REPORT ON SURVEY

BY

J. McCallum.

Part (1) MOUNTAIN AREA

" (2) LOWLAND AREA
INTRODUCTION

A considerable proportion of the Northern Range of Trinidad has been under private ownership now for many years. Until 1932, it was mainly covered by cocoa, forest or second growth but with the advent of the depression in the cocoa industry, landowners began to rent out increasing areas of steep hillsides to agricultural peasants, on which to grow crops. These peasants prefer the highest steepest and most inaccessible portions of the hillsides, as the danger of loss of crops by praedial larceny is thereby reduced. In many cases the forests have been removed right up to the summits of the hills and there is very little wood left. The inevitable result of all this has been a vast increase in erosion, flooding and landslides and in many places the erosion has gone so far that there is very little of the original soil left.

The area covered in this survey may be taken more or less as a typical example of many similar areas in the Northern Range.

This mountain survey area covers the side of one of the foothills of the Northern Range and comprises part of the Maracas Valley. In common with the lowland area, it is situated in the Tacarigua ward of the County of St. George about nine miles east of Port of Spain.

The area may be described as taking the form of a great inverted V, the arms of which form ridges on either side and converge at the top to form the apex and summit of the hill at a height of approximately 2000 feet above sea level. The greater part of the area consists of a shallow valley which rises steeply up the mountain, in such a way, that the majority of the land has South-Eastern aspect. The main valley itself is cut up into numerous small valleys which act as watercourses for the surrounding ridges but the general trend of these may be seen from the map.

A look at the accompanying photographs will give an idea of the topography of the land, a vast portion of which, has a slope equal to or even greater than the examples shown.
places the gradient is as steep as 1 in 1.

The rainfall is somewhere in the region of 80 inches per annum but in normal years nearly all the rain falls in the last seven or eight months and it is frequently of great violence.

At the present time, there are no accurate figures available of the total area covered in this survey but, at a round estimate, it may be taken as lying somewhere under 300 acres.

The communications are far from satisfactory. There is a good metal approach road as far as Floradale but, from there on, however, the only means of access is by a stone road and earth path, the roughness and steepness of which, make it quite unsuitable for any form of transport other than the head or the pack donkey. This path is the remnants of the old road used by the former cocoa planters to get their produce down to the main roads but since the cocoa industry faded out nothing has been done towards its upkeep. As illustrated by the photographs, both the head and the pack donkey are employed by the present day cultivators to get their produce down as far as Floradale. At this point it is usually transferred onto donkey carts and hence to markets the chief of which are St. Joseph, San Juan and Port of Spain.

GEOLOGY AND SOIL

In common with the rest of the Northern Range, this area originally came into the belt which consisted of Jurassic and Cretaceous rocks, including limestone. In the course of time, however, these were greatly folded and contorted into the present day quartz, talc and mica schists, with outcrops of limestone, which are so characteristic of the Northern Range. These schists decompose rapidly on exposure to the weather forming open textured sandy soils. These soils are usually studded with boulders and come under the type known as "Maracas Sands". Due to the vast amount of erosion which has gone on since the original forests and later cocoa plantations were removed, these soils are now very shallow, in many cases, the hard sub-soil is only a few inches under
the surface. As a result, the area is now covered with very
immature soils which are technically known as lithosols.

During the course of this survey soil samples were taken at
the sites marked on the map. These were submitted to the Soil
Science department of the College for examination and analysis
and the following report on them was issued by Professor Hardy
to whom the writer is greatly indebted.

**NOTE:** (1) All samples represent top 6 ins. of soil wherever
underlying rock was not nearer to the surface.
Rock occasionally reached at 3 to 4 ins.

(2) Samples having highest serial numbers were taken at
the highest altitudes.

<table>
<thead>
<tr>
<th>Lab. Field Gravel Sand (over crse.&amp; fine (2-0.02mms.)</th>
<th>Reaction CaCO_3</th>
<th>Total</th>
<th>Total C/N</th>
<th>Avail. Avail.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Norm. Exch.</td>
<td>Crg.</td>
<td>N Ratio</td>
<td>P2O_5 K2O</td>
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<tr>
<td></td>
<td>pH %</td>
<td>%</td>
<td>ppm</td>
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(A) SOILS OF CULTIVATED LANDS

