

NOT FOR LOAN

INVESTIGATION ON NUTRIENT STATUS

OF SOILS OF

PEASANT HOLDINGS Nos. II, III & IV

ON I.C.T.A. COLLEGE FARM

BY

E.A. FITZPATRICK

YEAR III DIPLOMA STUDENT

INTRODUCTION

Peasant Agriculture is an essential part of the economy of all agricultural communities in the tropics. Despite that fact little attention has in the past been paid to the accurate determination of size of holding suitable to the varying type of peasant found in the tropics.

It is at present the policy of most Agricultural Departments to get the people safely established on the land, but before this can be done suitable holding size must be determined by experiment. Such work has just been started by the Imperial College of Tropical Agriculture and have so far established four experimental holdings on the College farm:-

Holding No. I	(Diaram's holding)
Holding No. II	Cows (Garib's holding)
Holding No. III	Ploughing oxen (Ramnauth's holding)
Holding No. IV	Vegetables (Baboolal's holding)

In such experiments the soil aspect is usually overlooked. This, however, has not been the case at the College, where the soil nutrient status has been given detailed attention, especially in the search for deficiencies of the three main plant nutrients, namely: Nitrogen, Phosphorus and Potash.

Objects of the Investigations

These investigations were part of a controlled research scheme for the determination of size of Holding suitable to the varying type of peasant found in the tropics as well as serving as a special project for the author during the Third Year at the Imperial College of Tropical Agriculture.

The objects of the investigation were:-

i. to determine the nutrient status of soils of Peasant Holdings II, III and IV*.

ii. to recommend suitable fertiliser applications.

iii. to determine whether there is any correlation between results of experiments used.

Experimental methods

- A. Mitscherlich Pot Tests
- B. Corn microplot Tests

In addition to the above two methods a third method, laboratory analysis had been carried out by laboratory staff and is included, as it is upon it that the other two experiments were based.

Soils

The main soil type is called St. Augustine Clay Loam (Chenery) one of the series derived from detrital deposits brought down by flood water from the Northern range and deposited on the gently sloping plain on which the College stands.

There is also a strip of River Estate Sand found on the North East corner of Holding No. III. This is yellow Alluvial Soil of the Tunapuna River border.

Conclusions

* Holding I had already been dealt with by Laboratory staff.

First Series of Soil Samples for Laboratory Analysis

Each of the three holdings to be tested was carefully sampled, by laboratory staff during the Summer of 1947. Samples were taken to 6" and 12", deep each sample was bagged, labelled, numbered and a corresponding number put in the appropriate place on a map (see Holding maps, Appendix I).

The samples were then taken to the laboratory and analysed. The results are given in Appendix II.

The results lead to the following discussions and conclusions by Professor F. Hardy.

Holding No. II

Discussion

Texture: I.T. 12 to 18, mean 16; sand. Garden Plot, north of house, 24, loam, "heavier" because of higher organic matter content.

Reaction: Exch. pH 6.4 to 7.3, mean pH 6.7, mostly very slightly acid in spite of lime applied some years ago.

Organic matter: 1.0 to 1.5 percent top 6 ins. (1.7 in Garden) - low.

Carbon-nitrogen ratio: 6.5 to 8.3, mean 7.4, top 6 ins. very low indicating deterioration or surface-erosion.

Electrical conductivity: "Available nutrients" 50 to 93, medium-low to medium. "Rate of solution" 15 to 25 mostly, low, top 6 ins., denoting poor nutrient status and low potential fertility.

Available phosphate (Truog method): 16 to 80 mostly, mean 38, top 6 ins., highest (65) in south-west corner in Arable Strips 1 to 4, and in pasture (61) than in rest of holding. Slightly less in second 6 ins., About adequate.

Available potash (exchangeable K_2O): 70 to 140 mostly, mean 88; top 6 ins., inadequate.

Conclusions

No marked texture and fertility gradients are shown by the laboratory data for the soils of this holding (compare Holding III, lying immediately to the east of it). The soil is a sand, somewhat lighter than that of Holding III. It is very slightly acid. Its organic matter and nitrogen

nitrogen status is low, being somewhat lower, than that of Holding III. Available phosphate is slightly higher than that of Holding III, but is yet probably not high enough for adequacy for most crops. Available potash is considerably higher than in Holding III soil (88 as against 48), though it would not be considered adequate. The soil of Holding II, would be expected to respond generously to nitrogenous manures and doubtless also to potassic manures, but to less degree to phosphatic manures.

(F. Hardy)

Because of the lack of either fertility or texture gradients only one series of Mitscherlich pot tests were carried out.

A series of corn microplot experiments was not carried out because of the unavailability of a piece of land and, too, the laboratory results showed fairly close similarity to those for Holding No. III and it was considered that results obtained from such an experiment on Holding No. III would be applicable to this Holding.

Holding No. III

Discussion

Texture: I.T., 16 to 24; sand, sandy-loam, loam. Mean 21, sandy-loam.

Texture remarkably uniform over whole area.

Reaction: Exch. pH 6.2 - 7.3, i.e., around neutrality (pH 7.0). No free calcium carbonate present although the area was limed some years ago. There is little difference in reaction between top and second 6-ins. layers.

Organic matter: 1.3 to 1.8 percent; mean, 1.6. Medium-low, in top 6 ins. Data show no lateral trends.

Carbon-nitrogen ratio: 6.2 to 9.2 in top 6 ins., mean 8.0; low, indicating biologically-deteriorated soil, or appreciable surface erosion under long-continued cultivation.

Electrical conductivity: "Available nutrients" 50 to 100 mostly; medium-low to medium. "Rate of solution" 9 to 25, very low, top 6 ins., denoting low actual and potential fertility. (The values are small, even in spite of the liming).

Available phosphate (Truog method): 13 to 35 mostly, in top 6 ins., mean 32, medium-low. (Values below 30 regarded as inadequate for most tropical crops). About 10 p.p.m. less in second 6 ins. layer.

Available potash (exchangeable K_2O): 13 to 80 mostly in top 6 ins.,

mean 48, very low to low. (Values below 120 regarded as inadequate).

Conclusions

There appears to be a complete absence of texture and fertility gradient in this holding (No.III, with ploughing oxen). The soil is a sandy-loam, neutral in reaction, medium-low organic matter, and nitrogen status. Available phosphate is medium-low and available potash low in amount. The soil certainly would respond generously to combined NPK manuring.

(F. Hardy)

This like Holding No.II showed no marked fertility or texture gradients except for the small strip of River Estate Sand in the North East corner which was ignored in both sets of experiments. Therefore only one series of Mitscherlich pot tests and one series of Corn micro-plot experiments was carried out.

Holding No.IV

Discussion

Texture: I.T. 11 to 23; sand to loamy-sand. Highest values (i.e: most "loamy") on north side, in the "Garden" area, where organic matter contents are highest.

Reaction: Exchange reactions (not recorded) all below pH 7.0 hence there are no lime reserves. Normal reaction, pH 7.2 to pH 6.4, neutral to slightly acid. The "garden" soils are the least acid.

Organic matter: 1.6 to 2.9 to 7.9 percent in top 6-ins. layer (i.e: medium-low to very high). O.M. contents of "garden" soil, 7.9, 2.9, 2.6 percent. O.M. content of second 6-ins. layer not greatly less than that of top 6-ins.

Carbon-nitrogen ratio: 7.3 to 22.7, top 6 ins., depending on O.M. content. The soil of the N.E. part of the garden has highest O.M. (7.9 percent) and highest C/N ratio (22.7); this is partly due to presence of free carbon as charcoal.

Electrical conductivity: "Available nutrients", 25 to 125, low to fairly high; highest values where O.M. contents are highest (in the northern part of the holding). "Rate of solution" 2 to 24, very low to low, denoting sparse potential nutrient supply.

Available phosphate (Truog method) 12 to 610 p.p.m. (top 6 ins.); extremely variable. Highest values given by humic soil of the "garden" area, and possibly to be accounted for by the recent-manuring applied to vegetables.

Available potash (exchangeable K_2O): 31 to 357 p.p.m. (top 6 ins.); great availability. Highest values, as with phosphate, given by humic "garden" soil and possibly accounted for by recent manuring.

Conclusions:

The holding consists of two distinct parts which should be considered separately, namely, the "garden" area comprising the northern half, and the "pasture and fodder-grass" area in the south. The soils of these two areas have different agricultural history.

The garden area has been intensively manured and cropped as a vegetable garden; it partly occupies the site of the old St. Augustine Estate sugar-factory furnace with its attendant coal heap and ash dump; hence the presence of free carbon (charcoal and coal) in the relatively highly humic soil of this area. The analytical data for nutrients (N,P,K,) are all high for the garden area, partly because of recent manuring.

The pasture and fodder grass area comprises soil having a low nutrient status being especially deficient in available phosphate and potash. It should benefit greatly from general NPK manuring.

(F. Hardy)

Because of the marked fertility and texture gradients, the two areas (Garden and Pasture) were treated separately in subsequent experiments one series of Mitscherlich pot tests and one series corn microplot experiments was carried out for each separate area.

A. The Mitscherlich Method

It is not necessary here to examine in detail the theory underlying the Mitscherlich method.

Mitscherlich developed Leibig's Law of the Minimum by stating that: "The increase in yield produced by a given increase in any growth factor is proportional to the decrement from the maximum yield which can be obtained by increasing that particular factor greatly".

Expressed mathematically thus:-

$$\frac{dy}{dx} = C_1 (A - Y)$$

where $\frac{dy}{dx}$ = the rate of increase of yield produced by the growth factor x .

A = The maximum yield value that could be produced by increasing x .

C_1 = a constant called the effect or efficiency factor which depends on the particular growth factor under consideration.

This equation on integration and applied to any growth factor 'b' can be expressed :-

$$b = \frac{\log A - \log (A - y_0)}{C}$$

where y_0 is the yield produced by the growth factor 'b'

$$\text{or } b = \frac{\log 100 - \log (100 - y_0)}{C}$$

if y_0 is expressed as a percentage of A .

This general equation is said to be true for all plants. Since values of C are supposed to be constant and can be determined once for all by separate experiment, and the values used in the above equation.

This equation does not hold true for nitrogen as it has not been found possible to add enough nitrogen to obtain maximum yield.

A supplementary equation is therefore used:-

$$A_N = \frac{K_y - y_0}{K - 1}$$

where y_0 is the yield from the treatment with no nitrogen.

$$K = 10^{cx} \text{ where } C = \text{nitrogen effect factor}$$

$$x = \text{rate of nitrogen applied.}$$

In terms of a Mitscherlich pot :-

$$A_N = \frac{2.512y - y_0}{2.512 - 1}$$

A_N can thus be found and substituted in the normal Mitscherlich equation.

The values of A y_0 and y are found by means of replicate pot tests using the soil to be tested in standard Mitscherlich pots. From the results values can be obtained for maximum yield and yield in absence of any particular factor. The values can then be substituted in the appropriate equation.

