REPORT ON
A SURVEY OF PEASANT AGRICULTURE IN THE AREA TO
THE SOUTH OF ST. AUGUSTINE WITH SPECIAL REFERENCE
TO
THE PLACE OF CATTLE IN THE LOCAL ECONOMY.

Submitted in part requirement for the Diploma in Tropical Agriculture

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The negatives of photographs intended for this report and which had been accumulated over the past six months were all destroyed by a fire whilst enlargements were being made in Port-of-Spain.

The fire occurred some six days before the "handing-in date" April the 30th, thus the photographs now contained in the report were taken in 2 days and are really inadequate for the purpose of illustrating the text.
INTRODUCTION

In the two previous years, Colonial Agricultural Probationers have carried out general agricultural surveys of the areas surrounding the College, the object being to familiarise them with the technique of agricultural surveys, as a preliminary to investigation, research and extension.

A mass of data has now accumulated on the general agricultural practices of peasant farmers in the St. Augustine and surrounding areas. On the suggestion of Mr. C.W. Lynn, Acting Professor of Agriculture and Lecturer in Agricultural Advisory and Extension Methods, students this year have been able to choose one from a number of specific features of the agricultural economy that now require further investigation.

This particular report is devoted to a study of the place of cattle in the local economy; it was thought that the experience of such a survey would be of use in later years since cattle play an important part in most systems of peasant agriculture in the British Colonial Empire.

In itself this report is very general and attempts to cover the systems of feeding, breeding and management, dairying and the use of work oxen and buffaloes. A section has been included on pen manure since it is felt that cattle play an important part in the maintenance of soil fertility.

The salient feature of the local cattle husbandry and which deserves mention here is that in all but a few cases no crop whatsoever, not even grass is grown for the prime purpose of providing fodder. Therefore, apart from providing manure and power for cultivation cattle are almost completely divorced from the local crop husbandry, a situation rarely met with in temperate agriculture.

The report would be of little meaning without any background information or reference to the local systems of agriculture, so is thus divided into two short sections dealing with background and systems of agriculture, the third main section on cattle, followed by a final section dealing with recommendations and conclusions.

Appendices, Maps and Diagrams are included.
SECTION I.  BACKGROUND INFORMATION.

A. NATURAL RESOURCES.

1. The Land:

The survey area lies in the N. Plain of Trinidad in the County of St. George, and is roughly bounded by the Churchill-Roosevelt to the North, the Tacarigua River in the South, to the East by the Orange Grove Estate and to the West by the Curepe Estate of Caroni Ltd. The topography is very flat, most of it being about 110-120 sq. ft. above sea level. The Tunapuna and Guayacal Rivers converge in the centre of the area, and flow out to the West. The Tacarigua runs along the Southern boundary and runs into the Caroni River a short distance to the South.

Total area approximately 550 acres - 100 of these being house plots. (See Map 1.).

2. History:

Until the late 19's the whole area was in cane, with the slump both the Streatham Lodge and St. Augustine Estates closed down. In 1892 the Streatham Lodge Estate was laid out as a tenantry and has remained as such. The St. Augustine Estate was taken over by the Government and leased out in the early 19's to peasants on a 99 year contract.

3. Soils:

The soils of the area have been mapped by Chenery (See Map II.). They are mainly derived from pleistocene and recent alluvial, colluvial and detrital deposits and vary in texture from sands to clays. The soils are mainly acid and deficient in plant nutrients, in the South they suffer from impeded drainage. According to Chenery's Soil Productivity Map most of these soils are graded as "low" or "very low" for cane production (1).

For Chenery's classification of soils in the area and descriptions of the more important soil types see APPENDIX I.

4. Climate:

Due to the situation of the I.C.T.A. Meteorological Station, accurate climatical data is available for the area (See Appendix II).
The climate is tropical. The extreme shade temperature range is 60-95°F. The average day temperature is 84°F, average night temperature is 74°F. The average rainfall from 1928-1948 was 65.91 inches of which only 6.75 inches fell in the dry season (January-April). In most years a short dry season of about three weeks occurs at the sun's autumn equinox in September - this is known locally as the "petit careme". Hardy (2) in his analysis of "effective rainfall" by Mohr's method, showed this area to be one with a marked dry season (i.e. evaporation exceeds rainfall during part of the year and soils dry out to a considerable depth).

5. Natural Vegetation:

Beard in his monograph "Natural Vegetation of Trinidad" considers that the area was covered in the most part by swamp forest merging into palm swamp. There is little natural vegetation in the area now, since the land was originally cleared for cane cultivation. The small patches of common grazing might be regarded as some natural vegetation and are in the main composed of scrub and grass species.

6. Water resources: (apart from domestic water supply).

The area is crossed by several rivers which drain into the Caroni to the South. Thus there are two sources of water:

Wells - south of the Churchill-Roosevelt Highway ground water occurs at or near the surface in the wet season and within 10 to 15 feet of the surface during the dry season. Wells are dug by quite a number of peasants, especially when stand-pipes are not near. Generally, this water is not used for drinking, but for washing, watering stock, and the irrigation of vegetables.

Irrigation water - The Tacarigua River is linked up with a diversion weir, and water supplied through channels to the rice fields (See Map I). Irrigation is of the "supplementary dry season" type; the Tacarigua dries up in the dry season, but is able to meet the requirements of the wet season rice crops, and extend the length of the grazing season for a while after the rains cease.
B. **THE PEOPLE AND HUMAN FACTORS.**

7. **Population:** (Statistics see Appendix III).

The cultivators in the area are almost exclusively East Indians and are the descendants of indentured labourers from India. They live in village communities and inherit traditions of land tillage and livestock husbandry from their fore-bears in India.

8. **Religion:**

Mostly Hindu, with about 15% of the Muslim faith. Religion affects agriculture in the area to a high degree, the Hindu faith forbids the taking of life and thus livestock in the area are rarely kept for meat production - the cow is particularly sacred to the Hindu. The Moslem faith forbids the keeping of pigs and the local Moslem theocracy impose fines on Moslems in the area who do so.

In general however, the old tenets of religion are breaking down in the area, due mainly to missionary work and the fact that the peasants are so far away from India. (5).

Cattle and religion will be discussed further in another section.

9. **Housing:**

Types of houses in the area vary, but mostly they are tapia - built of poles, mud and straw. The straw used in the making of the mud plaster is that of a local grass, Sperololus indicus. Roofs are thatched with timite palm and floors are generally of beaten earth. These houses are generally lime washed and kept scrupulously clean. Sagging and leaking roofs are however common due to the construction of the roof without a sufficient pitch for the efficient discharge of rain water.

Both wooden and brick houses are seen in the area.

10. **Domestic water supply:**

Stand-pipes are found at intervals in the housing areas - these are supplied with rain water from a reservoir in the Cuare River, thus throughout the year adequate clean drinking water is available.
This service is quite good - main criticisms being too few taps and low pressure at peak periods of the day during the dry season. The charge for stand-pipe water is paid for by the General Water Rate, which in the case of most of the holdings is the minimum of 96¢ per annum.

11. Communications:

Area is well situated for transport of produce to Port-of-Spain with the Eastern Main Road, Churchill-Roosevelt and Trinidad Government Railway. Communications within the area consist of numerous earth traces and some metalled roads; these are generally in good repair. The Local Road Boards and Wardens’ Departments are responsible for most roads and traces. Traces in the Streatham Lodge area, whose maintenance is the job of the Estate management are in particularly bad repair and impassable for most of the year.

12. Food Supply:

Much of the food used in the area is home grown. Other foodstuffs are obtained from local and Port-of-Spain markets and shops.

13. Education:

Elementary education is free - compulsory between the ages of 6 and 12 and voluntary from 12-15. All houses within the survey area are within a mile or two of a school.

14. Health:

Within the area the old endemic diseases are most important. Main diseases and complaints of the area are Tropical Ulcer, Tuberculosis, Yaws, Syphilis, and Whooping Cough in children. Helminthic diseases are serious - survey of Health Department in 1946 showed 35.6% of population to be infected by hookworm and 27.1% by ascariasis. Malaria common in people residing in the low-lying rice lands of the Streatham Lodge area.

15. Economic Conditions:

In general the rural population of the area are poor and have a correspondingly low standard of living. However, certain changes have occurred in Trinidad since the war which materially affect peasant agriculture. The most important of these is the demand for vegetable crops; any grower can obtain maximum prices if he can get his crop to the market. However, successful vegetable gardening means an intensive system of cultivation and the use of relatively high quantities of fertilisers.
Most peasants in the area have not enough capital to start out in any such venture and there does seem to be a demand for some form of rural credit organization.

There are in Trinidad and Tobago, Agricultural Credit Societies who themselves obtain credit from an Agricultural Credit Bank financed by Government. These societies loan money to their members to assist in the production of crops, purchase of stock and poultry, purchase of fertilisers and manures and mend repairs to buildings. The founding of such a Society in the area would, in the writer's opinion, do much in improving the standard of agriculture and thus the standard of living.
16. General:

Any dissertation on the livestock of the area would be completely valueless without some picture of the systems of agriculture practised in the area. Also some account of land tenure is necessary.

17. Land Tenure:

The majority of small holders in Trinidad have gained the use of agricultural land in one of three ways:

(a) By becoming a cane farmer on estate land.
(b) By renting land from a more or less bankrupt estate.
(c) By buying or renting corn land.

Systems (b) and (c) operate in the survey area.

(b) Streatham Lodge Estate (550 acres).

Estate was laid out as a tenantry following the slump in sugar during late nineteenth century. There is no restriction whatsoever on utilization of the land, tenant is completely free from interference as long as he pays his rent regularly.

Rents are:

- **Rice land**: $10/acre/annum accounts for 150 acres.
- **Cane land**: $7.50/acre/annum " 100 acres.
- **House lots**: $4.8/acre/annum " 50 acres.
- **Pastures-roads-traces etc.**: 10 acres.
- **Remainder**: $7.50/acre/annum " 80 acres.

These rents are stabilised by law, no written lease. Subletting is permitted. Leases are on a year to year basis. Generally a family carries the lease on year after year.

(c) St. Augustine Area.