<table>
<thead>
<tr>
<th>No.</th>
<th>Lab.</th>
<th>Field</th>
<th>Gravel</th>
<th>Sand (over crse.&amp; fine (2-0.02mms.)</th>
<th>Reaction CaCO_3</th>
<th>Total</th>
<th>Total C/N</th>
<th>Avail. Avail.</th>
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<td>63.2</td>
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<td>54</td>
<td>51.0</td>
<td>7.3 6.9 1.60</td>
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<td>794</td>
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<td>7.8 7.6 trace</td>
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MEANS 61 52.9 7.0 6.6 3.53 0.281 8.8 30 96

(B) SOILS OF UNCULTIVATED LANDS

<table>
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<tr>
<th>No.</th>
<th>Lab.</th>
<th>Field</th>
<th>Gravel</th>
<th>Sand</th>
<th>Reaction CaCO_3</th>
<th>Total</th>
<th>Total C/N</th>
<th>Avail. Avail.</th>
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<tr>
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<td>60.0</td>
<td>4.9 3.8</td>
<td>5.28</td>
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<td>42</td>
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MEANS 56 57.1 6.8 6.3 5.68 0.292 11.3 29 42
DISCUSSION:

Texture: All the soils (except No. 15) are gravelly and all contain a high proportion of sand. (There was not enough soil for the determination of sticky point.) The contained fragments and coarse sand particles consist mainly of schist and quartz which suggests that the soils are LITHOSOLS and very immature.

Reaction: This ranges from very highly alkaline (pH above 8.0) to very highly acid (pH below 5.0). The alkaline samples contain varying amounts of free calcium carbonate, ranging from a trace to 1.7 percent (in No. 15), in proportion to the degree of alkalinity (except for No. 6), an uncultivated soil, which contains 1.6 percent CaCO₃ with only 7.3).

Organic matter and nitrogen contents: Total O.M. ranges from 6.6 percent (high) to 1.3 percent (low), and total nitrogen from 0.46 percent (very high) to 0.12 (medium-low), with carbon-nitrogen ratio varying between 14.4 and 5.3, being generally highest in soils containing highest amounts of organic matter and vice versa. The difference in organic status are possibly manifestations of the varying degrees of profile truncation by surface erosion.

Available phosphate: This ranges in amount from 69 p.p.m. to 5 p.p.m. Taking 30 p.p.m. as the lower limit of adequacy for most crops, six samples contain adequate amounts and 15 contain inadequate amounts of available phosphate.

Available potash: Only 4 samples were analysed for potash (Nos. 9, 12, 15 and 18). The values range from 161 p.p.m. to 48 p.p.m. Taking 100 p.p.m. as the lower limit of adequacy, then two of the samples (Nos. 15 and 18) lie above the border-line and two below (Nos. 9 and 12). These four soils are all under cultivation.

Comparison of cultivated and uncultivated soils: The laboratory data shows no significant differences between these two groups, although the uncultivated soils tend to contain most organic matter and to have highest carbon-nitrogen ratios. The available phosphate content of the uncultivated soils is only medium but slightly above the limit of adequacy, except in one sample (No. 3) which is very deficient in phosphate. (No potash figures are available). This suggests that the uncultivated soils have not been long out of cultivation, but are showing signs of recovering their organic status under second-growth bush.

Effect of altitude: The data show no significant differences between soils collected at low and at high altitudes.

Effect of limestone outcrops: The presence of small amounts of free calcium carbonate in some of the soils collected at medium altitudes indicates outcrops of metamorphic limestone.

(Signed) F. HARDY 18/2/43.
The history of the area is not at all clear. At one time, as with the rest of the Northern Range, it was almost certainly covered with Tropical Rainforest, containing a proportion of deciduous species, as the remnants can still be seen at St. Ann's Peak. However, the original vegetation was cut down and the land planted with cocoa, the remains of the old cocoa plantations can still be seen in the valley bottoms.

With the advent of the depression in the cocoa industry, in the early nineteen thirties, this land was gradually abandoned by its owners. As the owners had, however, still to pay the government land tax of 1/- per acre per annum, and, since they derived little or no income from the land, many owners would have been willing to rid themselves of the burden of paying, by selling out. The decline in the cocoa industry threw a lot of the former estate employees out of employment, and, as these had to find a living elsewhere, it was only natural that they should try to grow their own food. To carry out this project, they had to acquire land, so they turned to the abandoned cocoa estates where they found the owners were only too willing to rent them plots, in the hope of deriving an alternative source of income from the old estates. This led to the indiscriminate use of much of the land on the slopes of the foothills of the Northern Range and eventually to that most serious world-wide problem, soil erosion.