Effect Factors

The values of the effect factor for nitrogen phosphate and potash as determined by Mitscherlich are as follows :-

Factor	Grams per Pot (g/pot)	Hundredweights per acre (cwts/acre)
Nitrogen	.40	0.153
Phosphate	1.95	0.753
Potash	3.02	1.170

Subsoil Factor

In testing a sample of soil obtained from a field whose nutrient status is to be determined by the Mitscherlich method, the soil is usually taken down to an arbitrary depth (say 25 cm. or nearly 10 inches, which is the depth preferred by Mitscherlich). This procedure does not take into account the effect of the subsoil in the nutrition of the crop growing in the field; accordingly Mitscherlich suggests that the values for the amounts of phosphate and potash in the soil, as determined by a pot experiment, should be multiplied by 2. Since nitrate is usually leached downwards in the subsoil, and may therefore be more prevalent therein than in the topsoil, Mitscherlich suggests that another multiplying factor should be employed for translating the results for nitrogen content in the experimentally-examined soil sample into actual nitrogen contents in the field. He recommends that the magnitude of this subsoil factor be taken as 1.5 for permeable sandy soils, 2.0 for medium sandy soils or loams, and 4.0 for heavy clay soils.

The assumption of the constancy of the effect factor implies that the manurial requirements of all plants growing in a particular soil are identical, which is a very convenient and simple premise, but one which is open to severe criticism. Nevertheless, since the aim of the Mitscherlich method is to provide a measure of soil's content of available nutrients, the manurial treatment of that soil in the field may be varied depending on the kind of crop to be grown, and on the resources of the farmer.

Indicator plant

For indicator plant, Mitscherlich uses Oats. Since this plant is a long-day plant, and will not mature in the tropics, where the length of the daylight period is insufficient to induce flowering and fruiting, some other indicator plant must be utilised. Sudan Grass (*Andropogon sorghum* var. *sudanense*) has been used with some success in Hawaii, but it is not altogether satisfactory, being much more sensitive to phosphate deficiency in the soil than to potash deficiency. This plant has been used at the College with some success and was used in all the experiments.

The Mitscherlich Pot Test Technique

The standard Mitscherlich pot used was 20 cms deep and 20 cms in diameter having a drainage hole 8 cms diameter with a 15 cm covering plate. It stands above a saucer 24 cms in diameter and 7 cms deep. The pot was enamelled white externally and black three quarters of the way up on the inside the rest being white enamel. It had a detachable wire superstructure 80 cms high which gives support to the plant.

Twelve pots were used in each experiment - each treatment run in triplicate, the treatments are :-

3 without N	-	PK
3 without P	-	NK
3 without K	-	NP
3 complete	-	NPK

The manures were applied in the following kinds and amounts :-

- 1.0 gms Nitrogen as Sulphate of Ammonia in 20 cc water (rain water)
- 1.5 gms Potash as Sulphate of Potash in 40 cc water (rain water)
- 1.1 gms Phosphate as Supephosphate in 33 cc water (rain water)

In addition the following nutrient substances were applied to each pot.

- .5 gms Sodium chloride in 5 cc water
- .5 gms Magnesium sulphate in 5 cc water
- 1.5 gms Precipitated chalk

NOTE: A dressing of 0.4 gms per pot of any artificial manure is equivalent to about 1 cwt. per acre so that the dosages represented dressings of $12\frac{1}{2}$, 16 and $7\frac{1}{2}$ cwt. per acre which may be regarded as sufficient to furnish a superabundance of the three essential nutrients.

Soil Sampling - Second Series

From each area to be tested a composite of ten individual samples was taken to a depth of 6" and not to 10" as used by Mitscherlich because comparison with laboratory results was necessary. A sampling spade was used for the operation and the spots recorded on maps which are shown in Appendix II.

The composites were taken to the laboratory and spread onto large wooden trays and left to air dry, mixing regularly to facilitate drying as well as to obtain uniformity.

After a week the large lumps were gently pounded with a mallet, hard enough to break them up but not so hard as to destroy the structure of the soil. The soil was then passed through a cm riddle mixed again and a sample taken from it for laboratory determination of the nutrient status which was used for comparison with mean results of top 6" of First Series of Samples. The comparison is shown below in Table I.

TABLE I

COMPARISON OF RESULTS BETWEEN LABORATORY ANALYSES for
FIRST AND SECOND SERIES OF SOIL SAMPLES

TOP SIX INCHES

Number of Holding		Series	Date Collected	Total N %	Avail P ₂ O ₅ ppm	Avail K ₂ O ppm
II		First*	23.6.47	0.104	38	88
		Second	27.1.48	0.13	44	84
III		First*	24.6.47	0.114	32	48
		Second	27.1.48	0.10	32	62
IV	Garden	First*	12.8.47	.165	351	260
		Second	12.11.47	.195	520	272
	Pasture	First*	12.8.47	.115	14	39
		Second	12.11.47	.149	10	63

* Means

Soil preparation

Seven pounds of riddled soil was placed in a large basin, to it was added the requisite amount of fertilizer solution (by means of pipette and burette) and precipitated chalk. Some rain water was also added and the mixture worked between the hands.

The object of the last important operation was to impart a crumb structure to the soil which facilitated aeration and drainage.

Mitscherlich recommends that sand be added to the soil in the ratio of sand to soil of 1.2 which he claims would cause better growth. Experiment has shown that total soil gives equally good growth.

Pot Preparation

A cover plate was placed in the bottom of each pot raising them slightly to facilitate drainage by standing each on three pieces of broken glass.

Four pounds of quartz gravel was then placed in the bottom of the pots followed by the prepared soil.

The soil was transferred from the basin to the pots in the hands allowing it to run gradually through the fingers on to the quartz gravel, thus avoiding packing. The last handful of soil added was first worked to a powdery consistence so as to form a good "seed bed".

The pots were transferred to a shed having a steel frame, glass roof and wire mosquito netting sides to exclude birds and insects. There they were labelled, arranged in replicate, watered lightly with a pipette and covered with the drainage saucer.

Seed Preparation

The germination percentage of the available Sudan grass seed was fairly low as was discovered in previous experiments carried out by laboratory staff. In order to overcome this some seed was placed in a beaker containing rain water, vigorously stirred and allowed to stand. After two hours seed remaining on the surface were discarded using for planting only those that sank.

Planting

The drainage saucer was removed and on the soil placed a perforated cardboard disc containing 35 equally spaced holes, beneath each hole was made a hole in the soil $\frac{3}{8}$ " deep using a piece of glass rod. The disc was removed and three seeds placed in each hole which were then closed using the same piece of glass rod. The pots were then watered and again covered with the drainage saucer.

Treatment during growth

As soon as germination took place (3 - 5 days) the drainage saucers were removed and placed in their correct positions beneath the pots.

Along with the germination of the Sudan grass came many weeds which were at once pulled up.

At ten to twelve days old the pots were thinned to 35 plants per pot, in some case supplying was necessary, the seedling used being those from the same pot or from a pot with same treatment.

It was recommended that thinning and supplying be done earlier; (at the two-leaf stage) but it was found that very few plants could be recovered for supplying.

When the plants were about 10 inches tall the superstructures were attached to the pots. This stage in all cases was reached by the middle of the fourth week.

It was discovered that the superstructures did not have enough cross struts to prevent the plants from falling out. This was overcome by using as supplementary cross struts pieces of chord which were attached when necessary.

Watering was an essential daily operation, for good growth depended on it. In the early stage regular light watering with a pipette was necessary, being done as many as five times per day. During later stages routine waterings three times per day (8.00 a.m., 12.30 p.m. and 6.00 p.m.†) were carried out. The amount of water depended upon the amount collected in the drainage saucer and the feel of the soil. The drainage water was returned to the pots before any new lot was added, in that way no nutrient substances were lost.

Throughout all the experiments rain water which was collected in two large galvanised iron containers outside the cage was used, for it was shown that tap water contained phosphates.

At ten weeks old the pots were photographed (see below), soon after flowering took place and at that stage they were harvested.

Harvesting

The plants were severed at soil level, chaffed, bagged and each bag labelled to correspond to the pot from which the plants came. The bags were then put in an electrically heated oven at 100°C and dried to constant weight. From the weight nutrient status of soil was calculated. From results see Appendix III.

After harvesting root matter was washed free of soil, bagged, oven dried, weighed and photographed. For weights see Appendix III; photographs are shown below.

For actual dates on which operations were carried out see Holding Diaries Appendix IV.

Pests and Diseases.

Thrips caused negligible damage in all the series during late stages.

Scleroteum rolfsii killed a few plants during early stages. The attack was worst in the series for Holding IV, but reduced ^{watering and}weeding out of dead and dying plants checked the attack.

Discussion of Results.

HOLDING No. II

Nitrogen

Strikingly deficient as shown by the fact that only 21.9% of the 'maximum' growth is obtained in its absence.

Calculation from Mitscherlich formulae for determining nutrient content and manurial requirement gives a value of .44 cwts. per acre for available nitrogen and 4.36 cwts. per acre for the manurial requirement which is equivalent to 21.8 cwts. per acre of sulphate of ammonia.

Phosphate

Deficiency of this nutrient only allows of 73.1 % of the 'maximum' growth.

Calculation from Mitscherlich formulae gives the mean available content as .76 cwts per acre P_2O_5 , denoting a deficiency of .99 cwts per acre, which could be made good by the application of 5.9 cwts per acre of 17% superphosphate.

Potash

The least deficient of the three nutrients, growth in its absence being 83.4% of the 'maximum' growth.

The available K_2O from Mitscherlich formulae is .69 cwts per acre thus there is a deficiency of .91 cwts per acre which could be corrected by the addition of 1.8 cwts per acre of Sulphate of potash.

Holding No. III

Nitrogen

This nutrient is markedly deficient, only 21.7% of the 'maximum' growth being obtained in its absence.

Mitscherlich formulae gives the mean availability as .44 cwts per acre and a deficiency of 4.36 cwts per acre, which could only be raised to optimum for growth by the addition of 21.8 cwts per acre of Sulphate of ammonia.

Phosphate

Growth in the absence of this nutrient is 72.6% of the 'maximum' growth.

Calculation from Mitscherlich formulae gives the mean availability as .75 cwts per acre P_2O_5 and a deficiency of 1.0 cwts per acre. Correction of this deficiency can be made by a dressing of 6.0 cwts per acre of 17% superphosphate.

Potash

In the absence of this nutrient only 68.9% of the 'maximum' growth was obtained, indicating a large deficiency of this nutrient.

Applying Mitscherlich formulae, the mean availability of K_2O is

/found

found to be .43 cwts per acre, there is therefore a deficiency of 1.17 cwts per acre which could be corrected by the application of 2.3 cwts per acre of Sulphate of potash.

Holding IV

Garden

Nitrogen

Here, as in the above two Holdings there is a striking lack of this nutrient. Growth in its absence was 31.6% of the 'maximum'.

Mitscherlich formulae gives the mean availability as .7 cwts per acre and a deficiency of 4.1 cwts per acre, correction of which could be made by the application of 20.5 cwts per acre of Sulphate of ammonia.

Phosphate

Growth in the absence of this nutrient is 110.7% of the 'maximum' therefore this nutrient is present in excess.

Potash

Here again a deficiency is found, for growth in the absence of this nutrient is 87.2% of the 'maximum'.

Calculation from Mitscherlich formulae gives the mean availability as .76 cwts per acre K_2O or a deficiency of .84 cwts per acre. This could be corrected by the application of 1.7 cwts per acre of Sulphate of potash.

Pasture

Nitrogen

Deficiency of this nutrient is marked, for growth in its absence is only 19.6% of the 'maximum'.

Application of Mitscherlich formulae gives the mean availability as .39 cwts per acre or a deficiency of 4.41 cwts per acre ~~of Sulphate of ammonia~~. A dressing of 22.1 cwts per acre of Sulphate of ammonia would correct this deficiency.

Phosphate

This is the next in order of deficiencies. Absence of this nutrient only allows of 45.5% of the 'maximum'.

