PIG HUSBANDRY IN THE ST. AUGUSTINE AREA OF TRINIDAD;

Present Position, Limitations and Potentialities.

J.T.T. Schouten.
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INTRODUCTION.

A recommendation contained in the West Indian Royal Commission of 1938-39 (Cmd. 6174, page 20 para.20) is as follows:

"The outstanding agricultural need in the West Indies is more intensive use of the land, with increased production of food in order to support a rapidly growing population. The most urgent need is the development of peasant agriculture. ——— The practice of shifting cultivation by peasant farmers must be abandoned and replaced by an organised system of mixed farming."

2. This report is written as a first step towards achieving a more intensive use of the land, but is directed towards a single item, which is essentially part of a mixed farming system. The first step indicated by the Commission, was to survey the present system of peasant agriculture for the purpose of devising better peasant farming systems. With this view in mind then, it was decided to study the husbandry of pigs in the St. Augustine Area of Trinidad; to show as far as possible the background of the people, land and crops, which are relative to this study; and to describe the practices of pig keeping.

3. The scope of the survey is confined to the St. Augustine Area of Trinidad as shown on the sketch map. The words "St. Augustine Area" are here used loosely to describe the land within a two mile radius of the Imperial College of Tropical Agriculture. In this area many pigs and pig keepers were contacted; from the size and shape of the former and the happy indifference of the latter, it was quite safe to conclude that teaching, knowledge and literature on the subject of pigs would be in short supply. This proved to be correct and the report is an effort to indicate the level of knowledge and the starting points for investigation and later extension.

4. It was encouraging however to find that many pigs existed, even though they must prove to be of little economic value; filling -more -
more the role of household pets when the weaner takes up to 18 months
to become a reasonable bacon weight pig. It was felt that surely
there must be a place for pig husbandry amongst these people, and that
they would take up an improved system if they were taught sound
principles based on investigations on all the local problems.

5. This report is divided up into three parts, which are also
an indication of the order in which the work was undertaken. To these
three parts are added an Introduction, Summary and Conclusions,
Acknowledgments and Appendices. The first part - General Background
Information, includes the setting of the picture regarding land, climate
and human factors. The second part deals with the local agricultural
situation in special relation to pig keeping. The final part deals
with suggestions for investigations preliminary to a policy for pig
keeping developments.
PART I - GENERAL BACKGROUND INFORMATION.

(a) The Land -

The area of land covered by the survey is a circle of about two miles radius with the Imperial College as its centre; it occurs in the County St. George. The northern limits are the foothills of the Northern Range, and goes south as far as the Caroni River. The western limits are to the St. Joseph and Maracas Rivers, and then east to the eastern side of Tunapuna. The sketch map indicates generally the area of land referred to in this report. Two smaller areas were chosen for detailed observations; the first, Floradale Valley and hillsides, and secondly the Streatham Lodge area south of the College. Peasants from other parts were met with, and ideas were obtained in the course of casual conversations and the writer is satisfied that these two areas represented the whole, in regard to pig husbandry.

2. The Eastern Main Road provides a useful demarcation line in the topography of the country. To the north the land rises sharply and to the south occurs very flat countryside which is inclined to become swampy. The meandering course of the rivers show, in the map, the lack of run off gradient, and the physical formation of the land. As expected the rice crop plays an important role in peasant agriculture in this part. The topography has thus influenced the crops, and as it will be seen this has influenced the general trend of race of peasant found in these two areas.

3. The soils of the area have been classified by Chenery into the following types:

- River Estate loams,
- Streatham Lodge fine sand,
- St. Augustine red loams,
- Pasea Clays in the southern area.

In the northern area detrital soil types including Maracas fine sand at Floradale. These soils range from free draining types like St. Augustine red loam and River Estate loams to partially impeded drainage as found in the Streatham Lodge fine sand; to impeded drainage of the Pasea Clay soil.

(b) Climate -

4. Data of the climate of the area recorded for 25 years at the - meteorological -
meteorological station at the Imperial College is given in Appendix I.
The monthly averaged rainfall figures up to 1947 when compared with the
figures of rainfall for 1948 will give an appreciation of the elasticity
of the monthly averages. Thus in 1948, the wet season was six months
with
duration as compared to the average of eight months. An approximation of
the amount of effective rainfall may be gained by classifying the intensity
of the downfall. Light showers of less than 0.40 inches per hour will be
of little value to the crops on account of the evaporation taking place.
This class accounts for 60% of the total annual rainfall. Heavy storms
where the rate of fall is greater, 0.75 inches per hour, results in run-off water and is again lost to the crops. This class accounts for 20% of
the rainfall. Effective rainfall therefore is in the region of 20% of the
annual total.