At this stage, the government became aware of what was happening and although various approvals and recommendations have been legislated, very little work of any practical value towards stopping this erosion and denudation has so far been put into operation, on this area. However, a step was taken by the government in 1939 when it recommended that all land over 500 feet should be acquisitioned to allow conservation measures to be practised, on a large scale. This action resulted in the government buying Providence Estate in the South west of the area but, while negotiations on this transaction were in progress, 6 acres beside Floradale were sold privately.
Other than these two portions of land, the rest of the area is let out to any peasant who wishes to cultivate a garden. These are taken in plots, from a ½ to 2 acres in size, and at rents varying from five to eight dollars per acre. Sometimes, one peasant may rent several small plots on different parts of the hill, in such a way, that he may have two or more landlords.

The plots were originally demarcated but as little or no check is kept on this, the cultivated area often far exceeds that marked out.

Most of the landlords are absentee, some living as far away as New York. In such cases, a caretaker is usually left in charge. One such caretaker is allowed to cultivate as he wishes and rent out the remainder to other peasants. There are no contracts and no security of tenure, a peasant just cultivates a portion of land until the yield makes further cultivation uneconomical and then he goes elsewhere.

PEASANTS.

The peasants of this area are of two kinds, namely, West Indians and East Indians. The West Indians are the descendants of Negro slaves brought over from West Africa during the eighteenth and early part of the nineteenth centuries, while the others are the descendants of East Indians from India who came over as labourers at different periods after 1854. The latter have increased in numbers so rapidly that they now occupy about one third of the population of Trinidad.

The majority of these peasants would prefer a wage-paying job to working as peasants but they dislike working on sugar cane estates. In the case of the Negroes, this is probably due to their former association with the land as slaves.

Although there are to be found on this area, peasants, who derive their entire livelihood from the soil, there are a number, who, having permanent work elsewhere, cultivate, in addition, plots on the hill, as a means of producing food to supplement their incomes. On this basis, the peasants can again be divided into
classes. The type of peasant, found in one of these classes, works on the hill most of the time i.e. six or seven days a week, with a day off for market every now and then. The second type works on the hill only at weekends, as they have regular jobs elsewhere. Their chief incentive seems to be, the production of food, as they invariably have large families. Then again, there are a few, who work on the hill for 2 or 3 weeks at a time, but, on getting work elsewhere, go off to it, returning to the hill only at weekends or whenever work permits or terminates.

With the exception of two families, who live on the hill, all the rest of the cultivators have to come long distances to their work, some of them living as far away as Tunapuna and St. Joseph. They start out for their day’s work in the cool and early hours of the morning, around 6 o’clock and after a long tiring journey, usually on foot, they arrive at their plots about 8 6’clock. Here they put in a full day’s work as they usually do not return to their homes until late in the afternoon.

On the whole, these peasants should be classed as industrious, hard-working people, although most of them are far from familiar with the most elementary rules of good husbandry and soil conservation.

HUSBANDRY.

Except for the valley bottoms, "shifting cultivation" is practised throughout the entire area. During the last two decades fires have reduced the original forest to lastro, consisting of low scrub, with here and there patches of bracken, whilst the bush is often entangled with vines and razor grass. In the dry season, this vegetation is frequently tinder dry and very fire-susceptible. When a peasant requires a particular area for cultivation he usually takes advantage of this state of the vegetation and clears his plot by burning. As little or no precautions are taken prior to or even during "the burn", the fire often spreads far beyond the required area. For the reasons previously stated, and as illustrated by
the photographs, the areas cleared thus are often the highest and steepest. In normal years, this burning takes place towards the end of the dry season, leaving the soil completely exposed to the full force of the heavy rains in June, because, although some of the crops are planted before this time, they are usually so small, that they contribute little or nothing towards soil cover.

Other than this burning, there is very little preparation prior to planting. If there are any trees, in the way, they are felled and allowed to fall the natural way, i.e. down the slope, and so they contribute little or nothing towards soil conservation. Anything in the way of terracing is practically unheard of.

The cultivations consist of a slight scratching with a hoe, but more often holes are made between the rocks, with a hoe or cutlass and the seeds or sets are placed in these and the earth scraped up around them.

The crops are never grown separately but in mixtures with other crops. By adopting this method, greater use can be made of the land, more food can be obtained from a particular plot and weeds can be kept under control more easily, as different crops have different seasons of growth and therefore ripen at different periods.