Mitscherlich formulae gives the mean availability as .35 cwt per acre P_2O_5 and a deficiency of 1.40 cwt per acre which could be corrected by the application of 8.4 cwt per acre of 17% superphosphate.

Potash

This is the least deficient nutrient for in its absence growth is 49.2% of the 'maximum'.

Calculation from Mitscherlich formulae gives the mean availability as .25 cwt per acre K_2O or a deficiency of 1.35 cwt per acre. Correction of this can be made by the application of 2.7 cwt per acre of Sulphate of potash.

The results from all these soils except that for Holding IV Garden show close similarity, not only because they are from the same general soil type, but also because they have received the same treatment for many years. Therefore the slight differences may not be due to any inherent characteristics but rather to variation in the residual amounts of fertiliser applied in the past.

The soil of Holding IV Garden despite regular and heavy applications of fertilisers only ^{phosphate} seems to have accumulated.

It is clear therefore that these soils show large deficiencies which can be made good by the application of heavy dressings of nitrogen, phosphate and ~~phosphate~~ potash.

RESULTS OF MITSCHERLICH POT TEST APPLIED TO

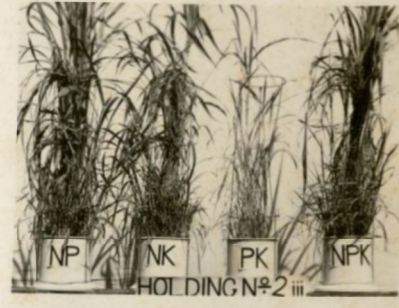
PEASANT HOLDING SOIL

EXPERIMENTAL HOLDING No. II

College Farm Field R IV (formerly Fields 25-27W and R X)

Cows (Garib's holding)

Soil Samples collected 27th January, 1948 Second Series



ROOT MATTER FROM POTS



NP NK PK NPK
HOLDING N° 2 ii



NP NK PK NPK
HOLDING N° 2 i



NP NK PK NPK
HOLDING N° 2 iii

RESULTS OF MITSCHERLICH POT TEST APPLIED TO

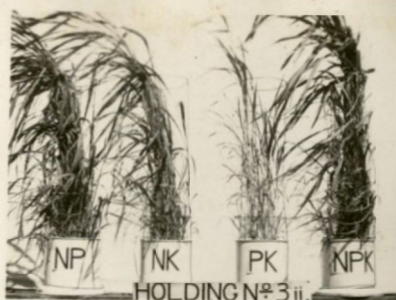
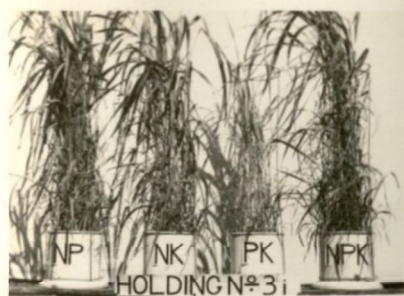
PEASANT HOLDING SOIL

EXPERIMENTAL HOLDING No. III

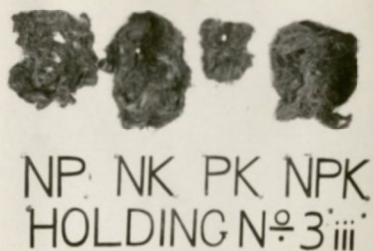
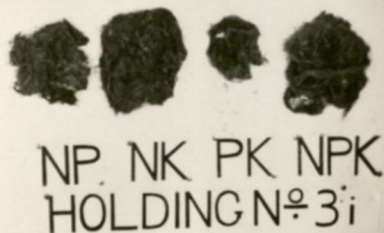
College Farm Field R1 (formerly Fields 25-27E and R IX)

Ploughing oxen (Rammauth's holding)

Soil Samples collected 27th January, 1948 Second Series



ROOT MATTER FROM POTS



RESULTS OF MITSCHERLICH POT TEST APPLIED TO

PEASANT HOLDING SOIL

EXPERIMENTAL HOLDING No. IV

College Farm Field 17 (formerly Field 16B)

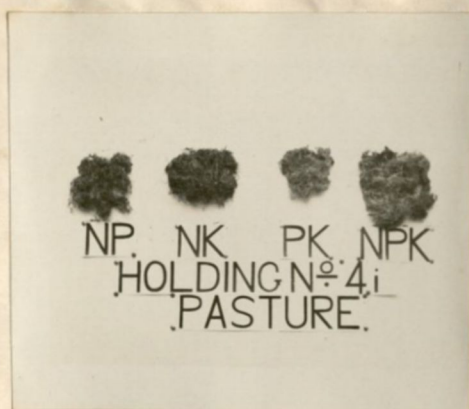
Vegetables (Baboolal's holding)

Soil Samples collected 12th November, 1947 Second Series

PASTURE



ROOT MATTER FROM POTS



Corn Microplot Test Method

This method was devised by R.V. Holme working in Jamaica, B.W.I. in order to determine if the nutrient status of a given soil was suitable to sugar cane growth.

R.V. Holme accepts Liebig's Law of diminishing returns but states that the actual form of the curve illustrating the law has to be established for different conditions. This can be calculated from the average of a large number of field scale experimental results in a locality. In the case of sugar cane many years would have to be devoted to the operation.

By the use of the corn microplot field experiments hundreds of results can be obtained in a very short time and thus the form of the curve determined.

The formula for the curve as used by Yates has been adopted by R.V. Holme.

Few of his experimental results have shown the soil to be deficient in either potash or phosphate so that so far only a nitrogen response curve has been given. This curve closely approximates to that given by cane experiments.

For practical purposes therefore it is evident that the corn microplot nitrogen response curve can be permissibly used to 'correct' a portion of the error of a sugar cane experiment.

When the results of a sugar cane experiment are fitted to the curve, calculation will give the yields to be expected from other treatments not included in the experiment. This means that only three treatments are necessary : control - intermediate - "maximum" and from the results given by them an economic dose of fertiliser determined.

In the experiment three levels of nitrogen, phosphate and potash are used. The results are tabulated for each fertiliser in the form of the average weight per hundred plants of the single and double dose plots expressed as a percentage of the control plots of that fertiliser. Thus a single figure is obtained for each fertiliser in each experiment. There will be a deficiency of nutrients if the figures obtained are above the following :-

N	-	125
P	-	130
K	-	110

Then knowing which nutrients are deficient, field experiments are laid down to determine the economic dose, or a rough estimate of how much to apply can be made.

NOTE: This method is to be preferred to pot tests in that it is carried out under natural conditions and obviates the use of arbitrary correction factors.

SITES OF EXPERIMENTS

Because these Holdings are experimental it was impossible to put down other experiments inside them, therefore pieces of land corresponding to the areas inside the Holdings were used for the experiments. The exact places are shown on Holding maps in Appendix II.

X_0 - nil X_1 - 4.7 gms X_2 - 9.5 gms

14 gms $\frac{1}{2}$ A per 4 sq. ft. = 3 cwt. per acre

25 gms $\frac{3}{4}$ A per 4 sq. ft. = 5 cwt. per acre

14.0 gms Super per 4 sq. ft. = 3 cwt. per acre

28.0 gms Super per 4 sq. ft. = 6 cwt. per acre

4.7 gms M/T per 4 sq. ft. = 1 cwt. per acre

9.5 gms M/T per 4 sq. ft. = 2 cwt. per acre

The plots were spaced 20 feet apart during the experimental area 30 ft. x 10 ft. and in order to get even conditions a 10 ft. border was left clear round the experimental area.

Land Preparation

The land was cleared, sorted out and experimental area marked to give a 10 ft. x 10 ft. plot and the border was cleared.

Planting

This operation was carried out with the aid of a frame which was 6 ft. long, 2 ft. wide, with wires at every 2 ft. forming three compartments, each two feet square which were equivalent to two plots and a two foot space. This frame obviated the necessity of having to divide the

Corn Microplot Experimental Technique

The standard size plots used were two feet square in a single replicate of a 3 x 3 x 3 factorial design, there being 27 plots in three rows of nine plots each.

The treatments were :-

Sulphate of Ammonia

No - nil N₃ - 14 gms N₆ - 28 gms

Super (16% P₂O₅)

Po - nil P₁ - 14.0 gms P₂ - 28.0 gms

Muriate of Potash

Ko - nil K₁ - 4.7 gms K₂ - 9.3 gms

14 gms S/A per 4 sq.ft. = 3 cwts. per acre

28 gms S/A per 4 sq.ft. = 6 cwts. per acre

14.0 gms Super per 4 sq.ft. = 3 cwts. per acre

28.0 gms Super per 4 sq.ft. = 6 cwts. per acre

4.7 gms M/P per 4 sq.ft. = 1 cwt. per acre

9.3 gms M/P per sq.ft. = 2 cwts. per acre

The plots were spaced two feet apart thus making the experimental area 34 ft x 10 ft. and in order to get even conditions a 10 ft. border was left clear around the experimental area.

Land Preparation

The land was cleared, marked out and experimental area worked to as fine a tilth as possible using hand hoes and rakes.

Planting

This operation was carried out with the aid of a frame which was 6 ft. long, 2 ft. wide, with cross bars at every 2 ft. forming three compartments, each two feet square which were equivalent to two plots and a two foot space. This frame obviated the necessity of having to divide up

the area by measurement and too, reduced the possibility of error.

The frame was placed in the required position and three drills, 3 ins. deep, were made in the correct compartment, fifteen seeds were sown in each drill and partially covered with soil, the requisite amount of fertiliser was sprinkled on the drills and this in turn was covered with soil leaving a level surface. Measurement of fertiliser was carried out in the field, using as measures cut down test tubes.

It was recommended that the seed be soaked in water for 24 hours prior to planting. This was not carried out because the actual date of planting could never be accurately determined. Instead the plots were soaked with water just after planting.

Thinning

Seven to ten days after planting each plot was thinned to a maximum of thirty plants per plot, leaving wherever possible ten plants per row.

Watering

For the major part of the operations conditions were very dry and water had to be applied three times per day.

Soil Sampling - Third Series

A composite of four individual samples was taken to a depth of 6" from each area and laboratory analysis carried out. This was done in order that comparison with mean results of First Series of Samples could be made. The comparison is shown in Table II.

TABLE II

COMPARISON BETWEEN RESULTS OF LABORATORY ANALYSES FOR FIRST AND THIRD SERIES
OF SOIL SAMPLES

No. of Holding	Series	Date Collect -ed	Depth ins.	Total sand %	I.T. I.T.	Reac- tion pH	O.M %	Total N %	C/N ratio	Elect. cond. Avail rate (mhos x 10 ⁻⁶)		Available P ₂ O ₅ K ₂ O p.p.m p.p.m	
III	First*	24.6.47	6	35.0	21	7.5	1.58	0.114	8.0	80	20	32	48
	Third	7.3.48	6	40.2	22	7.0	1.8	0.15	6.8	130	10	20	59
IV	Garden First*	12.8.47	6	43.0	22	6.7	4.48	0.165	15.2	104	20	351	260
	Third	31.3.48	6	47.7	24	7.0	5.1	0.18	16.4	292	0	1654	651
	Pasture First*	12.8.47	6	48.8	15	6.6	1.61	0.115	8.3	28	8	14	39
	Third	29.2.48	6	43.9	20	5.8	2.1	0.14	8.8	41	0	17	45

* Means

Harvesting

At four weeks photographs were taken of a representative row of a representative number of plots. These are shown below.

The plants were then pulled up, shaken free of soil, counted and weighed in the field and figures recorded on a plan.