(c) Water Resources

5. It may be seen from the sketch map that the area is fairly well
intersected with rivers and streams. There are numerous subsidiary streams
which have not been described on the map, but most of these become dry during
the dry weather. In the southern area the rivers and streams are sluggish
and drainage generally is a problem, in contradistinction to the north where
erosion and slowing up of run-off water are the problems. Here the water
finds its way down to the flat south lands through numerous valleys etc.,
but mixed farming sites are very definitely limited on the hills because water
is not easily available for livestock. The lower farms with river and
stream frontages however usually have livestock on them.

6. In the south the contour of the land is eminently suited to paddi
crops. The rice lands are carefully terraced off to allow flooding when
required. A weir has been set up by Government to assist in this respect.
Sugar production on the other hand, which is also a part of the cropping
system, needs elaborate drainage to take away excess water. Between these
two crops lie the water requirements of livestock.

7. Other water resources of the area include a stand-pipe system
along the roads, with taps conveniently placed to supply water for domestic
purposes, for as many households as possible. This convenience of course
is not found in the hills of the Floradale area.
8. The population density of the area varies immensely, and also there is great variation in type and origin of the peasants. A census of the whole Island taken in the year 1733 showed that the male adult population was 162 persons, of which 29 were white. The present day population is in the region of 530,762, giving an overall density of 232 people to the square mile. The population has shown a swift rise in latter years. The birthrate per 1000 head of population in 1946 was 38.64, the death rate per 1000 head was 13.75. In the area concerned in the survey, the following villages occur, which are the main centres of habitation:

<table>
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<th>Name</th>
<th>No. of households</th>
<th>Total population</th>
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<tr>
<td>Curepe</td>
<td>1,206</td>
<td>5,579</td>
</tr>
<tr>
<td>St. Augustine</td>
<td>275</td>
<td>1,274</td>
</tr>
<tr>
<td>Tunapuna</td>
<td>1,345</td>
<td>7,328</td>
</tr>
<tr>
<td>El Dorado</td>
<td>763</td>
<td>3,573</td>
</tr>
<tr>
<td>Streatham Lodge</td>
<td>455</td>
<td>2,580</td>
</tr>
<tr>
<td>St. Joseph</td>
<td>620</td>
<td>2,982</td>
</tr>
<tr>
<td>Paea</td>
<td>225</td>
<td>1,065</td>
</tr>
</tbody>
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It is interesting to note that, for example, each household of the Streatham Lodge area contains on an average 4.6 people. This seems a surprisingly low figure as a household has been known to contain 13 people, adults and children.

9. With regard to the Northern Range hillsides, fewer habitations exist as the ascent up the hills is taken, until finally there are none, though patches of land are cultivated. The cultivators of this land will spend the day toiling on the hillsides and then in the evening return to their households in the village. The tendency of these people is to live in villages and communal centres, which fact has a great bearing on crops and the livestock which they keep. When an area is "built up" and becomes urban, it is difficult to decide whether the keeping of livestock endangers public health. The Health Department has laid restrictions on keeping livestock in urban areas; in some areas pigs are forbidden, and in others, the manner of draining urine and dealing with manure is controlled.

10. The West Indian population is a very mixed one. It contains East European, Chinese, Indian and African types of people. This report deals with two types, who are predominant, and who are the agriculturists of the area. They are namely, the East Indian and the African. The East Indian -peasants-
peasants compose the majority of the agriculturists on the southern flat lands, and are rice and sugar cultivators particularly. In the North the agriculturists are mostly African type peasants. These people have their cultivated gardens on the steep hillsides.

11. Originally, there was no large indigenous population in the West Indies. The subsequent gathering up of types of people and placing of these types in the West Indies was due to the demand for labour, particularly to work the sugar cane industry. Slaves were imported from Africa and later when slavery was abolished, indentured labour obtained from India. The land tenure in the West Indies generally is receiving a lot of slaves who reached these islands had no common tribal associations, customs, or ways of life; and this aspect is apparent even today. In contrast to this, the East Indian settled, armed with his religion, and his local Indian knowledge, which had been gained from centuries of work in the fields of India. In many cases the labourer brought his wife, and his associations with India were not given up, as presumably he expected to return at the conclusion of his contract. Thus he is particularly tenacious in maintaining and following his Indian cult and practices. However it has been observed with much interest during the survey that people of East Indian origin have considerably modified their views with regard to agriculture. This is an important point on the subject of an animal, which is pronounced "untouchable" by religious teachings. It is not intended to imply that a complete change of religious views has taken place with regard to pigs, but that ideas on this subject are in the process of changing. The reason for changed ideas can possibly be attributed to three factors.