This land was alienated after 1914-1918 war and sold to peasants at a rate of approximately $10 per acre. Tenure is virtually freehold, although lease titles were sold on a 99 year leave. About 500 acres of land was alienated in this way.
18. **Agricultural Systems:**

Agriculture in the area consists of regularised systems which have evolved in accordance with the economy, ecology and sociology of the area. Generally these systems aim to provide food for the home as well as cash crops, although individuals can be found farming either for subsistence alone or mainly for cash crops.

Brigland (5) classifies the systems as follows:

A. **The Sugar Cane Mixture** involving a crop of "plant" cane, usually three ratoons, but also food crops between harvesting and re-planting times and during the early stages of cane growth. The subsidiary crops are only grown during the wet season and are: sweet potatoes, pigeon peas, okras, eddoes, corn, cucumbers and beans. These cane farmers live in the Streatham Lodge Estate, supplying the Orange Grove factory with their cane.

B. **The Rice Rotation** - Padi is the main or wet season crop but the padi fields carry okras, tomatoes, cucumbers, cow peas, woolly pyrol and eggplants during the dry season, and in several cases a "ratoon" rice may be taken during the dry season. Most of the rice cultivators live in the lower St. Augustine area and have land in the irrigated area.

C. **Provision Gardening** - Neither cane nor rice produced, land is planted partly in yams, tannias, eddoes, cassava, pumpkin, cabbages, lettuce, peppers, pigeon peas, cucumbers, bodi and french beans, corn, okras etc. during the wet season. During the dry season the crops are almost the same as in the padi fields.

D. **Household Gardening** - odd vegetables, spices, flavourings and fruit are grown around the houses. *(SEE APPENDIX IV FOR PRINCIPAL CROPS).*

19. **Livestock:** (other than cattle).

Fowls and ducks common, fowls predominantly creole, bare-necked types, although some Rhode Island, White Leghorn and other improved breed "types" are found. Although housing is supplied in some cases, generally they wander loose, roosting at night in the stock shed.

Feeding - household scraps, and what they can forage for themselves; some are given various odd grains and rice husks.

*Goats* - kept for milk production - generally a "local type".

Some Anglo-Nubians and British Alpines in the area.
Pigs - not generally kept, are a few however in the area. One peasant has gone in for pig rearing in a big way and when last visited had 20 pigs.

Mules and donkeys - important in haulage and transport operations. Used sometimes for cultivations.
SECTION III.  

CATTLE.

A. GENERAL.

1. The object of this section is to record observations on local cattle management and on the part played by cattle in the agriculture of the area, together with any recommendations and conclusions made by the writer.

Certain difficulties have been met with in making this survey, and they are best recorded here - they are placed in a rough order of importance:

(a) General lack of knowledge on the part about his own stock; this has made extremely difficult the obtaining of information with regard to cattle breeding and management.

(b) Difficulty in obtaining accurate statistics of cattle numbers in the area; this has limited to quite an extent the making of great observations.

(c) The lack of any preliminary survey, much time has been taken up in collecting data to arrive at such standards as average yields, average length of lactation period etc.

(d) The lack of experimental work on tropical cattle breeding and management with reference to peasant agriculture. Most work done in the field has been specific to dairy cattle, maintained on estates or large dairy farms.

These difficulties together with others have limited to a certain extent the scope of this report.

2. The following table shows the number of livestock in Trinidad in 1946 as recorded by the census of that year. All classes of livestock are included, mainly to show the importance of peasant livestock in the general livestock economy of Trinidad.

/LIVESTOCK - 1946
<table>
<thead>
<tr>
<th>Livestock</th>
<th>Farms (1 acre and over)</th>
<th>Farms (less than 1 acre)</th>
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<tbody>
<tr>
<td>Cattle</td>
<td>24,722</td>
<td>13,102</td>
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<tr>
<td>Water buffaloes</td>
<td>2,851</td>
<td>370</td>
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<tr>
<td>Goats</td>
<td>17,303</td>
<td>15,112</td>
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<tr>
<td>Sheep</td>
<td>3,067</td>
<td>1,050</td>
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<tr>
<td>Swine</td>
<td>16,658</td>
<td>16,053</td>
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<tr>
<td>Donkeys</td>
<td>3,884</td>
<td>1,921</td>
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<tr>
<td>Mules</td>
<td>2,175</td>
<td>665</td>
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<tr>
<td>Horses</td>
<td>997</td>
<td>676</td>
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<tr>
<td>Rabbits</td>
<td>1,630</td>
<td>5,715</td>
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<tr>
<td>Fowls</td>
<td>225,717</td>
<td>346,882</td>
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<tr>
<td>Ducks</td>
<td>9,821</td>
<td>29,461</td>
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These figures immediately stress the importance of peasant owned livestock.

3. Religion plays a great part in cattle management in the survey area, the majority of peasants in the area are of E. Indian origin and are Hindus. Their religion forbids them to take the life of any animal, cattle being particularly sacred to them.

Although such religious prejudices have become modified throughout the years, there has been a marked antipathy to selling any animal for slaughter; this has resulted in the large numbers of scrub cattle to be found in the area. Today, most peasants although professing the Hindu faith will sell cattle for slaughter, and the number of peasants eating beef in the area is slowly increasing.

Castration of male cattle is forbidden by the tenets of Hinduism and this combined with a local belief that uncastrated bulls produce broader shoulders for work has led to the high numbers of scrub bulls in the area.

This sacredness of the cows has, however, its advantages; cattle are in the main fairly well kept and very rarely ill-treated.
In order to roughly assess the percentage holdings on which some form of major livestock was kept, and the relative proportions of different types of stock, a sample of 33 holdings was taken.

These 33 holdings are those situated on Freeman Road both North and South of the Churchill-Roosevelt Highway and 5 holdings on Watts Street.

Of the 33 holdings, 16 had some form of major livestock; the following table gives the details:

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<tr>
<th>HOLDING</th>
<th>COWS</th>
<th>HEIFERS</th>
<th>BULLS (DAIRY)</th>
<th>CALVES</th>
<th>OXEN</th>
<th>MULES</th>
<th>DONS</th>
<th>HORSES</th>
<th>PIGS</th>
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(HOLDING 2 CARRIED 1 RAB)

These figures are as near correct as possible, one or two peasants may and probably have given incorrect answers, but it does give an indication of the relative importance of the varying classes of stock. It must be remembered that the cattle population changes quite rapidly, many peasants looking on their cattle as a source of capital since they can be readily sold.
During the last decade the Caribbean area has grown remarkably livestock conscious. Discussions of and proposals for the re-organisation of the agricultural economy have universally emphasised the role of mixed farming and the importance of animal husbandry in this reorientation. The reports of the B.W.I. Royal Commission, of the Agric. Policy Committees in Trinidad, Jamaica and Antigua and of the Nutrition Committee in Jamaica, are so many variations on the time which was stated as follows by the West Indian Conference, Second Section, held in St. Thomas, Virgin Islands of the United States, in 1946: "In order to obtain the greatest advantage from diversified agriculture the keeping of livestock must be an integral part of any farming system. An efficient system of mixed farming will provide the means of regenerating soils and maintaining their fertility and will contribute towards the supplies of fresh protein foods such as milk, meat and eggs".

Extract from Report of Caribbean Commission on Livestock in the Caribbean.

The ideas formulated in the above extract are epitomised in most or all the agricultural policies of tropical countries. Difficulties arise, however, in trying to fit this system of mixed farming (as visualised in this report) to different systems of agriculture.

O.T. Faulkner in his article "Mixed Farming in the Tropics" defines Mixed Farming as meaning "not something about the proportion of arable and grassland, but a farming system the basis of which was the manuring of arable land with FYM made by keeping cattle at night on bedding".

On such a definition the system operating in the survey area can not be termed mixed farming although some peasants are tending that way.

The advantages of a system of mixed farming in the area are numerous and diverse. They can be enumerated as follows:

(a) Maintenance of soil fertility, through the agency of pen manure. From observations made in Trinidad and elsewhere and from word of mouth reports from people who have observed peasant agriculture in other parts of the tropics, it is obvious that in general the yields of crops in the survey area are far from good, soil fertility in the area
is not being maintained, it is decreasing. Fertilisers are used in the area to a certain extent, but most peasants are ignorant of their correct use and are too poor, or consider themselves too poor, to purchase them in quantities liable to be of any use in improving yields.

Yet every peasant in the area is aware of the usefulness and importance of pen manure, many purchase it from cattle keepers who are unable to utilise it themselves and who are in need of ready cash.

This awareness was neatly summed up by a St. Augustine vegetable gardener with a small herd who said "The cow is the foundation of the garden".

In the tropics F.Y.M. should be regarded mainly as a supplier of plant nutrients and trace elements, not as a supplier of organic matter for the improvement of soil texture, water holding capacity etc. as it is in temperate regions.

The improved production and conservation of F.Y.M. in the area would thus result in improved crops and the maintenance of soil fertility in the area.

(b) The inclusion of a forage grass in the rotation would result in saving of time by the peasant in cutting grass for his animals. A certain amount of his land is rested yearly and this will enable the peasant to devote more time to his arable crops. This last point is often overlooked, but on the I.C.T.A. peasant holdings it has been noticed that the increased time available for the peasant to tend his arable crops seems to have a beneficial effect on yields.

(c) Fresh milk is available in the area to supplement the diet, the value of milk as a protective food need not be stressed here.

(d) The increase of locally produced products such as milk and meat are important in the economy of Trinidad as a whole. Hence production of livestock produces negligible compared with importations from Australia, N. America and Europe.
The following table gives the import figures of butter, cheese and condensed milk and their values for the years 1939-1947. (4).

<table>
<thead>
<tr>
<th>YEAR</th>
<th>BUTTER</th>
<th>CHEESE</th>
<th>CONDENSED MILK</th>
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<tbody>
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<td>$B.W.I.</td>
<td>CWTS. $B.W.I.</td>
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<td>1941</td>
<td>18171</td>
<td>639518</td>
<td>6851 184287</td>
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<td>1942</td>
<td>17203</td>
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<td>18928</td>
<td>902473</td>
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<td>1946</td>
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<tr>
<td>1947</td>
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<td>6515 240529</td>
</tr>
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</table>

It will be seen that importation of these articles increased steadily throughout the war; the population of Trinidad is increasing rapidly and thus there must be a corresponding rise in imports.