No manuring whatsoever is practised, when the original forest or scrub is removed, there is a thin layer of soil containing organic matter which is the result of years of leaf fall under forest vegetation. The hard sub-soil is only a few inches under the surface and although fair crops can be grown on this for the first year or so after the burn, the yields soon fall off. When the yields make further cultivations uneconomical the peasant just moves elsewhere, allowing his plot to revert to scrub again and so the vicious circle continues.

The seeds or planting sets are practically all obtained locally, most of them being home grown or obtained from the Food Control Office as in the case of tomato or pidgeon pea seed.

The following is a list of the principal crops found
on the area, together with, their approximate dates of planting and harvesting. The season of growth for any particular crop is roughly the period between the dates given.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Period of Planting</th>
<th>Period of Harvesting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigeon peas</td>
<td>June</td>
<td>December</td>
</tr>
<tr>
<td>Salad Peas</td>
<td>November</td>
<td>January</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>November</td>
<td>January</td>
</tr>
<tr>
<td>Cassava</td>
<td>May, June &amp; November</td>
<td>After 12 months.</td>
</tr>
<tr>
<td>Rice</td>
<td>May</td>
<td>September</td>
</tr>
<tr>
<td>Maise</td>
<td>May, September</td>
<td>After 4 months.</td>
</tr>
<tr>
<td>Okra</td>
<td>May, September</td>
<td>February</td>
</tr>
<tr>
<td>Water Melons</td>
<td>May</td>
<td>December, January.</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>June</td>
<td>&quot;</td>
</tr>
<tr>
<td>Pumpkins</td>
<td>Anytime during wet season</td>
<td>&quot;</td>
</tr>
<tr>
<td>Bananas</td>
<td>-do.-</td>
<td>December.</td>
</tr>
<tr>
<td>Tannias</td>
<td>May, June.</td>
<td>After 12 months.</td>
</tr>
</tbody>
</table>

In regard to the above, it should, perhaps be stated that, there are great variations from the normal practised with all crops but a few of the most outstanding facts are:

1. Little or no planting is done during the dry season.
2. Rice is always sown with the first rains at the end of May and so gets the full benefits of the early and the heaviest rains in June.
3. Maize is sown either towards the end of the dry season in May or during the short dry period in September.
4. Tomatoes do not grow during the wet season, but useful crops can be planted towards the end of this season in November and harvested in January or February.

With the majority of peasants, after cultivations merely consist of one or two weedings and possibly the "earthing up" of plants with a hoe.

As with all operations on this area, harvesting is very simple. With some of the crops the hand is alone used by the peasants to
gather "the fruits" of their labours but with root crops such as tannias the hoe again has its use. In the case of cereals, such as maize and rice a small hook or scythe is employed, while the old cutlass makes short work of banana stems. Some of the crops are harvested prior to ripening. In the case of bananas this is usual but with other crops such as tomatoes it lessens the dangers of larceny.

With the possible exception of rice, the crops are all carried off the hill as soon as they are harvested. In fact a peasant usually only gathers in a day the amount of produce he can take with him that evening. Rice is threshed on the hill and only the grain is taken home, while in the case of maize the entire cobs are transported.

On account of the methods of mixed cultivation adopted, it is very difficult to get anything but rough estimates of the yields. These are usually pretty good for the first year after "the burn" but they soon begin to fall off, and when they become pretty low the land is abandoned and allowed to revert to scrub. This reversion usually takes place through a crop of pigeon peas and generally occurs at the end of two or three years.

The prices obtained for hill produce vary throughout the season, according to the usual supply and demand position. The price of pigeon peas ranges from 12¢ per lb. at the beginning of the season to as low as 6¢ per lb. during the flush period; tomatoes run from 16 to 30¢ per lb and such things as cucumbers and pumpkins average about 3¢ per lb.

In conclusion, I think it is only true to state that these peasants put in a lot of hard work for what little remuneration they get in return.

**FUTURE POLICY AND CONCLUSION.**

Before going on to comment upon future policy I think that I am completely justified in briefly summarising the effects that the present system of cultivation, on this type of land, has; as it is upon these, that the whole future, of this area and indeed many similar areas in the Northern Range, depend.
When a forest area is felled and burned at the end of the dry season, there is no covering left to induce the water to go into the ground. Instead of soaking in, all the rainwater rushes off over the surface, before it gets time to penetrate. On the steep slopes that are exploited for gardens, the damage is incalculable, for, not only do the ashes go, but the thin layer of soil as well. This means that very often the land cannot be used again for many years and, in some cases it is difficult to grow anything on it but the coarsest grass which is of no value to man or beast.