From the figures, the number of plants and their weight in ounces for each treatment's main effect were obtained (interaction being ignored) and these were reduced to ounces per hundred plants.

Taking the controls in each case of each fertilizer as 100, the yields of the single and double dose were averaged and recorded and this was the figure used to assess the deficiency of the particular fertiliser. For results see Appendix IV, and for actual date of operations see diaries Appendix V.

Pests and Diseases

No diseases were seen.

Fowls caused damage to many plots of the experiment for Holding IV Pasture. Two plots were completely destroyed and in many of the others the number of plants greatly reduced as will be seen from the results.

After the experiment, the two destroyed plots and a control plot were replanted on a new piece of land and these results fitted to the original results.

RESULTS OF CORN MICROPLOT EXPERIMENT APPLIED TO

PEASANT HOLDING SOIL

EXPERIMENTAL HOLDING No. III

College Farm Field R1 (formerly Fields 25-27E and R IX)

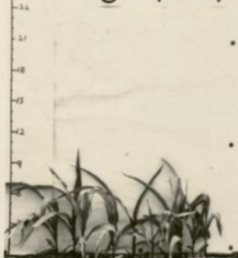
Ploughing oxen (Ramnauth's holding)

March 5th - April 2nd, 1948

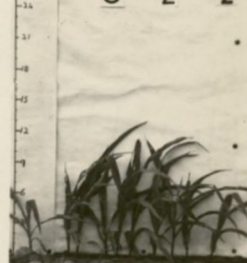
HOLDING N^o 3
N₀. P₀. K₀.



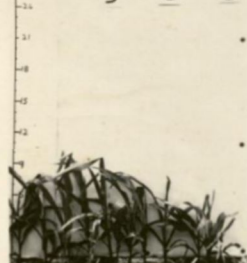
HOLDING N^o 3
N₀. P₁. K₁.



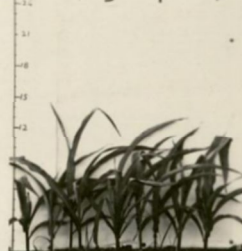
HOLDING N^o 3
N₀. P₂. K₂.



HOLDING N^o 3
N₃. P₀. K₀.



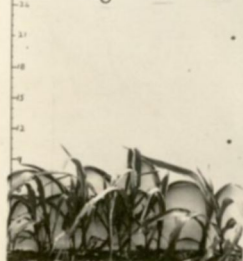
HOLDING N^o 3
N₃. P₁. K₁.



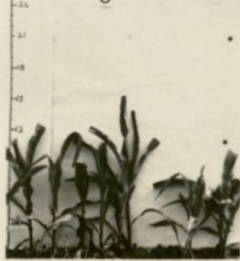
HOLDING N^o 3
N₃. P₂. K₂.



HOLDING N^o 3
N₆. P₀. K₀.



HOLDING N^o 3
N₆. P₁. K₁.



HOLDING N^o 3
N₆. P₂. K₂.



RESULTS OF CORN MICROPLOT EXPERIMENT APPLIED TO

PEASANT HOLDING SOIL

EXPERIMENTAL HOLDING No. IV

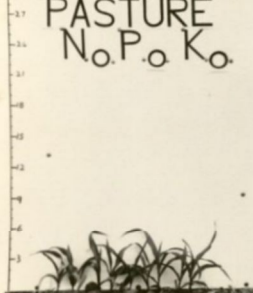
College Farm Field 17 (formerly Field 16B)

Vegetables (Baboolal's holding)

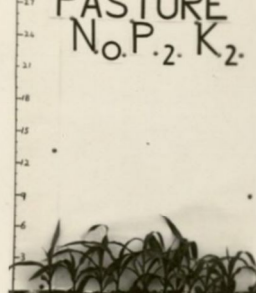
February 27th - March 26th, 1948

PASTURE

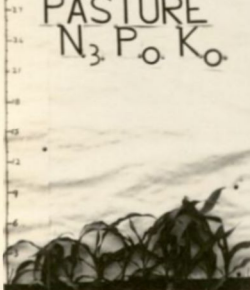
HOLDING N^o. 4
PASTURE
N₀. P₀. K₀.



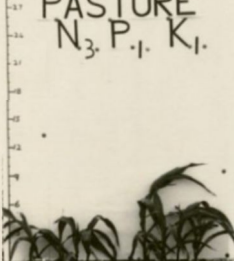
HOLDING N^o. 4
PASTURE
N₀. P₂. K₂.



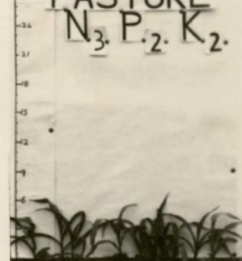
HOLDING N^o. 4
PASTURE
N₃. P₀. K₀.



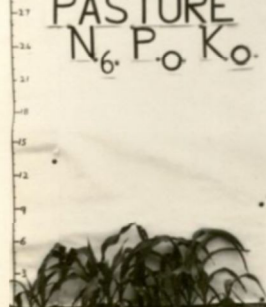
HOLDING N^o. 4
PASTURE
N₃. P₁. K₁.



HOLDING N^o. 4
PASTURE
N₃. P₂. K₂.



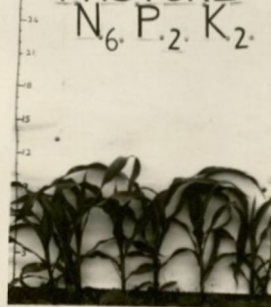
HOLDING N^o. 4
PASTURE
N₆. P₀. K₀.



HOLDING N^o. 4
PASTURE
N₆. P₁. K₁.



HOLDING N^o. 4
PASTURE
N₆. P₂. K₂.



RESULTS OF CORN MICROPLOT EXPERIMENT APPLIED TO

PEASANT HOLDING SOIL

EXPERIMENTAL HOLDING No. IV

College Farm Field 17 (formerly Field 16B)

Vegetables (Baboolal's holding)

March 30th - April 30th, 1948

GARDEN

HOLDING N°4
GARDEN
N₀ P₀ K₀



HOLDING N°4
GARDEN
N₀ P₁ K₁



HOLDING N°4
GARDEN
N₀ P₂ K₂



HOLDING N°4
GARDEN
N₃ P₀ K₀



HOLDING N°4
GARDEN
N₃ P₁ K₁



HOLDING N°4
GARDEN
N₃ P₂ K₂



HOLDING N°4
GARDEN
N₆ P₀ K₀



HOLDING N°4
GARDEN
N₆ P₁ K₁



HOLDING N°4
GARDEN
N₆ P₂ K₂



Results

The results were analysed by Holme's method and by statistical methods.

Discussion of Results

Holding No. III

Nitrogen

This nutrient was shown to be strikingly deficient by both methods of analysis. Statistical analyses being the more accurate showed that N_3 gave significantly greater yields than N_0 , N_6 gave significantly greater yields than N_3 and N_6 gave very highly significantly greater yields than N_0 . It would seem therefore that treatments greater than N_6 would give economically greater yields.

Phosphate

This nutrient was also shown to be deficient by the analytical methods used. P_1 gave significantly greater yields than P_0 and P_2 gave significantly greater yields than P_0 but P_2 did not give significantly greater yields than P_1 . Therefore, dressings of P_1 or between P_1 and P_2 would give good results.

Potash

This nutrient appears to be present in adequate amount.

Holding No. IV

Garden

Nitrogen, Phosphate and Potash are present in adequate amount, but it is not to be inferred that the corresponding area inside the Holding is of equal fertility, the area tested had recently been fertilised, whereas, the Garden area of the Holding had not received as heavy applications of fertilisers.

Pasture

At this site, Phosphate and Potash were present in adequate amount, Nitrogen was the only deficient nutrient.

Nitrogen

Again, this nutrient was strikingly deficient as shown by the analytical methods used. N_3 gave significantly greater yields than N_0 , N_6 gave significantly greater yields than N_0 . It would appear, therefore, that treatments greater than N_6 would give good results.

Conclusions and Recommendations

There appears to be no agreement between the methods used.

Chemical analysis suggests that Holdings Nos. II, III and IV Pasture would respond generously to combined applications of nitrogen, phosphate and potash and Holding IV Garden to be adequately supplied with nitrogen, phosphate and potash.

Mitscherlich Pot Tests showed that in only one case was any nutrient present in amount to support good plant growth that was in the case of Holding No. IV Garden where phosphate was present in excess. Everywhere else there was a general deficiency of the three nutrients.

Corn microplot experiments gave nitrogen as being markedly deficient in Holdings Nos. III and IV Pasture and phosphate as being deficient in Holding No. III. Everywhere else the nutrients were present in adequate amount.

Greater reliance should be placed on the Corn Microplot Experiments when considering nitrogen because it was for this that the experiment was chiefly designed, but as the experiment does not tell of how much to apply, and in the cases of its deficiency yields from N_6 are not highly significantly greater than yields from N_3 it would appear that the calculated treatments from the Mitscherlich formulae are too high.

In considering phosphate and potash greater reliance should be placed on the chemical analysis and on the Mitscherlich Pot Tests as it is doubtful whether corn plants in such a short growing season and under the dry conditions could fully assimilate all of these two nutrients which were applied.

Before any strong recommendations can be made it is advisable that the Corn Microplot Experiments be repeated during the wet season. Although water was applied regularly, the fierceness of the dry season may not have allowed deficiencies of phosphate and potash to show up as markedly as they did by other methods.

From the experimental evidence the fertiliser applications given in Table IV below should be made:

TABLE III
RECOMMENDED FERTILISER APPLICATIONS

Number of Holding	Fertiliser applications (cwts. per acre)		
	Sulphate of Ammonia	Superphosphate (17%)	Sulphate of Potash
II	10	4	1
III	10	5	1.5
IV Garden	7	-	1
Pasture	10	4	1.5

ACKNOWLEDGMENTS

Thanks are due to Professor F. Hardy, Mr. C.W. Hewitt and other members of the Chemistry Department staff for their help and guidance, without which it would have been impossible to carry out the operations.

REFERENCES

- Stewart, R. - Tech. Communication No.25, 1932, pp 1 - 46, Imperial Bureau Soil Science, Rothamsted.
- Innis, B.DeL & Hardy, F. - Investigations of the Mitscherlich Method in Trinidad. Trop. Agriculture, 1936, Vol.XIII, No.11, pp 292-298.
- Holme, R.V. - Paper No.3/44 "The importance of soil tests as shown by the use of the Corn Microplot Experiments" - Proceedings of the 1944 Meeting of B.W.I. Sugar Technologists pp 46 - 58.