Trinidad can't hope to become self-supporting in animal products, but it is not unfeasible to suggest that she should aim at meeting the demand for the liquid milk at a reasonable price, a commodity now in relatively short supply. The encouragement of milk production by peasant farmers should do much in meeting this demand.

The advantages can thus be summarised:

- Improved crop production.
- Improved soil fertility.
- A further source of income from animal products - milk, meat etc.
- Improved diet.
- Improved milk supply.

7. And finally what many agriculturists regard as the best judge of any farming system - an improved return to the cultivator.
B. TYPES OF CATTLE IN THE AREA.

8. Cattle are maintained for three purposes in the area:

- Milk production.
- Work.
- Meat.

Of these, milk and work are by far the most important, meat production is important only in so far as bulls, cows and calves not required by the cultivator for either milk or work are disposed of in this way.

9. MILK CATTLE:

Cattle were first introduced to Trinidad by the Spaniards in the late fifteenth century, the type introduced was probably Bos Indicus, since then, however, the indicus blood has been much admixed with that of Bos Taurus, due to the introduction of such European breeds as the Shorthorn, Devon, Red Poll, Jersey, Guernsey, Ayreshire and especially the Holstein.

The introduction of these breeds was carried out by individual planters - the breed introduced being a matter of their own taste.

In the survey area it is quite easy to pick out the more prominent characteristics of the European breeds - examples are, Ayreshire horns and the mealy muzzle of the Channel Island breeds. Holstein (Fresian) blood appears to predominate (most of the cattle being black and black and white) and is probably due to:

(a) the agisting of pure bred sires of this breed on the public savannahs during the 1900's.

(b) present government policy.

Thus in the area a motley collection predominately Zebu or Zebu graded with Holstein is found, but with individuals showing the characteristics of one or more of the breeds mentioned above.

Thus any attempt at describing the "average" milch cow of the area is impossible, the presence of most animals of such features as a coarse tail head, pendulous udder, rudimentary hump and sheath indicate that in general most milch cows have 40% and more Zebu blood. Dwarfing is not common in the area; there are some cases of dwarfing to a certain degree but nothing like that experienced in other tropical countries - especially Ceylon (Ref.2) where European cattle have been crossed.
Fig. 1. High grade Holstein cow grazing by the roadside - note padlock.
Fig. 2. Cow in foreground is a Zebu-Holstein cross - note her general debilitation.
Fig. 3. Shorthorn-Zebu cross
Fig. 4. An almost pure bred Ayreshire.
Fig. 5. Holstein x Zebu 18 months old.
Fig. 6. Grade Holstein heifer 6 months old.
Fig. 7. Holstein x Zebu x Jersey heifer.
Fig. 8. Zebu heifer 9-12 months old.
with native stock.

Under the conditions at the Government Stock Farm it has been found that the best cross is 75% Holstein and 25% Zebu blood, any higher percentage of European blood resulted in dwarfing, their recommendation for peasant cattle is a 50:50 cross.

Although some of the milking cows in the area appear in good condition, the majority appear to be suffering from malnutrition. The condition of calves and yearlings is generally poor, many appear to be stunted, thin and generally lethargic, although this last factor can be put down to weakness due to poor feeding. Generally speaking a year old heifer in the survey area is no bigger than a three month old Holstein calf in its native habitat.

10. WORK CATTLE:

Originally cattle brought in for haulage work, both of carts and implements came from India, and in general were of the Mysore and Nellore breeds. The situation at the moment however, has very much deteriorated. Pure lines of the breeds have been maintained in only a few cases, improvement of cattle in Trinidad has been dominated by attempts to produce high yielding milk cows, the improvement of work cattle has been entirely neglected.

Thus in the area at present there are very few pure Zebu oxen, the majority of oxen being bulls out of either zebu and grade holstein cows served by holstein bulls. This policy has produced a very heterogenous collection of beasts, and there can be seen oxen varying from pure Mysore and Nellore to scrub holstein bulls. The photographs illustrate some of the types to be seen in the area.

Also, the type of work ox is not improved by the policy of peasants in not castrating bulls to be used for work purposes. The castration of bulls is taboo under the Hindu religion, but probably the main reason for this non-castration policy is the generally held belief that non-castrated bulls develop wider and stronger shoulders for haulage purposes.
C. LOCAL CATTLE MANAGEMENT.

11. The purpose of this section is to illustrate the local systems of cattle management and to this purpose is divided into the following sections:

- Housing.
- Fodders.
- Feeding and general management.
- Breeding.

12. Housing:

In general very primitive with pens of very simple construction. Local building materials are used, the two main items being teak poles and timite palm for thatching. These pens are a shelter against sun and rain and an aid to producing farm yard manure apart from being a deterrent to theft. Essentially they consist of a flat sloping roof (either of thatch or corrugated iron) supported by poles, all four sides are open with usually three of them railed in. Cattle are tied up within the shelter, partitions being provided where more than one animal is kept. Floors are generally of beaten mud although in a few cases concrete floors have been laid, in a few cases peasants have even constructed proper standings and dung channels. The mud floors are the main weakness since urine and washings soak in giving rise to stagnant pools and odours unless some sort of drainage is provided. When provided drainage is generally in the form of a drain and sump.

Mangers are not fixtures since concentrates are generally fed as a gruel with water and molasses in buckets, similarly racks for grass and roughages are absent, the fodder being thrown on the floor in front of the animal.

Pens vary greatly, the photographs give an indication of their variability as well as their construction.

13. Fodders:

There are three main classes of feedingstuffs in the survey areas:

- Grazing.
- Fodders cut and carted to the stall.
- Purchased concentrates and concentrates home produced.
I.ote general construction, Fig. 9, shows a typical yard, with a grade Holstein bull tethered. Figs. 14, 15, and 16 show one way of collecting liquid manure - the can is for "baling out".
14. Grazing material is both varied and of poor quality. There are no cultivated pastures, grazing areas being waste land, road and trace sides, rice bunds and resting fields. Rice fields in particular provide some sort of grazing during the dry season. Often cattle are tethered on uncultivated patches in the peasants' garden where they can browse crop residues and weeds.

Natural pasture as found on waste ground and roadsides comprises mainly of grass species, in particular: Bamboo grass (Paspalum fasciculatum), Bahama grass (Cynodon dactylon), Savannah grass (Axonopus compressus) and rather Sour Grass (Paspalum conjugatum). The only legumes are a few/unpalatable Desmodium species.

15. For grazing purposes cattle are tethered, the tethering rope is generally fixed to a short iron spike (some 3 feet long) driven firmly into the ground. halters are simple, generally just a rope and leather collar. Some peasants favour a chain around the base of the horns; this has the advantage that the chain can be padlocked. Peasants when working in the fields commonly take their beasts with them, tethering them on the trace side until time to return in the afternoon.

16. Fodders cut and carted to the stall are the most important of the three groups, generally they are cut by hand and carried home for stall feeding; grass is the chief forage utilised and may either be obtained from natural growth on waste areas or from fields specially planted in soil grasses. The main natural sources are the grazing areas mentioned above, roadsides, waste land, rice field bunds and other spots where grass will grow. Many peasants have agreements with non-agriculturists to cut grass around their houses and gardens. Grass stealing is quite common in the survey area, a good illustration of how desperate the fodder shortage can be.

The species obtained are much the same as those grazed, one exception being a trailing species. "Water grass" (Commelina elegans) which is much favoured for its succulence.
PLATE III

Fig. 17. Grade Holstein cow tethered on the side of the Churchill-Roosevelt Highway, note chain around base of the horns.

Fig. 18. Rice stubble grazing - note poor condition of heifer grazing in fore-ground.

Fig. 19. A zebu heifer grazing in Streatham Lodge.

Figs. 20 and 21. Grade Holstein heifers tethered on waste land.
17. The fodder situation can become very critical towards the end of the dry season, the number of palatable grass species decreasing as the dry season progresses (due to non growth of certain species and increasing fibrousness of others). Towards the end of the dry season the peasants will cut almost anything available. The time and labour demands involved in cutting and collecting grass are very high and most certainly limit the number of cattle a man can keep if he has not specially planted forage grass. Towards the end of the dry season the collection of 80 lbs. or so of grass necessary for a beast's daily requirement can take anything up to three hours.

18. Grass collection is often the work of the children of the family, and they wander far and wide collecting a handful of palatable species here and there, gradually accumulating enough for the day's feed. The grass is then tied into bundles and carried home on the head or in carts. Peasants with more than one beast may spend the best part of a day getting a good cart-load sufficient to last them two or three days.

It is not easy to point out the vast importance of this grass collection in the area and the effect it has on the general agriculture, but there are two salient features.

1. That the number of cattle in the area is governed by the amount of grass that can be found on waste land within the area.

2. That valuable time which might be spent on his arable crops is taken up by the peasant and his family having to wander far and wide to collect grass.

19. A few peasants in the area have planted up small patches of land with Para grass (Brachiaria mutica) and those talked to appear to have found it very useful in alleviating the fodder situation during the critical dry season. Actual production of grass from these areas is, however, very low, due to poor cultivation resulting in an influx of weeds, poor soil (the area planted is invariably one of no use for anything else), too frequent cutting with too short resting intervals and complete lack of fertiliser or manurial treatment. Better grasses to grow would be Elephant grass (Pennisetum purpureum) or Guatemala grass (Tripsacum laxum) both of which have proved suitable at the college farm.
Fig. 22. A stand of Guatemala grass on the I.C.T.A. peasant holdings.

Fig. 23. Zebu bull tethered out on cane trash.

Fig. 24. Bringing home the grass.

Fig. 25. Peasant grown forage grass - a small patch, 1/5th of an acre sown by a Streatham Lodge farmer - as can be seen the stand is poor (cf. Fig. 22) and weeds have infiltrated.

Fig. 26. Guatemala grass in the foreground with a stand of elephant grass behind, note the more vigorous growth of the elephant grass.
20. Cane tops are a very useful fodder and are in plentiful supply during the cane harvest. Their usefulness is illustrated by the fact that they are the sole food of estate owned working cattle during the dry season. However, they are only available to peasants who have their own cane fields (as in the Streatham Lodge area) or to those who do carting work for cane estates and have access to the supply. Peasants carting cane are allowed to take away some tops each day.