(1) The distance of the West Indies from India. This must induce a  
dulling effect on Indian affairs.

(2) Everyday contact with the "innocent of all cults" - the African type peasant.

(3) The serious attempts of the leaders of these people to bulk all 
races, castes and classes into one West Indian community, which 
will achieve an independence from British rule.

12. The two main religions in the area surveyed are the Christian 
religion and Hinduism.

13. The educational facilities in the area furnish adequate primary 
-schools-
schools for both Indian and African children. These primary schools are sponsored by the Roman Catholic, Canadian and Church of England missions. There are also Government schools. Primary school education is compulsory between the ages of six and twelve, though this regulation is not adhered to and attendance by children is irregular. The Agricultural Department of Trinidad are having difficulty in establishing "school gardens" to meet the standards, such an idea must have, to obtain results.

(e) **Land Tenure**

14. Land tenure in the West Indies generally is receiving a lot of attention. It is understood that improved peasant agriculture as suggested by the Royal Commission will depend on the functioning of a satisfactory system of land tenure. Unfortunately the land which has generally become available to the peasant holder, is that land which had failed to bring economic returns from cane or cocoa. The Streatham Lodge soil type is a good example of poor uneconomic land to cane companies and accordingly given out to peasant. Previously, various Commissions have recommended that the Island Governments should acquire land to make available to peasants on a freehold tenure scheme. The Governments sold the land on an instalment system with an original deposit to recover the money spent in acquiring the land. The holdings were 3 - 5 acres and many peasants found that these were not in a position to purchase. Instead the land was bought by non-agriculturists and the peasant farmer became an ordinary rent paying tenant with no security of tenure. This principle undoubtedly had a deleterious effect on the type of farming practised and suppressed any thought of making permanent improvements.

15. Although, there are no Government Settlement Schemes in the area surveyed, there are some interesting points arising from the settlement scheme at "La Pastora". The scheme attracted the wrong type of people in a great many cases, in the first place. The aim of the scheme is to provide 93 settlements with two 2½ acre plots and a house. The public amenities provided are a school, a demonstration plot, recreation fields, a shop and water laid on to each plot. The cost of such a scheme is high. Government purchased 1200 acres of which 300 acres of land only -are-
are suitable for settlement. The cottages which were erected for the tenants cost $1000 per cottage and renovations in the first five years have amounted to $500 per cottage. The tenant on a 2-acre plot must pay rent and water rates to the amount of $45.12 per annum. If the tenant proves to be a good agriculturist he is given a 25 year lease. Incomes of the peasants range from $250 to $5000 per annum. The latter figure was made by an East Indian peasant who had a "mixed farm" of dairy cattle and intensive vegetable production. This aspect of settlement schemes and land tenure points to another investigation which is being carried out at the Imperial College in their peasant holdings. This investigation aims to obtain information on every angle of peasant agriculture by controlling, observing, and testing economically each and every agricultural practice, on a number of different types of holdings from a small intensive market garden, to a larger and more extensive mixed arable holding. It is readily appreciated that knowledge of this kind is imperative for success in laying down settlement schemes, and for giving advice on proper land utilisation. To quote Page, Principal of the College, in an address at a meeting of the Agricultural Society of Trinidad & Tobago (Dec. 11th 1947) -

"One of the features regarded as essential was that the peasant must live on his holding. Thus his stock are handy, use of animal manure involves no transport difficulties, and the peasant and his family can watch over their holding and see it develop. --- " In Trinidad then, the questions of capital costs, the stage at which the holding becomes self-supporting, the size of the holding, the type of agriculture to be practised and its expected returns are all to be answered before the land will be satisfactorily held.