TABLE I

LABORATORY DATA

EXPERIMENTAL HOLDING II

College Farm, Field R IV (formerly Fields 25-27 W. and R X)

Cows (Garib's holding)

Soil Samples collected 23rd June, 1947: First Series

Sample COL	Depth (ins.)	Total sand (%)	I.T.	React- ion (pH)	O.M. (%)	Total N (%)	C/N ratio	Elect.cond. Avail. Avail.			
								P ₂ O ₅		K ₂ O	
								(mhos x 10 ⁻⁶)		(p.p.m.)	
401 Arable Plot,	6	41.0	15	7.2	1.48	.114	7.5	65	24	54	126
402 Strip 1, S.	12	38.5	15	7.3	1.36	.107	7.4	59	23	53	
403 Arable Strip	2. 6	42.3	12	7.9	1.53	.109	8.2	81	19	88	102
404	12	40.7	14	7.7	1.13	.098	6.9	77	21	54	
405 Arable Strip	3. 6	40.5	15	7.7	1.38	.106	7.5	93	21	78	158
406	12	38.5	15	7.8	1.07	.097	6.4	91	20	68	
407 Arable Strip	4. 6	34.1	18	7.2	1.36	.097	8.1	78	6	40	96
408	12	33.0	19	7.6	1.26	.105	6.7	68	18	35	
409 Arable Strip	5. 6	40.5	15	7.4	1.22	.104	6.8	54	23	21	69
410	12	38.5	17	7.1	0.93	.094	5.7	63	15	22	
411 Arable Strip	6. 6	43.0	15	6.9	1.24	.101	7.1	56	22	22	77
412	12	39.0	16	7.3	1.13	.088	7.3	49	16	16	
413 Arable Strip	7. 6	40.2	14	7.3	1.33	.100	7.7	81	15	26	79
414	12	39.0	16	7.7	1.13	.085	7.5	63	31	23	
415 Arable Strip	8. 6	45.6	14	7.3	1.17	.082	8.3	62	20	16	(30)
416 N.	12	39.0	17	6.7	0.86	.083	6.0	54	16	11	
	6	40.9	15	7.4	1.34	.102	7.7	71	19	43	92
WEST SIDE: MEANS	12	38.3	16	7.4	1.11	.095	6.7	66	20	35	
417 Pasture Plot	6	38.4	17	7.1	1.48	.117	7.4	62	26	61	89
418	12	38.4	18	7.2	1.28	.114	6.5	59	27	38	
419 Fodder Grass	6	43.4	14	7.2	1.12	.094	6.9	63	24	25	89
420 S. half	12	49.0	13	7.6	1.09	.093	6.8	65	30	23	
421 Fodder Grass	6	46.4	13	6.8	0.95	.084	6.5	51	18	(11)	51
422 N. half	12	38.4	14	7.3	0.91	.076	7.0	48	11	9	
423 Garden Plot,	6	39.0	17	7.0	1.33	.110	7.0	59	18	20	89
424 S. of house	12	37.2	18	7.0	1.05	.099	6.2	54	16	17	
425 Garden Plot,	6	27.0	(24)	7.2	1.67	.130	7.5	62	17	33	86
426 N. of house	12	26.0	(25)	7.1	1.48	.126	6.8	52	26	21	
EAST SIDE: MEANS	6	38.8	17	7.1	1.31	.107	7.1	59	21	30	81
	12	37.8	18	7.2	1.16	.102	6.7	56	22	22	
MEANS OF ALL	6	40.1	16	7.2	1.33	.104	7.4	67	19	38	88
	12	38.1	17	7.3	1.13	.097	6.7	62	21	30	

TABLE II

LABORATORY DATA

EXPERIMENTAL HOLDING NO. III

College Farm, Field R I (formerly Fields 25-27 E and R IX)

Ploughing oxen (Ramnauth's holding)

Soil samples collected 24th June, 1947: First Series

Sam- Ple COL		Depth (ins.)	Total sand (%)	I.T.	React -ion (pH)	O.M. (%)	Total N (%)	C/N ratio	Elect.cond. Avail.Rate (mhos x 10 ⁻⁶)	Avail. P ₂ O ₅	Avail. K ₂ O (p.p.m.)	
427	Pasture Plot	6	29.0	22	7.6	1.28	.119	6.2	70	20	15	24
428		12	29.0	22	7.4	1.15	.102	6.6	55	24	14	
429	Garden Plot	6	29.6	22	7.7	1.74	.117	8.6	94	16	33	49
430		12	30.0	21	7.4	1.29	.112	6.7	86	25	14	-
431	Fodder Plot,	6	31.3	22	7.4	1.52	.113	7.8	(115)	(48)	32	111
432	S. end.	12	28.6	24	7.6	1.31	.114	6.7	80	25	21	
433	Fodder Plot,	6	29.0	22	7.9	1.55	.120	7.5	101	28	34	40
434	N. end.	12	28.8	22	7.7	1.48	.094	9.1	79	41	37	-
WEST SIDE: MEANS		6	29.7	22	7.7	1.52	.117	7.5	95	28	29	56
		12	29.1	22	7.5	1.31	.106	7.3	75	29	22	
435	Arable Plot H	6	31.0	23	7.3	1.71	.134	7.4	78	14	47	36
436		12	30.0	22	7.3	1.40	.124	6.5	76	22	32	
437	Arable Plot G	6	44.0	17	7.4	1.59	.115	8.0	66	15	31	13
438		12	37.0	18	7.5	1.48	.108	8.0	65	13	36	
439	Arable Plot F	6	38.0	22	7.4	1.76	.124	8.2	66	9	33	80
440		12	35.0	21	7.2	1.40	.099	8.2	55	17	22	
441	Arable Plot E	6	33.0	22	7.1	1.55	.122	7.4	50	12	13	59
442		12	34.5	22	7.1	1.33	.109	7.1	50	8	12	
443	Arable Plot D	6	34.5	22	7.2	1.60	.101	9.2	75	23	27	30
444		12	33.5	20	7.3	1.33	.095	8.1	58	18	19	
445		6	41.5	19	7.7	1.41	.104	7.9	86	15	35	32
446	Arable Plot C	12	38.7	17	7.7	1.21	.103	6.8	66	20	27	
447	Arable Plot B	6	42.7	16	7.7	1.48	.094	9.2	75	11	29	34
448		12	41.6	16	7.2	1.17	.107	6.4	65	14	17	
449	Arable Plot A	6	36.5	19	7.8	1.60	.102	9.1	86	23	50	70
450		12	37.5	18	7.7	1.21	.100	7.0	70	14	19	
EAST SIDE: MEANS		6	37.7	20	7.5	1.59	.112	8.3	73	15	33	44
		12	36.0	19	7.4	1.32	.106	7.3	63	16	23	
MEANS OF ALL		6	35.0	21	7.5	1.57	.114	8.0	80	20	32	48
		12	33.7	20	7.4	1.31	.106	7.3	67	20	23	

TABLE III

LABORATORY DATA

EXPERIMENTAL HOLDING No. IV

College Farm, Field 17 (formerly Field 16B)

Vegetables (Baboolal's holding)

Soil Samples collected 12th August, 1947: First Series

Sample COL		Depth (ins.)	Total sand (%)	React		O.M. (%)	Total N (%)	C/N ratio	Elect. cond.		Avail. P ₂ O ₅	Avail K ₂ O
				I.T.	-ion (pH)				Avail. Rate	(mhos x 10 ⁻⁶)		
(A)	<u>GARDEN AREA</u>											
451	Plot E. side	6	44.0	23	7.0	7.93*	.203	22.7	122	16	610	357
452		12	43.6	22	7.2	7.38	.135	31.7	125	18	567	-
453	Plot W. side	6	45.0	22	6.7	2.57	.151	10.6	107	21	351	263
454		12	46.0	18	6.9	2.36	.128	10.7	107	31	332	-
459	Plot S.E.	6	40.0	20	6.4	2.95	0.140	12.2	82	24	92	<u>99</u>
460	corner	12	30.0	22	6.7	2.48	0.144	9.5	91	14	70	
(B)	<u>PASTURE - FODDER GRASS AREA</u>											
455	Pasture plot	6	54.0	13	6.7	1.67	0.106	9.2	30	14	<u>16</u>	<u>47</u>
456		12	57.0	11	6.6	1.29	0.088	8.5	29	14	<u>22</u>	
457	Fodder plot	6	43.7	16	6.4	1.55	0.123	7.3	25	2	<u>12</u>	<u>31</u>
458		12	41.0	17	6.7	1.52	1.122	7.2	25	11	<u>11</u>	-

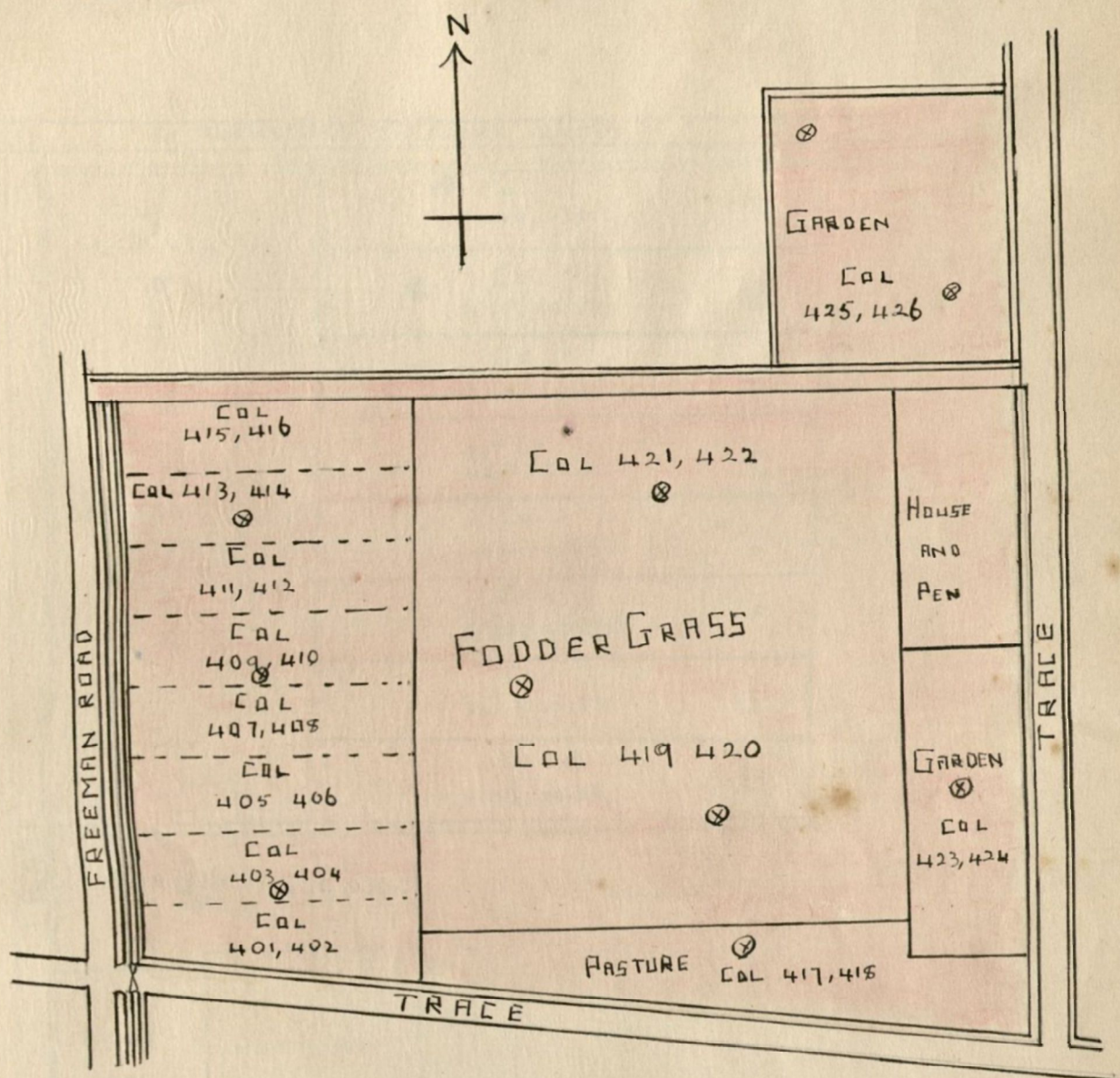
* Contaminated with "charcoal".

Values underlined, probably inadequate.NOTE: Holding had been manured just prior to sampling.