21. Concentrates are generally, if only haphazardly, used in the area to supplement the basic grass diet. The import of cattle food into the colony has almost completely ceased. The most commonly used concentrates are:

- **Trinidad produced coconut meal** - an extremely useful concentrate which is in good supply. Does however tend to go rancid if kept too long. S.E. 86.0. P.E. 18.4.
- **Rice bran** - a useful carbohydrate food, which can be obtained from the local mills. It has a starch equivalent of 42.5 and a protein equivalent of 7.5.
- **Linseed meal** - an extremely good high protein food, unfortunately in very short supply. S.E. 84.1. P.E. 31.5.
- **Molasses** - used chiefly for flavouring and making a feed palatable. Is a useful carbohydrate food in itself. S.E. 51.7. P.E. 0.5.
- **Woolly pyrol** - Locally grown and used more for human consumption than for stock; is utilised however where there is an excess. Protein equivalent is fairly high.

22. Other miscellaneous fodders fed include general odds and ends from the fields and gardens, such as sweet potato haulms (a very good feed), rice straw (when fodder gets really short) and odd rice seedlings, grapefruit skins etc.

No form of forage crop conservation is practised in the area, haymaking is not possible, ensilage has possibilities but as yet no technique economical on such small holdings has been devised.
FEEDING AND LOCAL MANAGEMENT.

23. The local methods of feeding and management are on the whole very haphazard; there is a more or less fixed system throughout the area, but it is very primitive and individual peasants have their own variations. The Hindu religion has a decided influence on the way in which peasants keep their animals, since it insists on the proper care of stock, but although the Indian peasant never fails to feed and water his cattle and may even groom and wash them, it is evident that his systems do not suffice to give the production demanded under present-day conditions.

24. Calves: Suckling is the almost universal method of rearing. Under one system of milking the actual amount of milk the calf receives is regulated in a rather curious manner. After calving the cow is milked out to ascertain what her yield is likely to be and from this the amount of milk fed to the calf is subtracted. From this time on the calf is separated from its dam, and the cow milked twice a day as normal except that only the difference between her total yield and that milk to be fed to the calf is removed; after milking the calf is allowed to suckle and thus roughly gets its requirements.

25. The usual allowance per calf is 2 bottles of milk in the morning and evening, i.e. about 5½ pints a day, this amount being decreased as the calf grows older. Water and grass are provided for the calves and usually some form of supplementary feeding, in most cases a small amount of coconut meal and molasses in water.

26. An alternative system is to milk the cow in the morning only, allowing the calf to suckle during the day and taking it away from its dam at night. Time of weaning is very variable, some peasants allow calves to suckle throughout the lactation period, whilst others wean them at three months and upwards.

In few cases do calves get their full requirements from such systems of rearing, and this is pretty obvious when one observes some of the poor specimens all too common in the survey area. Apart from this such minor troubles as damaged teats arise which make milking difficult, and it may be that drying off is hastened by milk being left in the udder after the calf has suckled.
27. **Store Periods**

This lasts from weaning until 2-2½ years old. During this time the animal subsists entirely on grass, although some peasants do feed a little coconut meal sparingly during the dry season when grass is short. Generally the store beasts are tethered out and not stall fed.

28. **Time of Service**

Varies considerably, most peasants will mate their heifers as early as possible, actual ages ranging from 18 months to 2½ years. The age of the heifer at her first mating depends a great deal on the amount of Zebu blood she has, the Zebu being much later maturing. With the normal peasant dairy animal (50% European, 50% Zebu) it is usually 2 years.

29. **Calving**

Whether or not the peasant endeavours to get his cows to calve at the beginning of the wet season (the obvious time since grass is plentiful) is not known, but in any case getting a cow into calf is so difficult amongst cattle of the area that if he succeeded it would be just a matter of luck. With the cows of the survey area re-services appear to be the rule rather than the exception, the cause of this is not understood but it is certainly not due to the partial sterility of the bulls used, since — the semen of all the bulls on the Government Stock Farm and Government Breeding Units is regularly tested. It has been suggested (See G.81) that it may be due to protozoa, *Trichomonas foetus*, but as yet no investigation has been carried out.

Some peasants have their cows calve under shelter whilst others release them and let them find their own place in the yard. In talking to peasants it appears that apart from a few cases of mal-presentation there are rarely any calving troubles, generally the cow is kept under observation when calving and assistance rendered if it appears necessary.

30. **The milking cow**

Once the cow has calved she immediately begins to receive extra concentrates, during her dry period she has been subsisting on 80-100 lbs. of grass a day and about 5 lbs. of coconut meal (most peasants feed this amount to their cows when dry).
The coconut meal is doubled, 6 lbs. being fed and if available an extra pound of linseed meal is added to the ration. When cattle cake was available most peasants used this also. In few cases are concentrates fed dry, usually they are mixed up in 2 gallons of water with 2-1 lb. of molasses and some salt added and fed as a gruel. During the lactation period the cow receives any additional foods that may be available - such as any woolly pyrol that can be spared, sweet potato vines etc.

31. Such a ration is not sufficient to give more than 2-3 gallons a day at the maximum. Lactation yields vary enormously, the average lying between 250-300 gallons with exceptions on either side. Lactation periods range from 5 months to over a year, depending on the type of animal; there appears to be no system of drying off practised, the cow being milked right out until she dries off normally.

The peasants aim at getting a calf a year, but in few cases do, owing to the difficulty of getting cows into calf.

32. Work oxen:
Subsist entirely on a grass diet, with supplementary feeding during periods of heavy work, such as ploughing.

33. Water and Shade:
There is a plentiful supply of water around the house lots and cattle kept in the byre at day or tethered in the yard rarely suffer from want of it. Beasts tethered on roadsides and waste land, however, definitely suffer from lack of water and lack of shade. This is particularly the case during the dry season when cattle are tethered out on the rice fields; cattle are taken there in the early morning after feeding and watering and remain there until mid-afternoon, during this time they have no water and in very few cases any shade. Zebu stock are better able to stand these conditions, due to an adapted heat regulating mechanism and even where shade is provided can be seen grazing when the sun is at its height and European type stock are lying in the shade and obviously suffering from the heat.

34. Disposal of Stock:
Aged cows and bulls of no use for any other purpose are sold to the abattoir or to local butchers, who regularly travel through the area. Younger stock are rarely sold for meat since a better price can be obtained for them by selling to other peasants.
35. *Milk cattle* - the extreme heterogeneity of the cattle population in the survey area has already been mentioned, as have the reasons for such a mixture of types of cattle.

Of recent years, however, the Holstein type of animal has been becoming more and more dominant throughout Trinidad, the reason for this change over to one breed is due mainly to the policy of the Government Stock Farm whose dairy herd at St. Joseph is of grade Holsteins and whose bulls at the various stud centres are again grade Holstein, and also to the fact that most estates (e.g. Waterloo) who run dairies rely on Holsteins.

36. There is no doubt that the Holstein as kept on the Stock farm and at estate dairies is a good dairy cow. And it is this fact that has attracted the peasant; nowadays as long as he can mate his cow to a bull that looks predominantly Holstein he is happy.

This means that the percentage of European blood in peasant stock is gradually increasing. This change over from a predominantly Zebu to a European type animal, slow as it may be does mean that two factors which limit the production of peasant owned cattle are becoming more prominent, these are - climate and plane of nutrition.

37. Of all domestic animals cattle are most affected by climate, thus the chief dairying and beef producing countries are all situated in the temperate or near temperate regions of the world, good dairy and beef stock are found in the tropics, but these areas are very localised and occur where climate is modified by altitude, e.g. the Highlands of Kenya. Cattle are indigenous to certain tropical countries, but in all these cases the climate is that of the dry tropics and even so the indigenous beast is not an economic animal. Due to the entire lack of either cattle of any sort or an economic indigenous type, the policy in the development of any tropical region, as in Trinidad, has been in the past to introduce European cattle, firstly in the hope that they would maintain their productivity in a tropical climate and secondly that this being found not so that they would on crossing with a Zebu type of beast pass on their productive capacity to the crosses.

This cross it was hoped would combine the capacity of production of its European parent with the hardiness of its tropical parent.
38. Work carried out all over the world (5,6,7) has definitely shown that the hardiness of its zebu ancestors is not maintained in this type of cross-bred beast, and that the beast will suffer from practically the same deterioration as pure-bred European stock do in the wet tropics.

There are certain grave disabilities from which European cattle in a tropical environment suffer from, these disabilities render them quite unsuitable for either milk or meat production under peasant conditions. These factors may be summarised as follows:

(a) The heat regulating mechanism is adapted to life in a temperate and not tropical region. Investigations ( ) have shown that ranges of atmospheric temperature and humidity typical of tropical areas and which can be tolerated by zebu cattle cause adverse physiological reaction in European stock as evidenced by:-

Progressive rise in body temperature and respiration rate and a change/pulse rate. Although there are variations between and within breeds, it is generally accepted that the upper limit to which European cattle can be subjected corresponds to a mean annual temperature of between 65°-70°F. The mean annual temperature of Trinidad lies between 82-86°F, also during the wet season June-December there is a high relative humidity usually accompanied by a relatively low rate of air movement, a combination of conditions which throws a still greater strain on the animals' heat regulating mechanism.

European cattle are accustomed to a relatively high plane of nutrition. In Trinidad however, the prolonged dry season is the main factor limiting the nutrition of cattle. It is doubtful whether a predominantly European type beast would in any case profit from a high plane of nutrition since apart from allowing of better growth and production it increases metabolic activity and thus heat output which in the tropics will increase the strain already put on European type stock.

39. The effect of climate on cattle can be modified to a great extent by management. Thus at the Government Stock Farm it has been found possible to maintain a ¾ Holstein/¼ Zebu type of beast under the type of management practised there. This management is briefly: scientific feeding, cows in by day in a large, cool, airy cowshed
cowshed and a plentiful water supply, even so it has been found that to increase the percentage of European blood above 75% even under these conditions will result in a poorer type of animal and decreased production.

