. Total Wt. of Ears (lb) : 1st Reaping	5 135	6 443	6 001	5 577	6 318	5 259	6 024	5 554	1 269	1 709
12. Total Wt. of Ears (lb) : 2nd Reaping	2 083	1 962	2 282	1 763	2 183	1 862	2 086	1 959	552	744
13. Total Wt. of Ears (lb) : 1st & 2nd Reaping	7 217	8 405	8 283	7 340	8 501	7 122	8 110	7 514	1 623	2 185

TABLE 8 *a*

Data for Caymanas Sandy Loam
Total Yields (lbs Shelled Corn Per Plot)

N_1	N_2	N_3	P_0	P_1	P_2	K_0	K_1	Zn_0	Zn_1
508.36	544.91*	555.12*	527.54	550.42	550.43	538.84	538.81	807.30	801.09

Significant Differences for N, P & K

.05 Level* 31.80
.01 Level 48.16

Significan Differences for Z_n

.05 Level 17.38
.01 Level 39.82

TABLE 8 *b*

Data for Caymanas Clay Loam
Total Yields (Bushels Shelled Corn per Acre)

N_1	N_2	N_3	N_4	P_1	P_2	K_1	K_2	M_1	M_2
2 009.2	1 912.2	2 131.6	2 026.2	4 006.2	4 073.0	4 125.0	3 954.2	4 021.8	4057.4