APPENDIX II.

Holding No 2 Garib

3.07 acres

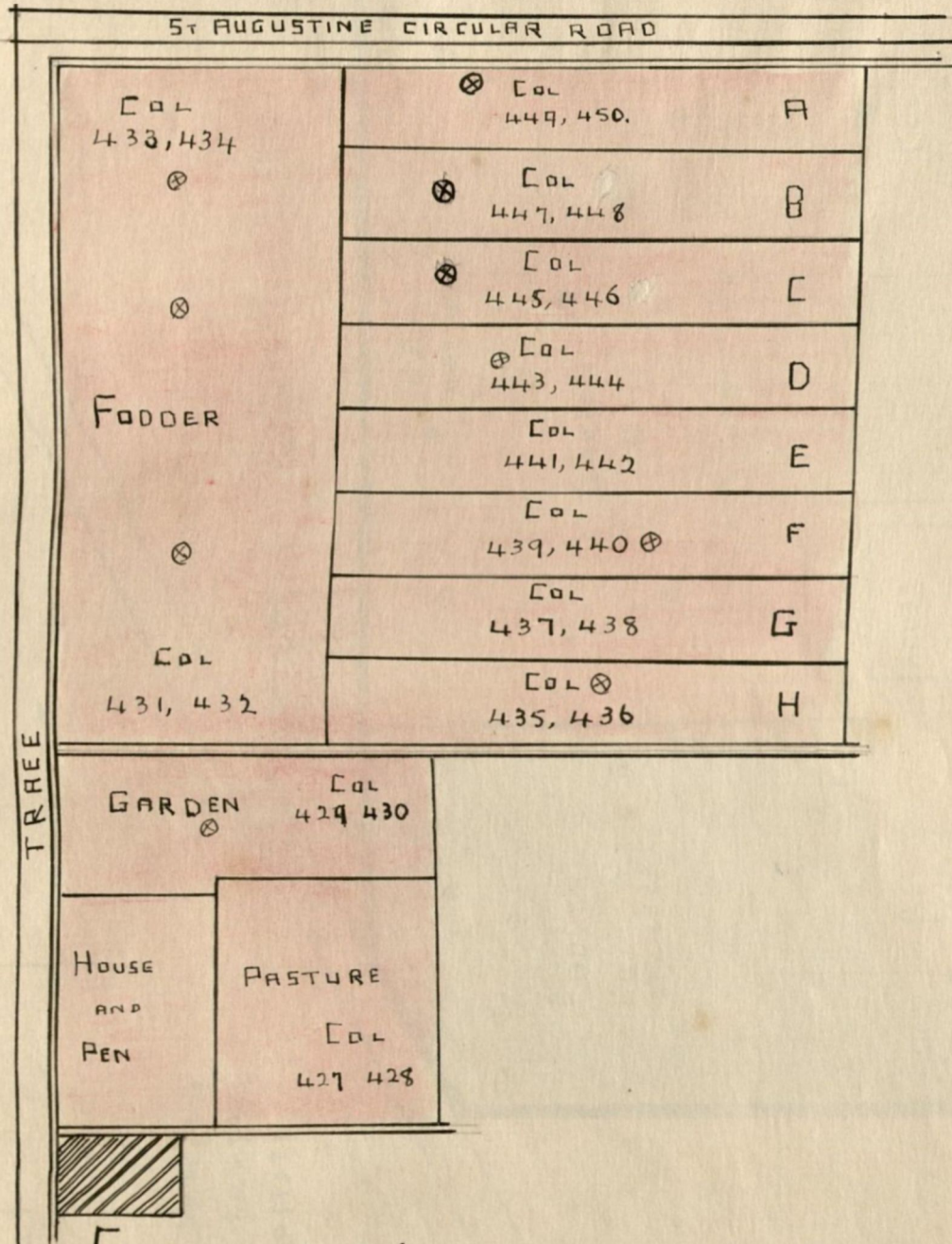


SCALE 1" = 80'

COL 410 First Series of Soil Samples

⊗ Second Series of Soil Samples

Holding No 3 Ramnauth



SCALE 1" = 80'

COL 439 First Series of Soil Samples
 ⊗ Second Series of Soil Samples
 ■ Site of Corn Microplots

Holding No 4 Baboolal

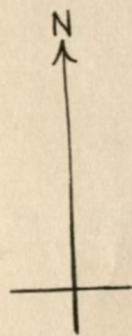
1 acre

Col 459 First Series of Soil Samples

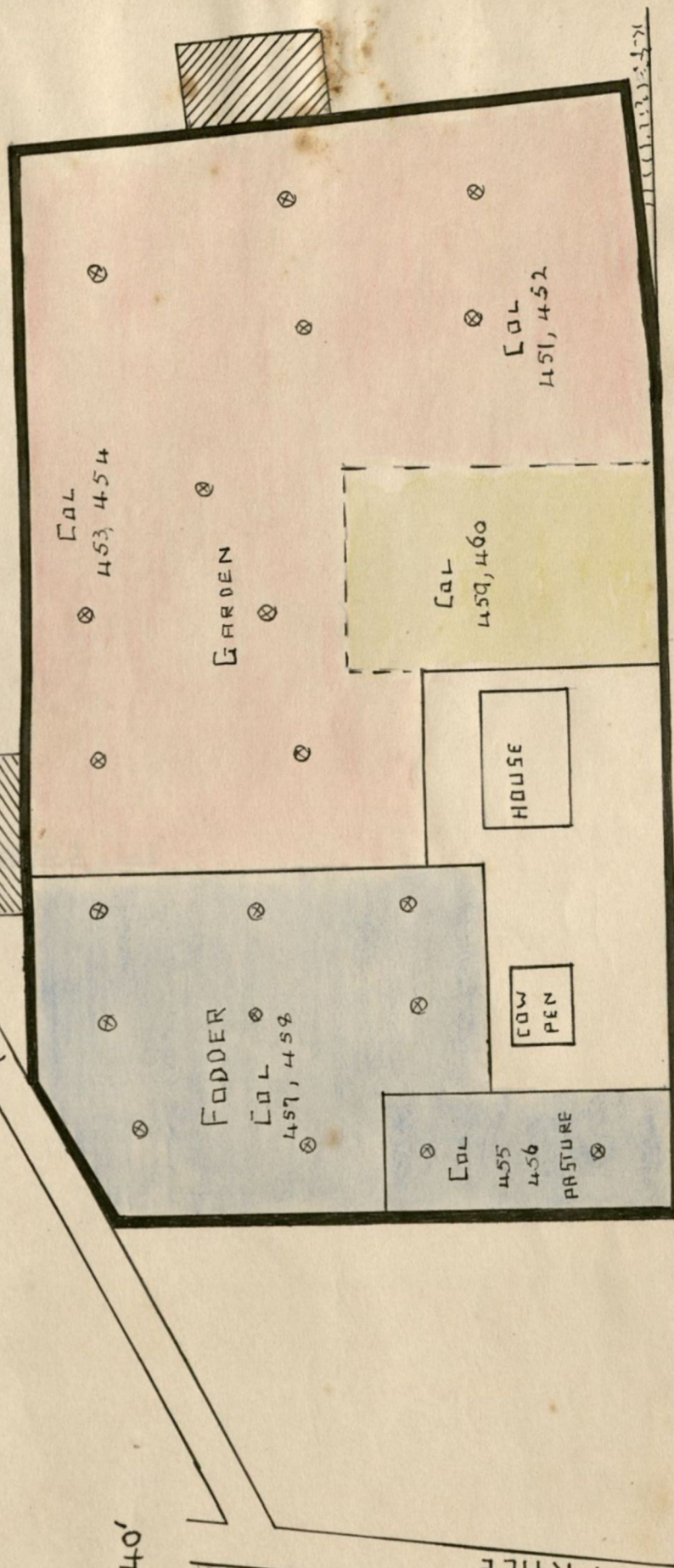
⊗ Second Series of Soil Samples

▨ Site of Corn Microplots

SCALE 1" = 40'



TRACE



TRACE

TRACE

WATTS ROAD

ANALYSIS OF NITROGEN-FERTILIZED PASTURE AND GARDEN PLANT MATERIAL

No. of Holdings	Treatment	Mean wt. of roots (gms)	Mean wt. of stems (gms)	Percentage of total dry weight
II	N	23.0	52.7	64.3
	P	17.5	45.5	73.1
	K	8.1	18.9	21.9
	NPK	22.5	54.5	(100)
III	N	18.8	42.5	68.2
	P	17.7	41.8	72.6
	K	8.3	18.1	21.7
	NPK	17.6	41.7	(100)
IV	Garden			
	N	18.2	61.3	87.3
	P	18.2	79.8	110.7
	K	4.6	22.3	31.6
IV	Pasture			
	N	15.0	70.3	(100)
	N	7.7	32.3	49.2
	P	6.8	29.9	46.5
	K	4.1	13.9	19.6
	NPK	15.2	45.7	(100)

No. of Holdings	Nutrient	Amount present (gms/g)	Value (gms/g)	Standard measures
<u>APPENDIX III</u>				
II	N (N)		4.33	S/A 21.3
	P (P ₂ O ₅)	.76	.98	Super (17%) 5.9
	K (K ₂ O)	.99	.91	S/Pot 1.3
III	N (N)	.44	4.36	S/A 21.3
	P (P ₂ O ₅)	.73	1.00	Super (17%) 6.0
	K (K ₂ O)	.43	1.17	S/Pot 2.3
IV	Garden			
	N (N)	.70	4.1	S/A 20.5
	P (P ₂ O ₅)	Excessive	-	Super (17%) nil
	K (K ₂ O)	.76	.84	S/Pot 1.7
	Pasture			
	N (N)	.39	4.41	S/A 22.1
	P (P ₂ O ₅)	.35	1.40	Super (17%) 8.4
	K (K ₂ O)	.25	1.33	S/Pot 2.7

RESULTS OF MITSCHERLICH POT TESTS APPLIED TO
PEASANT HOLDING SOILS.