Under peasant conditions, feeding is anything but scientific, stock are often tethered out all day with no shade whatsoever, and often when tethered out they receive water only first thing in the morning and in the late afternoon. 75% of European blood in such cases is much too high. Dr. Hall at the Government Stock Farm suggests a 50:50 type of animal for peasant cultivators, but even this seems a too high percentage of Holstein blood.

40. The maintenance of a type with fixed proportions of Zebu and Holstein blood requires back crossing every so often with a Zebu parent, thus at the Stock Farm a small Zebu herd must be maintained to provide bulls for this purpose. Under controlled conditions this is a comparatively easy procedure, but it will be difficult to persuade peasants with a grade Holstein cow to back cross that cow with a Zebu bull. Thus in the improvement of peasant stock some other method must be used. It is not intended to discuss the improvement of cattle in this section, it will be dealt with in Section IV.

41. Few peasants in the area possess dairy bulls and for services rely on either the Breeding unit at the Government Stock Farm or on certain peasants who maintain a bull for service purposes.

At the breeding unit they have a choice of bulls, all of which are grade Holstein, the stud centre charges a nominal fee of 75c per service and this entitles the peasant to as many re-services as necessary.

Locally owned bulls vary a great deal from scrubs pure and simple to very high grade Holsteins, service charges vary, but the general rate is $2. which allows in most cases for 2 or 3 re-services. The majority of peasants are now using the bulls at the Stock Farm, although many still utilise local bulls. Many peasants spoken to were not aware of the cheapness of having their cows sired by Government bulls, and the facilities offered could be better advertised amongst the peasants.
42. Work oxen.

The popularity of the Holstein has resulted in the almost complete eradication of breeding pure Zebu cattle in the survey area. The peasant will not cross his cow with a Zebu bull, the bull must be some type of Holstein. This practice has resulted in a grave shortage of good oxen in the area with resulting high prices and also it has increased the number of small nondescript bulls that can be seen pulling carts. Oxen are now brought in from other parts of the island. The government has done nothing at all to encourage ox breeding in the island and even on the Stock farm no breeding or improvement work is being carried out.

43. The Government and Sugar Estates originally imported Nellore, Gugarat, and Mysore cattle from India, but of recent years the sugar estates have turned from these light Zebu oxen to the heavier and faster moving Murrah breed of buffaloes, nowadays Zebu oxen are rarely seen on estates. In all probability the peasants will turn to the buffalo as a work animal instead of the Zebu oxen now used.
D. DAIRYING.

44. In the Trinidad and Tobago census of 1946 the following figures were given for the daily sale of milk:

- Total milk sold: 27,546 bottles
- Milk produced on farms: 15,662 bottles
- Milk produced on small plots: 13,885 bottles

These figures emphasise the importance of peasant owned cattle in the colony's liquid milk supply.

45. Milking times are roughly 4 a.m. and 3:30 p.m., the cows being tied during milking; most peasants tie the calf up near the cow during milking since they find that a cow lets her milk down more easily.

46. Few peasants go to the bother of washing the cow's udder before milking, in many cases the cow is regularly washed and groomed but this is not a clean milk measure, but a Hindu custom. There is no straining or cooling of milk, it is immediately bottled.

47. There are several ways in which the peasant can dispose of his milk, they are:

(a) Utilise it himself.
(b) Sell it to his neighbours.
(c) Sell it to a milk retailer.
(d) Sell it to the Government Stock Farm.

48. Most peasants keep just one cow which is used solely as a house cow, yields are so low that after feeding the calf (which most peasants rear) and satisfying the demands of his family there is little over, any excess can be sold to a neighbour or used for ghee making.

49. Several peasants, not wishing to have their cows tuberculin tested and thus unable to sell their milk to a licenced dealer, sell their milk to other peasants in the survey area. There is quite a demand for it from peasants who possess no cow or whose cow is dry. Prices charged vary from 12-14¢ a rum bottle.
10 cows are owned mainly grade Holsteins, milk is sold to the Curepe Dairies. The brothers who own it are also the local butchers. They possess no land, but collect grass in all the surrounding districts, and for this purpose have purchased a jitney. They have no bull at the moment but are rearing two young ones, see Figs. 28. and 29.
50. At least one Port-of-Spain dairyman collects milk from peasant producers, he pays 12£ per rum bottle, and the milk is sold in Port-of-Spain at 17£ a pint. Since a rum bottle contains 1 1/5 pints he pays 72£ a gallon for the milk, which he later sells in Port-of-Spain for $1.36.

51. Under the "milk for school children" scheme, the Government Stock Farm at St. Joseph purchases milk from peasants. The peasants take the milk to the farm where they receive 90£ a gallon for it. Mr. Dominique, Supervisor at the Government Stock Farm, states that this scheme is very popular with the peasants and that they have quite a waiting list of peasants wishing to participate. Unfortunately the farm can only take about 80 gallons per day.

52. For a person to retail milk in Trinidad, he must first obtain a licence, this licence enables him to sell only milk which is obtained from tuberculosis free cows, which are kept and milked in premises approved by the Health Authority.

Thus any peasant who wishes to sell milk to a licenced retailer must have his premises inspected and his cattle tuberculin tested. Officers from the Stock Farm do the testing and inspecting. Any animals which react to the test are slaughtered, the Government paying 80% of the valuation of the cow as compensation. There are no fixed standards for cowsheds etc., as long as the shed is reasonably clean it will be passed.

53. This slaughter policy of cows reacting to the tuberculin test has scared many peasants off selling milk to registered dairy men. Several peasants however, get round this by selling their milk to another peasant who is licenced to sell milk to a retailer. The Government tuberculin test scheme thus falls down since it is very difficult to catch anyone doing it.

54. Two peasants talked to stated that they made ghee (clarified butter), the method of manufacture is to churn the milk, the butter being collected and boiled. Ghee has an advantage over butter in the tropics in that it can be kept much longer.
58. Research into the conservation and production of pen manure has been going on for several years, the results of this research are well known. Points to be aimed at being, to keep conditions as anaerobic as possible and the temperature as high as possible, 26°C being found the optimum. Under these conditions the formation of nitrates and the evolution of ammonia are retarded.

59. On the I.C.T.A. peasant holdings a system of manure conservation and production is practised which could be easily adopted in the survey area. Under this system instead of cattle being kept in the normal peasant type shelter, they are kept in byres in which the floor is sunk some 2-3 ft. below ground level (see photographs), the depth being increased by building a clay wall about one foot high around the edge of the pit.

The floor and sides of the pit are smoothed and graded, and all corners rounded off to eliminate any depressions where liquid might collect and form potential fly breeding areas.

The first essential of this system is plenty of bedding——everything possible is used, excess grass, cane trash, maize stalk; and anything which the animal fails to eat.

When the manure fills the pit, it is forked out and the process begun again. Fly breeding is an important factor in manure production; with this system (Ref. 8) it has been shown that if the top layer of manure is shaken up twice daily, any larvae hatched from eggs laid in the freshly voided dung were shaken down into the lower layers of the manure and killed by the heat of fermentation.

On cleaning out the pit, the manure must be built up into a well compacted heap, the actual forking from pit to heap will provide enough oxygen for bacterial action necessary for the breaking down of the fibrous bedding. The object now must be to build a compact heap and thus prevent excessive oxidation. Some sort of cover should be provided for (no matter how rough) to protect it from sun and rain thus checking leaching and further oxidation.
55. In Section III A. dealing with the importance of cattle in the local agriculture, importance was attached to the production of farm yard manure, both in its use for increasing yields and the fact that peasants in the survey area are fully aware of its worth. Nevertheless, great improvement is desirable in the production and storage of farm yard manure in the area, although no comprehensive experimentation has been carried out on the subject it is obvious that crop yields in the area could be greatly increased by using manure produced under more controlled conditions than are general at present.

56. On holdings in the survey area manure is generally produced as follows:

Bedding is placed under stock, housed generally in a beaten clay or concrete floored byre. Bedding is generally sparse, rice straw, uneaten and trampled grass, cane tops etc., especially in the dry season when fodder is short. Manure and soiled bedding are cleared out of the pen once or more often a day and flung onto an untidy heap. This loose heap of dung and bedding is fully exposed to sun, rain and wind. Under these conditions oxidation of organic matter and the leaching of nutrients are rapid, the end product being a nutrient poor and near worthless. After rotting the manure is carted out and applied as required, in some cases due to the poor condition of traces in the wet season, manure is carted out to the fields in the dry season and left in small heaps (see photograph) until the beginning of the wet season, resulting of course in further oxidation and leaching.

57. Apart from resulting in a poor product, this method of throwing manure into loose heaps provides flies with ideal breeding grounds, and often instead of being an asset to the peasant these heaps become a source of infection for many fly borne diseases.
These photographs show the general construction of the stock sheds now being used. 30 was designed for one bullock, 31 for two cows and followers, whilst 32 and 33 illustrate one designed for 6 cows.

Fig. 35 shows a manure heap compactly built and protected from rain and sun by a covering of cane trash.
Although at the time of writing no trials have been carried out comparing manure produced in this way and the normal peasant product, the greatly increased yields on the I.C.T.A. peasant holdings since the adoption of this method give a very good indication of its work.

60. For the success of this method the following conditions must be satisfied:

1. Suitable site - essential that water does not drain into the pit.

2. Plentiful supply of bedding - otherwise pit will become a morass due to trampling of dung and urine by the beast.

3. Shaking up of bedding - to prevent fly breeding.

4. Continuity of purpose - i.e. the building of a protected heap on cleaning out of the pit.

61. Certain difficulties arise in the adoption of this system in the area, the bedding supply is one, another is whether such cowsheds (under peasant control) would be passed by the Health Department as suitable for liquid milk production. This second difficulty could be easily surmounted, since as has been observed on the experimental peasant holdings, this type of byre is nearly completely fly free and certainly more hygienic than those found under normal peasant conditions in the area.