Although most of this area has not yet reached the stage described above, it is only a matter of a few years at the outside, until such a state of affairs exists, if things are allowed to continue as they are at present. Even at the present time, there are places where only the scantiest of vegetation will grow.

It will be seen, therefore, that the situation calls for immediate and drastic action but the position is complicated by a terrific demand for land on which to grow food, as the population of Trinidad has vastly increased during the last few decades.

On analysing the problem as it presents itself to me I would suggest that any future policy should be divided into three definite steps which may be described as short term, long term and intermediate term.

The short term step calls for immediate attention, and it is the most obvious of the three, namely, the prevention of erosion. Probably, for this to be one hundred per cent effective all cultivation would require to be prohibited. This would entail the acquiring of alternative land for as many as possible of the present cultivators. However, as already stated, this if far from easy and prohibition of cultivation would throw many hardships on these peasants. It may, however, be argued that if things are allowed to continue as at present, it is inevitable that in a few years the land will not produce anything, anyhow, so surely the prohibition of cultivation how is "the lesser of two evils". It may be possible to effect a compromise by restricting the number of cultivators, and by exercising strict control over them in such things as the laying
out of plots and fire prevention measures. In connection with the former the following rules would require to be rigidly enforced:

1. Each garden should take the form of a narrow rectangular strip, the length of which, runs across and not down the slope.

2. No two gardens should be continuous, but each plot should be separated from its neighbours, on either side and above and below it, by a wide strip of uncultivated land.

3. Gardens should be staggered down the slope, instead of one being directly below the other.

4. No watercourse or ravine should be included in a garden and a strip on either side of a watercourse should be left permanently uncleared.

Before going on to discuss the next step, I should perhaps state that, as matters stand at the moment, the facilities for enforcing such a system, as that outlined above, are neither available nor do they seem to be forthcoming in the immediate future. In any event, as it is doubtful if such a system would do little more than prolong the period until complete soil exhaustion, the only plausible solution seems to me to be the closing of the entire area to the cultivators of all crops, other than those of a permanent nature such as tonka beans.

With any future policy, the next step would seem to me to be the re-establishment of a thin layer of organic soil on those places where the soil has been badly eroded. It is highly probable that this would entail a period under forest vegetation. It may even be possible that such a soil would require to be left alone for a period to enable it to rejuvenate under coarse grass or scrub, before anything in the way of establishing a forest canopy could be brought about.

The third and long term policy would seem to me to be the framing of and adopting on the area, some form of permanent agriculture, including livestock, which would not only maintain the soil but build it up in depth and fertility as the years progress. This would require the establishment of smallholdings on the area and the project would probably be laid out along the lines of an improved
land settlement. I merely say "improved land settlement" because there must be control if the scheme is likely to have any chance of success. In any event, a great deal of experimentation is still required before any such project could be contemplated.
The Lowland Section of the survey area comprises a small portion of the Northern Plain of the island. It also lies in the Tacarigua Ward of the County of St. George and, as shown on the accompanying map, it is surrounded by the Tacarigua river, the Churchill-Roosevelt highway and the two estates, namely Curépe and Orange Grove.

Its relief varies greatly from that of the mountain section, in that it is almost flat, there being but a slight fall of about 12 feet from North East to South West, the whole area lying just a little over 100 ft. above sea level. It is drained by the Tacarigua, Guayaval and Tunapuna rivers.

The communications are far from satisfactory, although they are much better than in the mountain area. As well as the Churchill-Roosevelt highway, which runs along the whole Northern Boundary, there is a good government road running at right angles to it, and cutting through the Western half of the area. Other than these two roads, access to the greater portion of the land is by the old estate traces, provision for the upkeep of which is at present nonexistent. The inevitable result of this has been a rapid deterioration to such a low state of repair that the use of vehicular traffic on many of them is now almost impossible.

There is no accurate estimate available of the total area but it is probably somewhere between 500 and 600 acres. This is made up roughly as follows: 100 acres of house plots, 150 acres of cane land and 300 acres of paddy land.

**GEOLOGY and SOILS.**

This area comes into the Foothill belt of the Northern Plain and in common with the rest of this geological strip, it consists of detrital deposits and hill wash with newer patches of
alluvium from the rivers which have debouched out of the Northern Range in recent years.

This geological background has given rise to the formation of no less than eight major soil types as identified and named by Dr. Chenery in 1946. The extent and location of each type may be seen from the accompanying soil map.

The following is a table compiled from figures published by Chenery on the results of his analysis of five of the more important of these soil types.