No. of Holding		Treatment	Mean wt. of roots (gms)	Mean wt. of stems (gms)	Percentage of experimental maximum
II		NP	23.0	53.7	84.3
		NK	17.5	46.3	73.1
		PK	8.1	13.9	21.9
		NPK	22.5	63.6	(100)
III		NP	18.8	42.5	68.9
		NK	17.7	44.8	72.6
		PK	8.9	13.4	21.7
		NPK	17.6	61.7	(100)
IV	Garden	NP	13.2	61.3	87.2
		NK	16.2	79.8	110.7
		PK	4.6	22.3	31.6
		NPK	15.0	70.3	(100)
	Pasture	NP	7.7	32.3	49.2
		NK	6.8	29.9	45.5
		PK	4.1	12.9	19.6
		NPK	18.0	65.7	(100)

No. of Holding		Nutrient Status		Manurial Requirement	
		Nutrient	Amount present (cwts.ac)	Nutrient	Standard manures (cwts. ac.)
II		N (N)	.44	4.36	S/A 21.8
		P (P ₂ O ₅)	.76	.99	Super (17%) 5.9
		K (K ₂ O)	.69	.91	S/Pot 1.8
III		N (N)	.44	4.36	S/A 21.8
		P (P ₂ O ₅)	.75	1.00	Super (17%) 6.0
		K (K ₂ O)	.43	1.17	S/Pot 2.3
IV	Garden	N (N)	.70	4.1	S/A 20.5
		P (P ₂ O ₅)	Excessive	-	Super (17%) nil
		K (K ₂ O)	.76	.84	S/Pot 1.7
	Pasture	N (N)	.39	4.41	S/A 22.1
		P (P ₂ O ₅)	.35	1.40	Super (17%) 8.4
		K (K ₂ O)	.25	1.35	S/Pot 2.7

REPORT OF THE COMMISSIONER OF PLANT INDUSTRY

For the Year Ending June 30, 1942

(Revised - 1942)

June 30, 1942

3.0.1 10.5/30	3.1.0 11.5/30	3.1.1 12.5/30	Sub black wt.(oz) plants (No) 79.5 270
3.0.2 11.5/30	3.1.2 12.5/30	3.1.2 13.5/30	
3.0.3 12.5/30	3.1.3 13.5/30	3.1.3 14.5/30	
3.0.4 13.5/30	3.1.4 14.5/30	3.1.4 15.5/30	Sub black wt.(oz) plants (No) 80.5 270
3.0.5 14.5/30	3.1.5 15.5/30	3.1.5 16.5/30	
3.0.6 15.5/30	3.1.6 16.5/30	3.1.6 17.5/30	
3.0.7 16.5/30	3.1.7 17.5/30	3.1.7 18.5/30	Sub black wt.(oz) plants (No) 81.5 270
3.0.8 17.5/30	3.1.8 18.5/30	3.1.8 19.5/30	
3.0.9 18.5/30	3.1.9 19.5/30	3.1.9 20.5/30	
3.0.10 19.5/30	3.1.10 20.5/30	3.1.10 21.5/30	Sub black wt.(oz) plants (No) 82.5 270
3.0.11 20.5/30	3.1.11 21.5/30	3.1.11 22.5/30	
3.0.12 21.5/30	3.1.12 22.5/30	3.1.12 23.5/30	

APPENDIX IV

Expressed as $\frac{\text{weight of plants in can.}}{\text{number of plants}}$

	E_0	E_1	E_2
10	10	10	10
20	20	20	20
30	30	30	30
40	40	40	40
50	50	50	50
60	60	60	60
70	70	70	70
80	80	80	80
90	90	90	90
100	100	100	100

RESULTS OF CORN MICROPLOT EXPERIMENT APPLIED TO PEASANT HOLDING SOIL

EXPERIMENTAL HOLDING No.III

College Farm Field R1 formerly Fields 25 - 27E and R IX

Ploughing oxen (Ramnauth's holding)

March 5th - April 2nd, 1948

0.0.0 5.5/30	6.1.0 12.5/30	3.1.2 10.0/30	Sub block a wt.(oz) plants (No) 79.5 270
3.0.1 6.5/30	6.0.2 11.5/30	0.1.1 4.5/30	
0.2.2 7.5/30	3.2.0 10.0/30	6.2.1 11.5/30	
3.1.1 10.5/30	0.2.1 11.0/30	6.0.1 9.5/30	Sub block b wt.(ozs) plants (No) 91.5 270
3.2.2 8.0/30	6.1.2 16.0/30	0.1.0 9.0/30	
0.0.2 9.0/30	3.0.0 8.5/30	6.2.0 10.0/30	
0.0.1 4.5/30	0.2.0 9.0/30	6.1.1 11.5/30	Sub block c wt.(ozs) plants (No) 89.5 270
0.1.2 6.5/30	3.2.1 11.5/30	3.1.0 12.0/30	
3.0.2 8.0/30	6.0.0 9.0/30	6.2.2 17.5/30	

Expressed as $\frac{\text{weight of plants in ozs.}}{\text{number of plants}}$

	K ₀	K ₁	K ₂
N ₀	78	67	77
N ₃	101	95	87
N ₆	105	108	149
Total	284	270	313

	N ₀						N ₃						N ₆					
	P ₀		P ₁		P ₂		P ₀		P ₁		P ₂		P ₀		P ₁		P ₂	
	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no
K ₀	5.5	30	9.0	30	9.0	30	8.5	30	12.0	30	10.0	30	9.0	30	12.5	30	10.0	30
K ₁	4.5	30	4.5	30	11.0	30	6.5	30	10.5	30	11.5	30	9.5	30	11.5	30	11.5	30
K ₂	9.0	30	6.5	30	7.5	30	8.0	30	10.0	30	8.0	30	11.5	30	16.0	30	17.5	30

Statistical analysis

	N ₀			N ₃			N ₆		
	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂
K ₀	18	30	30	28	40	33	30	42	33
K ₁	15	15	37	22	35	38	32	38	38
K ₂	30	22	25	27	33	27	38	53	58

Expressed as weight in ozs. of 100 plants in each plot

	N ₀	N ₃	N ₆
P ₀	63	77	100
P ₁	67	108	133
P ₂	92	98	129
Total	222	283	362

	K ₀	K ₁	K ₂
N ₀	78	67	77
N ₃	101	95	87
N ₆	105	108	149
Total	284	270	313

	P ₀	P ₁	P ₂
K ₀	76	112	96
K ₁	69	88	113
K ₂	95	108	110
Total	240	308	319

Factors	S.S.	D.F.	Variance	F.calc	F. theory .05	F. theory .01
Total	2566.7	26	-	-	-	-
Blocks	106.9	2	53.5		5.14	10.92
N	1094.9	2	547.5	18.4		
P	406.9	2	203.5	6.9		
K	106.9	2	53.5			
NP	140.9	4	35.2		4.53	9.15
NK	353.5	4	88.4			
PK	178.9	4	44.7			
Error	177.8	6	29.6			

Nitrogen and potash show significance.

Nitrogen

	<u>Total weight</u>	<u>wt. of 100 plants</u>	<u>Wt. as a percentage of No.</u>
N ₀	222	24.6	(100)
N ₃	283	31.4	128
N ₆	360	40.0	163

Significant differences between main treatment totals = $\sqrt{29.6 \times 2 \times 9 \times t}$

at .05	36.4	4.0	16
at .01	85.7	9.5	39
at .001	127.2	14.4	59

∴ N₃ is significantly greater than N₀, N₆ is significantly greater than N₃ and N₆ is very highly significantly greater than N₀.

Phosphate

	<u>Total weight</u>	<u>wt.of 100 plants</u>	<u>wt.as percentage of No.</u>
P ₀	240	26.6	(100)
P ₁	308	34.2	129
P ₂	319	35.3	133

Significant differences between main treatment totals = $\sqrt{29.6 \times 2 \times 9 \times t}$

at .05	36.4	4.0	15
at .01	85.7	9.5	36
at .001	127.2	14.4	54

∴ P₁ is significantly greater than P₀ and P₂ is also significantly greater than P₀.

Holme's method of analysis

	N ₀		N ₃		N ₆	
	wt oz	pl no	wt oz	pl no	wt oz	pl no
P ₀	19.0	90	23.0	90	30.0	90
P ₁	20.0	90	32.5	90	40.0	90
P ₂	27.5	90	29.5	90	39.0	90
Total	66.5	270	85.0	270	109.0	270
wt.of 100 plants	24.6		31.5		40.4	
average percentage yields	P ₀ (100)		P (av) 141.9			

	P ₀		P ₁		P ₂	
	wt oz	pl no	wt oz	pl no	wt oz	pl no
K ₀	23.0	90	33.5	90	29.0	90
K ₁	20.5	90	26.5	90	34.0	90
K ₂	28.5	90	32.5	90	33.0	90
Total	72.0	270	92.5	270	96.0	270
wt. of 100 plants	26.7		34.2		35.6	
Average percentage yields	P ₀ (100)		P (av) 130.7			

	K ₀		K ₁		K ₂	
	wt oz	pl no	wt oz	pl no	wt oz	pl no
N ₀	23.5	90	20.0	90	23.0	90
N ₃	30.5	90	28.5	90	26.0	90
N ₆	31.5	90	32.5	90	45.0	90
Total	85.5	270	81.0	270	94.0	270
wt. of 100 plants	31.7		30.0		34.8	
average percentage yields	K ₀ (100)		K (av) 102.2			

		<u>wt. ozs.</u>	<u>plant No.</u>
Sub block	a	79.5	270
"	" b	91.5	270
"	" c	89.5	270
Grand Total		260.5	810

Wt. of 100 plants 32.2 ozs.

Average percentage of control 100%

<u>N</u>	<u>P</u>	<u>K</u>
141.9	130.7	102.2

Nitrogen markedly deficient, phosphate slightly deficient,
potash adequate.

RESULTS OF CORN MICROPLOT EXPERIMENT APPLIED TO PEASANT HOLDING SOIL

EXPERIMENTAL HOLDING NO. IV

College Farm Field 17 formerly Field 16B

Vegetables (Baboolal's Holding)

March 30th - April 28th, 1948

GARDEN

0.0.0 127/30	6.1.0 132/30	3.1.2 103/30	Sub block a wt (ozs) plants (No) 1100 264
5.0.1 150/30	6.0.2 139/30	0.1.1 133/29	
0.2.2 100/30	3.2.0 101/30	6.2.1 115/27	
3.1.1 92/30	0.2.1 100/30	6.0.1 115/32	Sub block b wt (ozs) Plants (No) 664 265
3.2.2 101/30	6.1.2 88/28	0.1.0 85/32	
0.0.2 71/30	3.0.0 100/29	6.2.0 71/24	
0.0.1 64/24	0.2.0 93/27	6.1.1 67/26	Sub block c wt (ozs) plants (No) 775 240
0.1.2 78/27	3.2.1 114/30	3.1.0 72/22	
3.0.2 110/30	6.0.0 103/30	6.2.2 74/24	

Expressed as weight of plants in ozs
number of plants

K ₀	1111	1033	975
E ₁	1095	1668	1139
E ₂	1087	957	977
Total	3273	3648	3052

	No						N3						N6					
	Po		P1		P2		Po		P1		P2		Po		P1		P2	
	wt	pl	wt	pl	wt	pl	wt	pl	wt	pl	wt	pl	wt	pl	wt	pl	wt	pl
	oz	no	oz	no	oz	no	oz	no	oz	no	oz	no	oz	no	oz	no	oz	no
K ₀	127	30	85	32	93	27	100	29	72	22	101	30	103	30	132	30	71	24
K ₁	64	24	133	29	100	30	150	30	92	30	114	30	115	32	67	26	115	27
K ₂	71	30	78	27	100	30	110	30	103	30	101	30	139	30	88	28	74	24

	No			N3			N6		
	Po	P1	P2	Po	P1	P2	Po	P1	P2
K ₀	423	266	344	345	327	336	343	440	296
K ₁	266	493	333	500	307	380	329	258	426
K ₂	237	300	333	367	343	336	463	314	308

Expressed as weight in ozs, of 100 plants in each plot.