(f) **Housing**

16. The types of houses of this area are varied, but mostly they are tapia-built of poles, mud and straw. The straw is obtained from a local grass SPEROBOLUS INDICUS. The roofing is usually a thick thatch, but from a constructional point of view very few thatches have the correct pitch for the efficient discharge of water. It was often noticed that householders were busy stopping a leak or renewing the thatch, and possibly

- the simple-
the simple principle of the height of the roof must not be less than half the span, would have saved much of this work. These tapia houses are small and on an average consist of three rooms and a small verandah, either in the front or at the back. The variation from tapia-built houses include brick houses and wooden houses.

(g) Communications -

17. Communications exist in the form of numerous traces, roads and streets. The traces fall into a very poor state of repair and become useless in some cases. It is difficult to find out who is really responsible for their upkeep. The local ruling states that the Local Road Boards are responsible for second class roads, criss-cross roads. The local Warden's Department is responsible for third class roads and Crown Traces. Traces on privately owned land become the responsibility of the individual or company owning the land: these are the traces which are most neglected. There is an urgent need particularly in the Streatham Lodge area that roads and traces should be kept in better repair, and that the people concerned should shoulder their responsibilities.

(h) Food -

18. The diet of the peasants of the area is of course adapted in each household to suit tastes. Meat and fish are usually expensive and are not easily obtained as they are in short supply. Starch foods are mainly products of the holdings, such as rice, cassava, corn, yams, sweet potatoes and tannias. Also vegetables are to a certain extent obtained
from the "garden". Pigeon peas are commonly grown. The efforts of the African peasant to grow hillside rice on the slopes of the Northern Range is a step to avoid purchasing rice at black market prices at the village shops.

(i) Health -

19. Some of the aspects in which the Health Department are engaged in keeping their semi-rural areas disease and sickness free, are as follows:

(i) The enlarging or starting of villages and community centres must be planned and the plans submitted to the Health Department for their inspection.

(ii) Traces must be properly constructed with run-off drains to avoid swamps and malarial mosquito breeding spots.

(iii) The tendency of the peasants to live in communities has necessitated regulations regarding the keeping of livestock. In certain prescribed areas, where the population is dense, pigs are not allowed to be kept, although cattle and goats are allowed. The impression gained is that this regulation is enforced by common consent as the bulk of the people object to pig odours. Such an area lies between the Eastern Main Road and the Churchill-Roosevelt Highway. There is no doubt that pigs are kept in this closed area and that the health authorities are aware of them. Providing the pig sties have concrete floors with concrete drains to deal with the manure and urine in a sanitary way (which loses it to agriculture), there are no complaints made.

A small village holding near Tunapuna where donkeys and cows are kept but there are no pigs. The cow shed may be seen in the background.
General Economic Conditions

20. Trinidad has undergone the same economic changes since the war as most British possessions. The value of money has greatly altered. One old Indian peasant described the extent of the devaluation of the Trinidad dollar very aptly when he told the following story. Before the war he used to go into town with a dollar to purchase the household requirements. Having spent the dollar he found it heavy work carrying all his purchases home and required to rest at intervals. Now, when he goes into town to spend a dollar he finds that he can run home with his purchases without much trouble.

21. These conditions have very materially affected peasant agriculture. The demand for market garden produce is far greater than may be supplied. An awareness of the value of this type of food produces maximum prices paid to the vegetable gardener, providing he is situated close to a market. Mentioned previously, is the case of the gardener at La Pastora whose income totalled $5000 per year. If the necessities of life such as food are high priced, then the price of articles considered luxuries may be left to the imagination. Thus if the peasant can arrange to be as self-supporting as possible and also include a cash crop with profitable returns, he may well use the situation to his own benefit.

22. An important question arising out of this survey is - what degree of capital investment is required in the average peasant holding? It has been mentioned previously that valuable work is being carried out at the Imperial College peasant holding experiment to procure this figure, and to set a standard of production, which that capital investment will allow. It has been shown that in comparatively few years the Island's population could be doubled. Scientific treatments of disease and sickness have lowered the death rate and there is an increased birthrate. These factors put a heavier burden on the productivity of the land and the method of obtaining its fruits - Agriculture. Thus the Royal Commission pointed out the need for the intensification of the use of land. Large scale capitalistic farming methods already have an impressive record regarding output of food in the tropics. The land is capitalised to give the utmost yield, the limiting point is a small profit per ton on
the produce. The range of crops in which this type of farming is practised, is steadily becoming greater and now includes crops which were the monopoly of peasant producers. It seems possible that a situation will occur, where the urgency for agricultural products will demand, that the peasant at least equals the mechanised output acre for acre, and animal for animal. In the case of livestock, a poor milk yielding cow of a herd of four belonging to a peasant will produce a serious drop in his average output of milk. To cull a quarter of his herd is also a large undertaking. Thus in the peasant area there is a chance of a large number of poor milk yielding cows.