62. LIQUID MANURE.

Liquid manure is used by several peasants in the survey area. On the Aranguez Estate its use is almost universal, being not used for forcing vegetables. The system outlined above cuts out its production, the F.Y.M. produced being greatly enhanced in value. The system at Aranguez is to build a dung channel in the cattle pen running into a large can or barrel, the receptacle being fitted with a lid (see diagram), urine and washings from the pen are collected in this way, often the liquid manure is fortified with an artificial fertiliser, generally sulphate of ammonia.
Collection of this liquid manure, apart from conserving a useful plant food is a useful sanitary measure, since on most peasant holdings this liquid drains over the yard producing smelly, unsanitary pools.

65. **Recommendations.**

That the Department of Agriculture should investigate improved methods of F.Y.M. production and conservation and demonstrate the most suitable of these within such centres of peasant agriculture as the survey area. Also the position should be clarified in the case of milk producers with regard to the "storage under the beast" system recommended above.

Liquid manure conservation should be encouraged in the area, not only from the agricultural but also from the medical point of view.
F. HAULAGE BY OXEN AND BUFFALOES.

64. As mentioned in C. para. 42, the original introductions of draught oxen were made by Government and the Sugar Estates. Three breeds were introduced, the Nellore, Mysore and Gujerat breeds, under peasant conditions crossing between these three breeds took place and the type of Zebu found in the survey area was evolved.

65. These kept Zebu bullocks were not considered suitable for heavy work by the sugar estates who turned to importing two breeds of buffaloes - the Murrah breed of the Southern Punjab and Delhi Province and the long horned Nagpuri buffaloes of Central and Southern India.

66. The Murrah buffaloes are very massive, stockily built animals with deep, wide frames and short, massive limbs and are usually black in colour though a fawn-grey colouring of the hair is not uncommon and white markings are occasionally seen on the face, legs and tail. The most characteristic feature is the tightly curled horns. Peculiarity enough they are not considered suitable for draught purposes in India (Ref. 9) where they are used for milk and ghee production.

67. The long horned Nagpuri buffaloes are entirely different from the Murrah and probably represent a very ancient indigenous Indian type. They are usually black, but white patches on the face, legs and tip of tail are common. In India they are essentially a draught animal.

No buffaloes are kept in the survey area, except in the Streatham Lodge area where most of the cane growing community live. It is not unlikely that in the end they will replace Zebu bullocks for draught purposes due to their greater working capacity and the decreasing numbers of Zebu breeding cattle.

68. TRANSPORT.

Bulls, bullocks and buffaloes are used in carts for general haulage work in the survey area, such as carting grass, manure, sugar cane etc. For lighter work on good roads, such as
PLATE VII

Fig. 36 Donkey and young bull harnessed in the same cart, note the unusual harness.

Fig. 37 Young Zebu bull.

Fig. 38 Zebu working bull tethered on a recently harvested cane field.

Figs. 39 and 40. A very old bull, note extremely poor condition and also the callous on back of neck the result of a poor fitting yoke.

When two cows are yoked, a pole is used running between the beasts. A heavy wooden yoke is used, and a ring suspended from the centre of it is attached to the pole. There are variations to these methods of yoking and some of them are illustrated by the plates and diagrams.
hauling produce to Port-of-Spain, the faster donkey or mule is preferred. During the cane harvest sugar estates employ peasants who own a bullock and cart, to cart harvested cane. Since the dry season is a slack period on peasant holdings, this is a valuable extra source of income, also the peasant is allowed to take home cane tops for fodder.

69. CULTIVATION.

Oxen and buffaloes are the only types of animal used for cultivation in the survey area. Sugar cane and rice are the only two crops which generally receive any form of animal cultivation. The advantages of oxen for implement draught on the wet heavy soils of the survey area are:

1. Slow steady pull - a horse under similar circumstances would jerk and jolt forward, the plough being out of the ground more often than in.
2. The hoof of the ox being cloven spreads out under pressure giving it a better foothold, and closes when removed from the ground.
3. Ease of management and simplicity of harness.

70. Ploughing is the major cultivation operation; usually a single furrow mouldboard plough drawn by two oxen is used. Subsequent tillage operations are usually done by hand. In the rice fields, however, (see photo) subsequent to ploughing a heavy wooden framed harrow is drawn across the flooded field to puddle the soil, the feet of the oxen themselves assist this process.

71. YOKING.

Carts: the method of yoking an ox between shafts is simple. A single yoke over the neck is used, with an iron hoop under the neck to keep it in position. A ring is slid over each shaft, kept in position by a pin and attached to the yoke by a short tug. Steering is done by reins attached to the nose rope, by calling and by using a prodding stick.

When two oxen are yoked, a pole is used running between the beasts. A heavy wooden yoke is used, and a ring suspended from the centre of it is attached to the pole. There are variations to these methods of yoking and some of them are illustrated by the plates and diagrams.
PLATE VIII

Fig. 41 Team of oxen in plough harness.
Fig. 42 Peasant type plough with wooden pole, and in front of it a modern Ransomes "Victory" all metal plough.
Fig. 43 A Zebu x Holstein bull used both for work and service.
Fig. 44 "York" harrow, used for puddling rice fields note heavy wooden frame and iron tynes.
Fig. A. THE BOW - runs up on either side of the animal's neck and prevents lateral and vertical motion.

Fig. B. SINGLE YOKE -

Fig. C. METHOD OF PULLING with ring on shaft or pole, several holes are provided for adjustment.

Fig. D. DOUBLE YOKE - the one depicted here is a general purpose type, the width between the mid-points of the bows being 2ft 9" to 3ft. For a two furrow plough this should be 3ft 6" and for 3 furrows 4ft 6".
**Ploughs:** the same single pole method is used, but generally a chain is attached from yoke to plough and twisted around the shaft, some types of plough use a chain only. The heavy drags used in the rice fields are attached to the yoke by a chain.

72. **Breaking in.**

In the survey area, oxen are usually about 2½ years old when broken in, they should be handled as early as possible since the Zebu if not handled early can be dangerous and quite unbreakable. The first operation is to acquaint the animal with the feel of the yoke, and then should be yoked with a quiet trained beast. Once accustomed the animal is attached to a log and made to pull it over rough ground. From this it graduates to a plough and finally to a cart. These stages must not be rushed, after breaking in, the beast should be paired with another ox, the pair always being worked together.

73. **Castration.**

All male draught animals should be castrated; in the survey area this is not general since many peasants believe that the uncastrated bulls develop better shoulders and are thus better workers.
74. Mr. G.W.H. Wob (Ref.10), Senior Lecturer in Animal Husbandry at the I.C.T.A. has listed pests and diseases prevalent in the survey area in the following order of importance:

- Parasitic Helminths
- Ecto parasites
- Bacterial diseases such as T.B. and contagious abortion.

75. Parasitic Helminths.

This is a subject treated with considerable apathy by the peasants. The wastage and loss arising from these internal parasites is accepted as inevitable and it is only when marked clinical symptoms or death are observed that the interest of the peasant is aroused. The climate of Trinidad, warm and humid is well suited to the infection of animals by internal parasites, and the incidence of attack is further increased by the poor condition of the stock due to inadequate feeding.

Although no actual work has been done amongst peasant animals, it is not unlikely that they are infected with all the common helminths. The general depreciation factor caused by internal parasites is enormous, and the loss in production is more constant than from epidemic diseases.

Control - no control measures are taken by peasants, although some of them brew up local herbs and drench their cattle with these.

Treatment with phenothiazine is both easy and effective and controls most of the more important worms, the drug is however selective in its action, certain species of worms being unaffected.

General doses are - cattle 0.8-0.9 grams, calves 20-60 grams of phenothiazine powders given as a drench at 4-5 month intervals.

76. Ecto parasites.

Wickens and Wilson (Ref.11) found that the only species of ecto parasite at all common on cattle in the area was the Brown cattle (or Texas Fever) tick, Boophilus annulatus, a member
of the Ixodidae, a one host tick and a continuous feeder. Its life history is simple (Ref.12) - eggs are laid on pasture land and reach larval stage in 6-10 days. These seed ticks remain on the vegetation until the passage of an animal, the ticks then get into the hairs of the legs, moving from these to more secluded positions - under the tail, escutcheon, behind the ears etc. The tick is adult after two months of feeding when the female already fertilised and fully engargad drops to the ground and deposits her eggs. The whole life cycle takes some 60 days and one female can produce 2-18,000 eggs.

77. The brown cattle tick can cause loss in two ways:

(a) Indirectly as the vector of piroplasmosis (Red water fever) and anaplasmosis.

(b) Directly by worrying the beast by sucking blood.

(a) Piro and anaplasmosis are not serious in the colony since most animals acquire resistance by contracting the disease (in a sub lethal form) in calfhood. Occasional outbreaks do occur when this resistance is broken down by some outside factor, e.g. another disease. Cattle imported from areas where red water fever is not present are susceptible.

(b) Tick worry: The loss occasioned by blood sucking is severe, as an animal heavily infested quickly falls in condition.

The spread of ticks in the area is due mainly to the fact that the waste land and roadsides used for grazing are communal, and even if a peasant has clean animals they can rapidly pick up ticks whilst out grazing. Cow sheds are often sources of re-infection since the ticks remain on old bedding, rails etc. Ticks can also be spread by carting contaminated fodder to animals stall fed (Ref.13).

78. Control:

In the survey area washing and the removal of ticks by hand picking are the two main methods, often disinfectant is added to the washing water. Both these methods are mechanical
and often the mouth parts and head of the tick are left embedded in the animals skin, this leads to ulcers, running sores and the scars all too commonly seen on peasant cattle. Some peasants use Coopers Dip (containing Sodium Arsenite) and wash their animals with a solution of this.

Experiments carried out in N. Australia showed that animals with 3/8 of Zebu blood seldom exhibited tick worry (Ref.14), this may be the reason which so many of the pure bred Zebu work oxen are not infected by ticks at all.

The use of gammexane at the rate of 1 lb. to 40 gallons of water, sprayed onto the beasts at weekly intervals has been proved a complete success in the elimination of ticks at the College Farm. This is an easy and economical method of control, one which might well be adopted by peasants in the area.

79. Tuberculosis:

Incidence probably much higher than the Department of Agriculture’s Reports (Ref. 17) indicate, the actual incidence of the disease amongst peasant cattle is completely unknown since tuberculin tests are only carried out on the stock of milk producers wishing to retail or wholesale milk, few peasants apply for milk licences.