<table>
<thead>
<tr>
<th>NAME</th>
<th>DEPTH</th>
<th>SAND</th>
<th>P.H.</th>
<th>P.H.</th>
<th>O.M.</th>
<th>N.</th>
<th>C/N.</th>
<th>P2O5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aranguez Clays</td>
<td>0&quot; -7&quot;</td>
<td>20.0</td>
<td>6.4</td>
<td>5.4</td>
<td>2.57</td>
<td>.089</td>
<td>16.7</td>
<td>31</td>
</tr>
<tr>
<td>River Estate Sands</td>
<td>0 -2&quot;</td>
<td>74</td>
<td>5.5</td>
<td>4.6</td>
<td>2.50</td>
<td>.163</td>
<td>8.9</td>
<td>7</td>
</tr>
<tr>
<td>Golden Grove Sandy Loam</td>
<td>0 -6&quot;</td>
<td>38.5</td>
<td>4.7</td>
<td>4.5</td>
<td>2.26</td>
<td>.132</td>
<td>9.9</td>
<td>6</td>
</tr>
<tr>
<td>St. Augustine Loams</td>
<td>0 -6&quot;</td>
<td>21.0</td>
<td>5.0</td>
<td>4.7</td>
<td>3.63</td>
<td>.193</td>
<td>10.9</td>
<td>1</td>
</tr>
<tr>
<td>Paase Clay</td>
<td>0 -8&quot;</td>
<td>13.5</td>
<td>6.1</td>
<td>5.5</td>
<td>2.10</td>
<td>.204</td>
<td>6.0</td>
<td>2</td>
</tr>
</tbody>
</table>

In connection with the above it should be noted that:
(1) all soil types except Aranguez clays are low in P2O5 and below and below the minimum for plant requirements; (2) the organic matter and nitrogen contents are low in all soils.

HISTORY and LAND TENURE.

The Lowland survey area was formerly under two estates namely, Streatham Lodge and St. Augustine.

Streatham Lodge was a sugar cane estate up to the year 1892, but from that date onwards it ceased to function as such. The factory was dismantled and the land was rented out to peasants, the original peasants being the one time estate employees. At the present time, the estate is owned by three people none of whom seem to take the slightest interest in the land, as the running of the enterprise is left entirely in the hands of a manager. The manager rents out land to peasants at the rates fixed by the Rent Restriction Ordinance. These range from about 10 dollars per acre per annum for paddy land to something like 7 dollars in the case of cane land. There are also a number of house plots of
varying size included in the area and these are let at from 2.2 to 8.2 dollars per annum. The leases are all annual, with no security of tenure. If an incoming peasant wishes to rent a particular plot, he contracts the present tenant and comes to an agreement with him. In this agreement the incoming peasant may pay the outgoing one as much as 400 dollars per acre to have the lease handed over to him. This transaction is communicated to the estate manager who merely changes the lease in the books, as and when requested. The estate manager pays the government land tax of 1/- per acre per annum and also collects the water rents from the tenants for the government each year in taxes, the manager of the estate recently made a petition to the government asking it to take over the upkeep of the roads on the estate. However, when it is considered that over 2,000 dollars go to the owners each year for absolutely no services the whole system seems unreasonable.

On the other hand, St. Augustine estate is owned by the government. From the year 1905 onwards it was leased out to peasants on a 999 year lease basis. No rent other than the general land tax of 1/- per acre per annum has ever been paid for it since that date. It will be seen, therefore, that the land is virtually a freehold, especially as the ownership passes from father to son or legal heir in the usual manner. However, the land is often sub-let to other peasants at rents ranging from 7 to 10 dollars per acre per annum. It is now practically all irrigated by a general irrigation scheme started in 1945, but as yet no extra tax is payable for this benefit. It seems unsatisfactory, therefore, that certain peasants get the advantages of sound irrigation without paying anything in return. This is particularly the case where the land is sub-let, as the long term lease tenants can reap the benefits of a government scheme by charging higher rents. It is hoped, however, to get legislation passed before long to allow the government to charge a water rate on such irrigated land.
DRAINAGE and IRRIGATION.

(1). St. Augustine Estate Government Scheme.

This irrigation project was started by the government in 1945 in an effort to increase the rice yields on the estate. The old estate dam was brought into use again and from it new conducting canals were laid down. The tracks of the latter, together with the drainage of the land covered in this scheme are illustrated on the accompanying map. In this connection, it should be noted that, all the drainage from the land involved goes into the Tunapuna river. There are, in addition, a number of small irrigation canals running out from the Tunapuna river but these only come into use in very wet weather.