	N ₀	N ₃	N ₆
P ₀	926	1211	1135
P ₁	1059	977	1012
P ₂	1010	1052	1030
Total	2995	3141	3177

	P ₀	P ₁	P ₂
K ₀	1111	1033	976
K ₁	1095	1058	1139
K ₂	1067	957	977
Total	3273	3048	3092

	K ₀	K ₁	K ₂
N ₀	1033	1092	870
N ₃	1008	1187	1046
N ₆	1079	1013	1085
Total	3120	3292	3001

Factor	S.S.	D.F.	Variance	F calc	F.theory .05	F.theory .01
Total	123,830.3	26	-	-	-	-
Blocks	64,877.8	2	32,438.9	5.486	5.14	10.92
N	3,619.8	2	1,859.9			
P	2,457.0	2	1,228.5			
K	4,756.5	2	2,878.3			
NP	35,762.8	4	8,940.7		4.53	9.15
NK	49,804.2	4	12,451.0			
PK	3,990.1	4	997.5			
Error	35,473.4	6	5,912.2			

No significant differences

Holme's method of analysis

	N ₀		N ₃		N ₆	
	wt oz	pl no	wt oz	pl no	wt oz	pl no
P ₀	262	84	360	89	357	92
P ₁	296	88	267	82	267	84
P ₂	293	87	316	90	260	75
Total	751	259	943	261	884	251
wt. of 100 plants	289.9		399.6		352.2	
Average Percentage yield	N ₀ (100)		N (av) 123.4			

	P ₀		P ₁		P ₂	
	wt oz	pl no	wt oz	pl no	wt oz	pl no
K ₀	330	89	289	84	265	81
K ₁	329	86	290	85	329	87
K ₂	310	90	269	85	275	84
Total	969	265	848	254	869	252
wt. of 100 plants	365.6		333.5		344.8	
average percentage yield	P ₀ (100)		P (av) 91.8			

	K ₀		K ₁		K ₂	
	wt oz	pl no	wt oz	pl no	wt oz	pl no
N ₀	305	89	297	83	249	87
N ₃	273	81	356	90	314	90
N ₆	306	84	297	85	301	82
Total	884	254	950	258	864	259
wt. of 100 plants	348.0		368.2		333.7	
average percentage yield	K ₀ (100)		K (av) 100.8			

	wt. ozs	Plant No.
Sub block a	1100	264
" " b	664	265
" " c	775	240
Grand Total	2539	767

wt. of 100 plants * 330 ozs.

Average percentage of control (100%)

$\frac{N}{123.4}$	$\frac{P}{91.8}$	$\frac{K}{100.8}$
-------------------	------------------	-------------------

Potash may be slightly deficient, nitrogen and phosphate adequate.

RESULTS OF CORN MICROPLOT EXPERIMENT APPLIED TO PEASANT HOLDING SOILEXPERIMENTAL HOLDING NO. IV

College Farm Field 17 (formerly Field 16B)

Vegetables (Baboolal's holding)February 27th - March 26th, 1948PASTURE

0.0.0 2.25/22	6.1.0 4.0/27	3.1.2 * 3.0/18	Sub block a wt.(ozs) plants (No) 42.0 218
3.0.1 8.75/24	6.0.2 7.25/29	0.1.1 * 4.0/29	
0.2.2 3.75/27	3.2.0 3.5/15	6.2.1 15.5/29	
3.1.1 5.25/26	0.2.1 3.5/26	6.0.1 8.0/24	Sub block b wt.(ozs) plants (No) 45.25 233
3.2.2 3.0/30	6.1.2 9.5/23	0.1.0 3.75/30	
0.0.2 3.75/26	3.0.0 5.0/18	6.2.0 4.5/30	
0.0.1 3.0/30	0.2.0 4.0/30	6.1.1 10.0/30	Sub block c wt.(ozs) plants (No) 66.0 262
0.1.2 3.5/30	3.2.1 8.75/30	3.1.0 7.25/35	
3.0.2 7.5/25	6.0.0 5.0/24	6.2.2 17.0/28.	

Expressed as $\frac{\text{weight of plants in ozs.}}{\text{number of plants}}$

* Destroyed plots which were replanted

	N ₀						N ₃						N ₆					
	P ₀		P ₁		P ₂		P ₀		P ₁		P ₂		P ₀		P ₁		P ₂	
	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no	wt oz	pl no
K ₀	2.25	22	3.75	30	4.0	30	5.0	18	7.25	35	3.5	26	5.0	24	4.0	27	4.5	30
K ₁	3.0	30	4.	29	3.5	26	8.75	24	5.25	26	8.75	30	8.0	24	10.0	30	15.5	29
K ₂	3.75	26	3.5	30	3.75	27	7.5	25	3.	18	3.0	30	7.25	29	9.5	23	17.0	28

Statistical analysis

	N ₀			N ₃			N ₆		
	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂
K ₀	10	13	13	28	21	13	21	15	15
K ₁	10	14	13	36	20	29	33	33	50
K ₂	14	12	14	30	17	10	25	41	61

Expressed as weight in ozs. of 100 plants in each plot

	N ₀	N ₃	N ₆
P ₀	34	94	79
P ₁	39	58	89
P ₂	40	52	126
Total	113	204	294

	P ₀	P ₁	P ₂
K ₀	59	49	41
K ₁	79	67	92
K ₂	69	70	85
Total	207	186	218

	K ₀	K ₁	K ₂
N ₀	36	37	40
N ₃	62	85	57
N ₆	51	116	127
Total	149	238	224

Factor	S.S.	D.F.	Variance	F. calc	F. theory .05	F. theory .01
Total	4428.3	26	-	-	-	-
Blocks	118.3	2	59.2		5.14	10.92
N	1820.1	2	910.1	18.2		
P	58.7	2	29.4			
K	508.9	2	254.5			
NP	700.8	4	175.2		4.53	9.15
NK	767.3	4	191.8			
PK	153.4	4	38.4			
Error	300.8	6	50.1			

Nitrogen is the only nutrient showing significance.

	Total weight	wt. of 100 plants	Weights as a percentage of No.
N ₀	113	12.5	(100)
N ₃	204	22.6	180
N ₆	294	32.6	260

Significant differences between main treatment totals = $\sqrt{50.1 \times 2 \times 9 \times t}$

at .05	73	8.1	64
at .01	111	12.3	98
at .001	179	19.9	160

∴ N₃ is significantly greater than N₀, N₆ is significantly greater than N₃ and N₆ is very highly significantly greater than N₀.

Holme's method of analysis

	N ₀		N ₃		N ₆	
	wt oz	pl no	wt oz	pl no	wt oz	pl no
P ₀	9.0	78	21.25	67	20.25	77
P ₁	11.25	89	15.5	79	23.5	80
P ₂	11.25	83	15.25	86	37.0	87
Total	31.50	250	52.00	232	80.75	244
wt. of 100 plants	12.6		22.4		33.1	
average percentage yield	N ₀ (100)		N (av) 220			

	P ₀		P ₁		P ₂	
	wt oz	pl no	wt oz	pl no	wt oz	pl no
K ₀	12.25	64	15.0	92	12.0	86
K ₁	19.75	78	19.25	85	27.75	85
K ₂	18.5	80	15.5	71	23.75	85
Total	51.5	222	49.75	248	63.5	256
wt.of 100 plants	23.2		20.0		24.8	
AVERAGE percentage yields	P ₀ (100)		P (av) 97.4			

	K ₀		K ₁		K ₂	
	wt oz	pl no	wt oz	pl no	wt oz	pl no
N ₀	10.0	82	10.5	85	11.0	83
N ₃	15.75	79	22.75	80	13.5	73
N ₆	13.5	81	33.5	83	33.75	80
Total	39.25	242	66.75	248	68.25	236
wt. of 100 plants	16.2		26.9		28.9	
average percentage yield	K ₀ (100)		K (av) 172			

	<u>WT. Ozs.</u>	<u>Plant No.</u>
Sub block a	42.0	218
" " b	45.25	233
" " c	66.0	262
Grand Total	153.25	713

Wt. of 100 plants 21.5

Average percentage of control (100%)

$\frac{N}{220}$	$\frac{P}{97.4}$	$\frac{K}{172}$
-----------------	------------------	-----------------

Nitrogen and potash are deficient, phosphate adequate.

APPENDIX V

EXPERIMENT No. II and III.

Starchless Pot Test.

1943 January 27th. Soil samples collected (3, cond Series).
 February 12th. Soil & plants.
 February 19th. Fertiliser solutions prepared.
 February 26th - 28th. Pots prepared and planted.
 March 12th - 12th. Pots thinned and supplied.
 March 24th. Superstructure put on.
 May 11th. Pots photographed.
 May 15th. Plants harvested and root matter washed from soil.

HOLDING No. III

Corn against experiment.

1945

March 4th Land cleared of cane and prepared.
 " 5th Plots planted.
 " 7th Soil samples collected (Third Series)
 " 18th Plots thinned.
 April 2nd Nine plots photographed and the whole series harvested.

Rainfall during experiment = .81 inches.

HOLDING No. IV.

APPENDIX V

Grass and Fertiliser.

1945

December 14th Soil Samples collected (Second Series)
 " 19th Fertiliser solutions prepared.
 " 20th Soil riddled.
 " 23rd - 25th. Pots prepared and planted.
 December 3rd - 4th. Pots thinned and supplied.
 " 5th - 7th. Watering stopped in an effort to reduce *Sclerotium rolfsii* attack.
 " 8th Superstructure put on.

1946

January 24th Pots photographed.
 February 24th Pots harvested and root matter washed from soil.

Corn against experiment.

Fertiliser.

1946

February 26th Land cleared of unwanted grass and prepared.
 " 27th Plots planted.
 " 29th Soil samples collected (Third Series)
 March 6th Fertiliser damaged some of the plots, No P₁ K₂ and No P₁ K₁ were completely destroyed.
 " 29th Eight plots photographed and whole harvested.
 " 30th Plots No P₁ K₂, No P₁ K₁ and No P₁ K₁ replanted on a new piece of land.
 April 12th Three plots thinned.
 " 20th Three plots harvested.

Rainfall during experiment = 1.00 inches.

Rainfall during experiment = 1.45 inches.

DIARIES.

HOLDINGS No. II and III.

Mitscherlich Pot Test.

1948 January 27th. Soil samples collected (Second Series)
February 18th. Soil riddled.
February 19th. Fertiliser solutions prepared.
February 26th - 29th. Pots prepared and planted.
March 12th - 13th. Pots thinned and supplied.
March 24th. Superstructure put on.
May 11th. Pots photographed.
May 15th. Plants harvested and root matter washed from soil.

HOLDING No. III

Corn microplot experiment.

1948

March 4th Land cleared of cane and prepared.
" 5th Plots planted.
" 7th Soil samples collected (Third Series)
" 15th Plots thinned.
April 2nd Nine plots photographed and the whole series harvested.

Rainfall during experiment = .81 inches.

HOLDING No. IV.

Mitscherlich Pot Test.

Garden and Pasture.

1947

November 12th Soil Samples collected (Second Series)
" 19th Fertiliser solutions prepared.
" 20th Soil riddled.
" 23rd - 25th. Pots prepared and planted.
December 3rd - 4th. Pots thinned and supplied.
" 5th - 7th. Watering stopped in an effort to reduce Sclerotium rolfsii attack.
" 8th Superstructure put on.

1948

January 24th Pots photographed.
February 14th Pots harvested and root matter washed from soil.

Corn microplot experiment.

Pasture.

1948

February 26th Land cleared of Guatemala grass and prepared.
" 27th Plots planted.
" 29th Soil samples collected (Third Series)
March 5th Fowls damaged some of the plots, N₃ P₁ K₂ and N₀ P₁ K₁ were completely destroyed.
" 26th Eight plots photographed and whole harvested.
" 30th Plots N₀ P₀ K₀, N₃ P₁ K₂ and N₀ P₁ K₁ replanted on a new piece of land.
April 12th Three plots thinned.
" 28th Three plots harvested.

Rainfall during experiment = 1.00 inches.
Rainfall during replanting = 1.45 inches.

GARDEN

1948

March	19th	Land cleared of vegetables and prepared.
"	30th	Pots planted.
"	31st	Soil samples collected (Third Series).
April	8th	Land weeded.
"	12th	Plots thinned.
"	28th	Nine plots photographed and whole harvested.

Rainfall during the experiment = 1.45 inches.