80. Contagious abortion:

As with tuberculosis the incidence is probably higher than imagined. It may be the reason why so many cows appear to fail to take at service (Ref.10).

81. Paralytic Rabies: this disease was introduced into Trinidad from S.America by rabies infected bats - a species (Desmodus Rotundus) which lives principally on the blood of animals which it laps from a wound bitten in the skin. The outbreak lasted from 1928-1938. The highest incidence occurred in 1931-1932 when 2,000 donkeys, cattle and mules died. The outbreak was controlled by vaccination with rabies vaccine and the destruction of bats. Since 1936 no further cases have been reported, presumably owing to the destruction of the last infected bat.
This report would not be complete without some reference to the work of the Government Stock farm, especially since due to its nearness (Valsayn, St. Joseph) to the survey area, it has quite an effect on the animal husbandry of the area.

The objectives of the Farm have been given by Dr. Hall (Veterinary Officer and Officer in Charge) as follows:

i. The production of improved livestock of all classes.

ii. The study and dissemination of improved Animal Husbandry practices.

iii. The provision of an adequate supply of milk for Government Institutions and for the "milk for school children" scheme.

Facilities offered to the Public:

i. Service.

(a) Breeding Units - Stud Centres at which a number of breeding sires of various classes are stood for service are operated in several districts throughout the colony, viz:

<table>
<thead>
<tr>
<th>District</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port-of-Spain</td>
<td>Mucurapo</td>
</tr>
<tr>
<td>St. Joseph</td>
<td>Govt. Stock Farm</td>
</tr>
<tr>
<td>Arima</td>
<td>O'Meara Road</td>
</tr>
<tr>
<td>Sangre Grande</td>
<td>Brooklyn</td>
</tr>
<tr>
<td>Manzanilla</td>
<td>El Recuerdo</td>
</tr>
<tr>
<td>Chaguanas</td>
<td>Woodford Lodge</td>
</tr>
<tr>
<td>Penal</td>
<td>Demonstration Station, Penal</td>
</tr>
<tr>
<td>Rio Claro</td>
<td>Demonstration Station, Rio Claro,</td>
</tr>
</tbody>
</table>

(b) Courses - Vocational courses in practical Animal Husbandry are sometimes arranged.

(c) Literature - Pamphlets on the care and management are made available to the public.
ii. **Advice.**
The Farm Staff including the Veterinary Officer are always available to the public in an advisory capacity.

iii. **Demonstrations.**
Livestock and Agricultural groups pay frequent visits to the Farm, as do both elementary and secondary schools. The necessity for clean milk production is always emphasised. The farm also fosters livestock shows when the farm animals are exhibited.

85. **Types of Animals maintained on the Farm:**

1. **Dairy Cattle** - the herd chiefly consists of half-bred holsteins.
2. **Pigs** - Large Blacks and Berkshires.
3. **Goats** - British Alpine and Anglo Nubian.
5. **Horsekind:** (a) Three thoroughbred stallions, gifts of the Trinidad Turf Club are maintained.
   (b) **Jacks** - imported from the U.S.A., together with locally bred jacks are maintained for mule and donkey breeding.

86. **Investigational Work:**
General work is carried out, such as the extent to which up-grading may be advantageously employed, the selection of suitable grasses etc. One interesting experiment being conducted at the moment is the rearing of calves out of doors from almost immediately after birth.

87. **Dairy:**

1. Average number of milch cows - 80
2. Average milk production - 150 gallons per day
3. About 80 gallons of milk are purchased per day from peasants for the milk for school children scheme.
4. All milk is pasteurised by the Holding Method - milk heated to 145°F and held there for 30 minutes and then immediately is cooled to 50°F.
Public response to the farm is considered satisfactory and full use is made of the breeding units, advice is often sought on livestock problems especially with regard to the local conditions and the establishment of fodder crops.
SECTION IV. RECOMMENDATIONS.

1. That the Department of Agriculture should view peasant owned cattle in their correct perspective as:
   (a) Being more important than and not subsidiary to cattle owned by estates and large farms,
   (b) Producing more than half of the island's milk supply,
   (c) Being an important source of power for transport and cultivation,
   (d) Maintaining the fertility of large areas of land that would, if pen manure was not available, now be producing the poorest of crops,
   (e) Providing an important protective food for the peasant population,
   (f) Being a source of income for a large number of peasant farmers.

2. That having recognised the importance of peasant cattle modify its present policy to one which will include more fully measures for the improvement of peasant stock and stock husbandry. At present, work being carried out at the Government Stock Farm has little bearing on peasant agriculture. The main project, the breeding of a high yielding dairy herd requiring heavy feeding and careful management will be obviously of little use to the normal peasant.

   The following points, are in the writer's opinion a few of many deserving of investigation.

HOUSING:

3. Although adequate from a point of view of shelter, there is much to be desired in cleanliness. Concrete floors, with a dung channel and sump, or liquid manure tank, should be encouraged. Bedding should be removed regularly and the shed washed down.

   One bad practice to be seen on several holdings, is to tie cattle up facing one another in the shed; this should be discouraged as it facilitates the spread of such diseases as tuberculosis.
4. Fodders and Feeding:

Many people consider that the improvement of stock is subordinate to the improvement of fodders and that without good feeding, races degenerate and breeding work remains stationary. (Ref.15).

This is very true in the survey area, the crying need there is for the cultivation of some form of soiling grass. Unfortunately the small size of most of the holdings limits the amount of grass that can be grown, thus the optimum combination of quantity and quality is desired.

Paterson (1939) (Ref.16) considers Guatemala grass as being more important than Elephant grass since it is hardier and shows the least monthly fluctuations in yield from the wet to the dry season. Elephant grass on the other hand gives the larger yield of bulk and nutrients, also it is very palatable but liable to form pseudo-canes at the expense of the foliage.

Guatemala grass in Trinidad is severely attacked by Puccinia poliippera whilst Elephant grass var. Uganda is resistant to attack by Helminthesporium spp. Both grasses are propagated by sets and both need manuring to keep up yields. At the College, Elephant grass is now preferred to Guatemala grass. The experimental peasant holdings will in time provide valuable information on these points.

5. Breeding:

Most tropical countries have the same difficulties as Trinidad in the improvement of livestock. As has been already mentioned the hardiness of the Zebu is not passed on to its progeny when crossed with a European beast. In Ceylon (Ref.7) trials are now being carried out with imported Zebu cattle from India, the two breeds being used are the Red Sindhi and the Sahiwal. These imported Zebu cattle are, of course, more or less inured to a tropical climate, and are, moreover, accustomed to the coarse types of fodder which are indigenous to both India and Ceylon.

The chief advantage of introducing such Indian breeds into Ceylon is that they are already selected for milk production. Thus the average yields for both the Sindhi and Sahiwal breeds in their own Indian environment lie well above the 3,000 lb. level, animals
giving yields of 5,000 to 7,000 lbs. are fairly common, and with the Sahiwal yields of 10,000 lbs. are not infrequently recorded.

An importation of Sahiwal cattle has already been made here, (see photographs) and should the breed prove successful their use in "grading up" peasant cattle might be a rapid way of increasing milk yields.

6. Dairying:

It has been mentioned (D.51) already that the Government Stock Farm has a waiting list of peasants wishing to sell milk under the "milk for school children" scheme. This appears to be an indication that many more peasants wish to sell milk than do so at present. An enlargement of this scheme and the formation of a similar one might well prove to be an important feature in the improvement of stock and stock husbandry in Trinidad; with the sale of milk from his cows the peasant will realise their importance and welcome any measure that is liable to increase their yields. Premiums might be given for cleanliness and the scheme used as a channel for the extension of improved farming methods.

7. Pests and Diseases:

Investigations should be carried out to assess the actual frequency of the various pests and diseases of peasant cattle. Internal parasites in particular deserve attention, the use of such drugs as phenothiazine should be encouraged. Research into the causes of the low conception rate of peasant cattle is also long overdue.
SECTION V.

ACKNOWLEDGMENTS

I should like to extend my thanks to Mr. G.W.H. Webb for his assistance and encouragement in compiling this report, to Dr. Hall and Mr. Dominique of the Government Stock Farm and to Mr. C.W. Lynn on whose suggestion the survey has been carried out.

REFERENCES.

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7. V.C. WRIGHT - REPORT ON CATTLE BREEDING AND MILK PRODUCTION IN CEYLON - SESSIONAL PAPER XX-1946.
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   BULLS. 16-27.
10. G.W.H. WEBB - PRIVATE COMMUNICATION.
12. WHITNALL, RAE. B. 36. 21.
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14. F.A.O. AG. BULLETIN NO.1.- BREEDING LIVESTOCK ADAPTED TO UNFAVOURABLE ENVIRONMENTS.
The soils of the survey area were surveyed and mapped by Dr. E.M. Chenery in 1946. The following table gives the analysis data for the surface soil of the five main soil types:

<table>
<thead>
<tr>
<th>SOIL TYPE</th>
<th>Sand</th>
<th>Texture</th>
<th>pH</th>
<th>Nitrogen</th>
<th>C/N</th>
<th>P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;</th>
<th>K&lt;sub&gt;2&lt;/sub&gt;O</th>
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<tbody>
<tr>
<td>RIVER ESTATE SAND</td>
<td>74.0</td>
<td>18</td>
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<td>2.50</td>
<td>0.163</td>
<td>8.9</td>
<td>7 70</td>
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<tr>
<td>ST. AUGUSTINE LOAM</td>
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<td>36</td>
<td>5.0</td>
<td>5.65</td>
<td>0.197</td>
<td>10.9</td>
<td>1 50-150</td>
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<tr>
<td>GOLDEN GROVE SANDY LOAM</td>
<td>58.5</td>
<td>24</td>
<td>4.7</td>
<td>2.26</td>
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<tr>
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<td>25</td>
<td>5.0</td>
<td>0.8</td>
<td>-</td>
<td>-</td>
<td>4 20</td>
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<tr>
<td>PASMA CLAY</td>
<td>15.5</td>
<td>35</td>
<td>6.1</td>
<td>2.10</td>
<td>0.204</td>
<td>6.0</td>
<td>2</td>
</tr>
</tbody>
</table>

River Estate Sands and Loams: Free draining, grey brown podzolic soils. Uniform yellow-brown fine sand or sandy loam, merging gradually into a yellow ochre fine sand with faint red-brown mottling. Sand hard and compact but roots can penetrate. Liable to suffer from drought. Very acidic, low in available phosphate and potash.