The irrigation canals are kept filled throughout the entire growing season, giving the peasants the opportunity of having an unlimited supply of water to meet all requirements.

The Tunapuna river is cleared regularly by the government, in an effort to keep the area well drained, but due to the methods employed there seems to be a terrific waste of money and labour.

(2). Streatham Lodge Estate.

A similar project to the above on this estate is now under consideration. It is hoped to tap the Orange Grove water supply and to lead the drainage back into the Tacarigua river again. The broad outlines of this scheme are also illustrated on the map and it will be seen that the area to be covered is roughly two thirds of the whole estate. In connection with this scheme, it is hoped to alter the course of the Tunapuna river into the Tacarigua, to that indicated on the map.

St. John's river, which was the source of water supply for the old sugar cane factory, is used to irrigate a small area of land near the Churchill Roosevelt highway.

Where the Tacarigua begins to form part of the estate boundary, there is a peasant constructed dam and this is used to irrigate the adjoining river fields. However, as this is rather primitive, it is far from satisfactory.
Near the Churchill Roosevelt highway there are many rice plots which have neither source of supply and here the crop is entirely dependant on heavy rain for its water requirements.

PEASANTS.

The peasants of this area are entirely East Indian. The majority are rice farmers who grow their own ground provisions in addition to working elsewhere. Some work an Orange Grove and Caroni sugar cane estates, others in such places as St. Augustine nursery, while many take local work on roads and ditches of the P.W.D.

On Streatham Lodge estate there are some sugar cane farmers who grow sugar cane which they dispose of to the local factories on neighbouring estates. At the present time, however, due to the improved methods of mechanised cultigations on the big estates, this is a very uneconomical method of producing sugar cane.

The wives and children of these peasants help with cultivation and harvesting, especially at the rice harvest in December.

These peasants are, on the whole, more agriculturally minded than those on the hill and the majority are keen rice growers.

HUSBANDARY.

As we were absent from Trinidad during the chief planting period and the greater part of the growing season, it was impossible to see all the details of the various cultigations etc. which are practised, but by conversation with the peasants concerned, it has been possible to piece together a fair picture of what takes place.

For the purpose of convenience I will divide the area into two sections namely the rice area, and the sugar cane area, but before going on to describe what takes place on these, I wish to make it clear that all peasants share a common interest in that they grow their own ground provisions. This is usually done in a plot around the house, but it is not entirely confined to it, as the sugar cane growers interplant the sets with such things as
maize, beans and peas. In addition, useful crops of tomatoes and sweet potatoes are sometimes grown on rice fields during the dry season, after the rice is harvested.

All cultivations, in connection with the growing of these ground provisions, are done by hand and here again the common hoe comes to the forefront as the chief instrument of tillage. The fundamental difference between the type of cultivation practised on these plots and that on the hill lies in the combined facts that, the land is flat here and there is a certain amount of manuring practised as the majority of these peasants keep a few livestock. Soil erosion is, therefore, at a minimum and the livestock manure which goes onto these plots helps to replenish the soil with plant nutrients, as even on house gardens where no deliberate manuring is carried out, it is inevitable that a fair proportion of the excreta from pigs and poultry is not lost. On this basis a form of permanent agriculture is practised season after season with little or no falling off in yields.

The Rice Area

Evidently, as most of these peasants are too poor to have their own work oxen or buffaloes, the major cultivations in the way of ploughing and preparation of the seed beds are done under a system of contract. Some contractors even undertake the work of planting out the rice from their own nurseries. The entire charge for all the forementioned operations is somewhere between 15 and 20 dollars per acre. The rice is sown with the early rains in June in dry nurseries and it is transplanted out under water in July. There seems to be very little in the way of after cultivations, some of the peasants do a little weeding but this is not general. The most important item at this period is the maintaining of an adequate supply of water. For the irrigated land this is a simple matter as the main canals are kept filled throughout the growing season, but, for the non-irrigated fields it entails the continual looking after and repairing of all the banks to ensure that the maximum amount of rainwater is trapped.

As seen from the map, the non-irrigated land comprises about
one half of the total area under paddy, and as this is entirely
dependant on the rains for its water supply, there are great
fluctuations in the quality and quantity of the crop from year
to year. A small depth of water is maintained around the plants
until harvesting is almost due to begin towards the end of
November. At this time, as much as possible of the water is
drained away and harvesting commences when the crop is fully
ripe. This operation is done by hand and a scythe or hook with
a serrated edge is employed. The stalks are cut across at a
fair distance from the ground leaving a long stubble which often
sprouts again enabling a second or ratoon crop to be taken
towards the end of January. In the process of cutting, the crop
is placed in bundles and carried to a pile in the centre of the
field where threshing is carried out. The process of separating
the grain from the straw is simply done by striking small
bundles against a slatted table.

After the ratoon crop is taken, the majority of this rice
land lies under a "bare fallow" for the remainder of the season,
i.e. until June comes round again. Perhaps the expression "bare
fallow" is not altogether appropriate because during this period
a lush growth of weeds invariably appears.

However, as stated previously, this is not always the case
as there are a few peasants who make use of their paddy land
between seasons to grow useful crops of tomatoes, okras and sweet
potatoes. It must be remembered, however, that this is the dry
season, and therefore, this practice is more or less limited to
the parts where irrigation can be carried out. An example of
sweet potatoes growing in ridges, with irrigation water in between,
can be seen on an accompanying photograph. These dry season
crops are usually planted in January and harvested in March or
April.

_The Sugar Cane Area:_

The few peasants who cultivate sugar cane on Streatham Lodge
estate do so on plots varying in size from 2 to 4 acres. The
ploughing of the land for this crop is also usually done under
contract but all other operations, in the way of cultivations, are done by hand, the general hoe coming again to the forefront as the most popular implement. As was previously stated, sugar cane is never planted alone, but full use is made of the ground during the first season by interplanting the sets with such things as maize, beans and pigeon peas. These crops complete their growth and are harvested while the cane is still in its early stages of growth. As well as furnishing the peasant with a useful supply of food and vegetables, these inter-row crops provide a good cover for the soil and, therefore, go a long way in keeping down weeds. The cane is planted during the wet season from June to October, and, other than an occasional scraping up of the clay around the plants, it gets very little attention after the food crops are harvested. Harvesting takes place in March or April, approximately 18 months after planting and no ratoon crops are taken. The land is ploughed up again and so the two year cycle continues.

Fertilizers and Planting Material.
In the case if the rice crop no manuring whatsoever is carried out but this is not so with the sugar cane crop. The latter often gets dressings of farmyard manure and sulphate of ammonia but the application of both these fertilizers is by no means general. In any event, although dung should be perfectly alright as a means of supplying the soil with plant nutrients, sulphate of ammonia by itself must be far from balanced.

All the seeds or planting sets are either home grown or obtained from the Food Control Office.

Yields, Markets and Prices.

In the case of the rice crop, the yields vary greatly from one place to another and from season to season. It is difficult to get anything other than very rough estimates but even these show a fair difference between the irrigated and the non-irrigated land, as one would expect. The full benefits of irrigation, however, do not entirely lie in this, but also in the fact that during a season when the rains fail, the rice crop on the irrigated...
land will probably fail also, while the yields of the crop on the irrigated parts will be up to normal. At a rough estimate, the average yield for the whole area lies around 2,000 lbs. per acre, which is rather low. As most of this crop is grown for home consumption there is practically no market in it.

Sugar cane, on the other hand, is nothing but a cash crop from the peasants' point of view. The yields under this type of cultivation are very low compared with those on nearby estates. They range from 20 to 35 tons per acre. One particular peasant produces about 100 tons from his 3 acre plot, every two years.

Most of the cane is sold to the nearby factory on Orange Grove estate but even so the transport costs one dollar per ton. When it is considered that the peasant has less than 4 dollars per ton left after paying for the cutting and transport the industry on this system is far from remunerative.

**Conclusion.**

In conclusion, I think it is only fitting that I should also end this section by saying something about the future of this area.

Although the present standard of husbandry practised by the peasants is not high, we are not confronted with the serious problems which present themselves on the hill area, and, even if things continue, much as they are at present, there is every possibility that both soil and yields will be maintained on the present level.

With the laying down of a new irrigation scheme, on Streatham Lodge Estate, paddy could be grown on the present cane land. In this connection, I should add that some of the present sugar cane cultivators are looking forward to the day when they can alternate their cane crops with paddy. If this policy is adopted, the yields, all round, should be increased and weeds should be easier to control. In actual fact it would be a system of crop rotation and so get away from the present day monoculture.

Just how far this state of affairs will come about, remains
to be seen, but it is my belief that owing to the cost of the production of sugar cane on these plots compared with the costs on large estates, peasants will gradually swing over to the total abandonment of the crop in favour of paddy. In addition to being more economical, the latter crop would be a direct source of human food and food, in all cases, must be the prime consideration as these peasants invariably have large families.