St. Augustine Loam: Free draining, azonal to yellow podzolic light to dark yellowish-brown compacted sands and loams, merging into orange red-buff mottled material. Very acid and low in available phosphate and potash.

Golden Grove Sandy Loam: Free draining, yellow podzolic soil. Yellow grey uniform sandy top soil with ochre yellow sub soil, mottled with red and brown. Free draining but generally a high water table in the wet season though not waterlogged. Very acid and low in available potash and phosphate.

Streatham Sand: Partially impeded drainage. Yellow podzolic. Uniform bleached grey sand hard and compacted. Sub soil is mottled compact sand merging into more coarsely mottled and gravelly material. Very acid and very deficient in available phosphate and potash. Agriculturally very poor.

Pasea Clay: Drainage slow and partially impeded. Yellow podzolic, olive clay, darker olive-brown to brown sub soils with mottling of red-brown to brown. Soil is very deficient in phosphate and is acid. Used mainly for rice cultivation in the survey area.
### APPENDIX 2.

#### CLIMATE

**RAINFALL** - 25 years average in inches

<table>
<thead>
<tr>
<th>Month</th>
<th>Average Rainfall in Inches</th>
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</thead>
<tbody>
<tr>
<td>January</td>
<td>3.0</td>
</tr>
<tr>
<td>February</td>
<td>1.5</td>
</tr>
<tr>
<td>March</td>
<td>1.4</td>
</tr>
<tr>
<td>April</td>
<td>2.0</td>
</tr>
<tr>
<td>May</td>
<td>5.2</td>
</tr>
<tr>
<td>June</td>
<td>8.3</td>
</tr>
<tr>
<td>July</td>
<td>8.5</td>
</tr>
<tr>
<td>August</td>
<td>9.8</td>
</tr>
<tr>
<td>September</td>
<td>7.8</td>
</tr>
<tr>
<td>October</td>
<td>6.2</td>
</tr>
<tr>
<td>November</td>
<td>7.8</td>
</tr>
<tr>
<td>December</td>
<td>6.6</td>
</tr>
</tbody>
</table>

**AIR TEMPERATURE:**

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean Monthly Shade Temperature (Av. 18 yrs)°F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>84 Max. 69 Min. July 86 Max. 75 Min.</td>
</tr>
<tr>
<td>February</td>
<td>85 Max. 69 Min. August 87 Max. 71 Min.</td>
</tr>
<tr>
<td>March</td>
<td>86 Max. 69 Min. September 87 Max. 72 Min.</td>
</tr>
<tr>
<td>April</td>
<td>87 Max. 71 Min. October 87 Max. 72 Min.</td>
</tr>
<tr>
<td>May</td>
<td>87 Max. 72 Min. November 86 Max. 70 Min.</td>
</tr>
<tr>
<td>June</td>
<td>86 Max. 73 Min. December 85 Max. 70 Min.</td>
</tr>
</tbody>
</table>

**HUMIDITY AND WIND VELOCITY:**

<table>
<thead>
<tr>
<th>Month</th>
<th>Minimum Relative Humidity</th>
<th>Av. 14 yrs. at 8 a.m.</th>
<th>Av. 16 yrs. at 4 p.m.</th>
<th>Wind Vel. (M.P.H.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>47 (18 yrs. Av.)</td>
<td>85</td>
<td>69</td>
<td>2.01</td>
</tr>
<tr>
<td>February</td>
<td>52</td>
<td>83</td>
<td>66</td>
<td>2.43</td>
</tr>
<tr>
<td>March</td>
<td>50</td>
<td>77</td>
<td>63</td>
<td>2.87</td>
</tr>
<tr>
<td>April</td>
<td>52</td>
<td>75</td>
<td>63</td>
<td>3.03</td>
</tr>
<tr>
<td>May</td>
<td>56</td>
<td>77</td>
<td>67</td>
<td>3.07</td>
</tr>
<tr>
<td>June</td>
<td>62</td>
<td>81</td>
<td>73</td>
<td>2.48</td>
</tr>
<tr>
<td>July</td>
<td>63</td>
<td>84</td>
<td>75</td>
<td>1.92</td>
</tr>
<tr>
<td>August</td>
<td>63</td>
<td>86</td>
<td>76</td>
<td>1.46</td>
</tr>
<tr>
<td>September</td>
<td>62</td>
<td>85</td>
<td>76</td>
<td>1.50</td>
</tr>
<tr>
<td>October</td>
<td>61</td>
<td>84</td>
<td>76</td>
<td>1.52</td>
</tr>
<tr>
<td>November</td>
<td>61</td>
<td>85</td>
<td>77</td>
<td>1.52</td>
</tr>
<tr>
<td>December</td>
<td>61</td>
<td>86</td>
<td>74</td>
<td>1.79</td>
</tr>
</tbody>
</table>
APPENDIX 5

POPULATION STATISTICS

Following figures are taken from the Trinidad Census of 1946:

<table>
<thead>
<tr>
<th>AREA</th>
<th>HOUSEHOLDS</th>
<th>POPULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TUNAPUNA</td>
<td>1845</td>
<td>7328</td>
</tr>
<tr>
<td>ST. JOHN'S VILLAGE</td>
<td>75</td>
<td>387</td>
</tr>
<tr>
<td>SANTA MARGARITA</td>
<td>95</td>
<td>426</td>
</tr>
<tr>
<td>ST. AUGUSTINE</td>
<td>273</td>
<td>1274</td>
</tr>
<tr>
<td>ST. JOSEPH</td>
<td>610</td>
<td>2582</td>
</tr>
<tr>
<td>CUREPE</td>
<td>1206</td>
<td>5579</td>
</tr>
<tr>
<td>MONTEGRANDE</td>
<td>272</td>
<td>1257</td>
</tr>
<tr>
<td>FA. SEA</td>
<td>225</td>
<td>1085</td>
</tr>
<tr>
<td>STREATHAM LODGE</td>
<td>495</td>
<td>2290</td>
</tr>
</tbody>
</table>
APPENDIX A.

PRINCIPAL CROPS GROWN IN THE AREA.

RICE (Oryza sativa)
MAIZE (Zea mays)
SUGAR CANE
PIGEON PEA (Cajanus Indicus)
STRING BEAN (Phaseolus vulgaris)
WOOLLY PYRQL (Phaseolus mungo)
COW PEA (Vigna species)
EDDO (Colocasia antiquorum)
TOMATO (Lycopersicum esculentum)
EGG PLANT (Solanum melongena)
OKRA (Hibiscus esculentus)
YAM (Dioscorea species)
TANNA (Zanthosoma sagittifolium)
SWEET POTATO (Ipomoea batatas)
CASSAVA (Manihot utilissima)
BANANAS AND PLANTAINS (Musa species).

Other crops that can be found in the area include:-
Lettuce, Radish, Cucumber, Pumpkin, Christophine, Lima beans,
Bonavist bean, Chinese cabbage, Cabbage, Chili, Hot peppers,
Sweet peppers etc.

FRUITS

CITRUS - Grapefruit generally, but sweet oranges and limes are also common.
MANGO - (Mangifera Indica)
BREAD FRUIT - (Artocarpus communis)
COCONUT - (Cocos nucifera)
AVOCADO - (Persea americana)
PAPAYA - (Carica Papaya)
CASHEW NUTS - (Anacardium occidentale)
PINEAPPLE - (Ananas comosus)
AGRICULTURAL PRICES:
The following are the controlled prices for feedingstuffs, actual prices vary due to a black market in most commodities:

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bran</td>
<td>8¢ per lb.</td>
</tr>
<tr>
<td>Oats - clipped</td>
<td>6¢</td>
</tr>
<tr>
<td>unclipped</td>
<td>6¢</td>
</tr>
<tr>
<td>Pollard</td>
<td>8¢</td>
</tr>
<tr>
<td>Poultry food, local scratch grain</td>
<td>8¢ per lb.</td>
</tr>
<tr>
<td>Coconut meal</td>
<td>2¢</td>
</tr>
<tr>
<td>Rice husks - per kerosene tin</td>
<td>10¢</td>
</tr>
<tr>
<td>Crushed maize</td>
<td>6¢</td>
</tr>
<tr>
<td>Linseed oil meal</td>
<td>8¢</td>
</tr>
<tr>
<td>Fish meal</td>
<td>7¢</td>
</tr>
<tr>
<td>Bone meal</td>
<td>8¢</td>
</tr>
<tr>
<td>Bran</td>
<td>8¢</td>
</tr>
</tbody>
</table>

The following are the sort of prices peasants pay for various types of stock:

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow (Zebu-Holstein cross)</td>
<td>$250-350</td>
</tr>
<tr>
<td>Working bullock</td>
<td>$200-250</td>
</tr>
<tr>
<td>6-9 month old calf</td>
<td>$75-120</td>
</tr>
<tr>
<td>A bullock cart costs</td>
<td>somewhere around $140.</td>
</tr>
</tbody>
</table>
GENERAL MAP OF THE AREA

Main roads.

Rivers.

Traces.

This map is to no particular scale.
### SOILS MAP OF THE AREA

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Augustine Loam</td>
<td></td>
</tr>
<tr>
<td>Fasea Clay (carries most of the rice)</td>
<td></td>
</tr>
<tr>
<td>River Estate Sandy Loam (cane and provisions rice in northern lowlying area)</td>
<td></td>
</tr>
<tr>
<td>Golden Grove Sandy Loam (cane, rice and provisions)</td>
<td></td>
</tr>
<tr>
<td>Streatham Sand (all the waste land occurs on this soil type.)</td>
<td></td>
</tr>
<tr>
<td>Macoya Sand (cane, rice and provisions.)</td>
<td></td>
</tr>
<tr>
<td>Mon Plaisir Heavy Clay.</td>
<td></td>
</tr>
<tr>
<td>Conupia Clay.</td>
<td></td>
</tr>
</tbody>
</table>