23. If the peasant is to intensify the use of his land it is felt that he must, apart from knowing how to farm, capitalise his farm to an optimum extent. To most peasants this is an impossibility, and the land lies largely unfruitful.

24. In America it has been recognised that money must be made available as loans to agricultural producers, of the small capital class particularly, to fully develop their resources. Thus the Production and Marketing Administration, which is a branch of the U.S. Department of Agriculture, will undertake to help in planting programmes, farm and soil improvements of individual farmers, and will assist financially in the following practices if the farmer cooperates in the farm plan put out by the P.M.A.

(1) Application of lime and phosphates.
(2) Use of green manures.
(3) Control of erosion and conservation of water.
(4) Improvement of range and pasture land.
(5) Harvesting of grass and legume seed.
(6) Control of noxious weeds, improvement of forests and clearance of land.

Under this scheme payments to farmers amounted to $253,523,000 in 1946. The Farmer's Home Administration, again within the U.S.D.A., offers the small farmer a start on the road to higher income by providing loans to those not in a position to obtain assistance through normal commercial channels. The types of loans made are -

Production loans,
Farm ownership loans,
Loans to provide water, facilities etc.
These loans were carefully made, and trained personnel assisted borrowers in developing sound plans for organizing and operating farms. Repayments of loans were well up to schedule, in fact, more than 5000 borrowers had repaid in full, many years before final payments were due.

25. Experience has taught the United States Department of Agriculture in making loans, the importance of determining carefully the economic productivity of the land, and an analysis of the earning power to determine the size of the loan that can be carried by the farmer over a period of years.

26. The following information relating to Trinidad and Tobago was gained through an interview with Mr. Hutchinson, Inspector of Agricultural Credit Societies and Acting Cooperative Officer. Information was also obtained from the Annual Report 1948 of his Department — Agricultural Credit Societies (Ch.23 No.4):

The Colony is divided into three divisions for the purpose of administration of this scheme. Each divisional officer in charge is directly responsible to the Marketing & Cooperative Officer. The number of registered societies are increasing each year, and now total one hundred and fifty-one. Also the membership within the societies is ever increasing and has reached the figure of 5469. The societies obtain credit from the Agricultural Credit Bank, which is run and financed by Government. The credit is obtained with a 3% rate of interest and must be repaid at the end of the year. The society then loan the money to its members to meet as far as possible their requirements, and the rate of interest charged is 7%. The securities on the loan are crops, stock and buildings of the borrower. The purpose of the loans is to assist in the production of crops, to purchase stock and poultry, to purchase fertilisers and seeds and to make minor repairs to buildings. The total amount of money involved in the scheme, covering societies in Trinidad and Tobago, amounted to $152,691 for last year. A few "bad debts" are found in the transactions between society and member, and also cases have been known between society and the Agricultural Credit Bank. In this case each member of the society is responsible for the society's debt.

In his report the Cooperative Officer stated that although "members of the societies cannot show bank pass books recording appreciable savings, as
every cent that has been made by members of these bodies have been ploughed back in extending their holdings, purchasing stock or repairs to their buildings, a higher standard of living was obtained.

27. Extracted from the Report also -

"There is a tendency by Societies to over-lend their members despite the advice given by the inspectors, when members' applications for loans are being considered. The introduction of a basis on which loans will be calculated by societies to members, should be put in force while societies are being educated in cooperative principles and are building their own reserves."

28. Future ideas, connected with these societies include schemes for the establishment of an Agricultural Cooperative Societies Loan Bank, whereby members would purchase shares in their own societies and then the societies in turn purchase shares in the Credit Bank. This scheme is designed to encourage the peasant to use his own money on a cooperative basis rather than depending on the Government Treasury. Another future idea, although it was explained that it was merely an idea, is to use these societies as units for mechanised farming. This is an interesting thought where the machinery is owned by Government who charge a rate for its hire. Tractor cultivation would be facilitated if groups of peasants could be found who were engaged in the same crop production. In such a scheme there may be found a chance of controlling rotations of crops of the peasants, grazing and grass requirements for stock being carefully watched and set aside. Such a scheme it was considered would raise the standard of living of the peasants by 30%.

29. Considerable amount of attention has been paid to this item of rural credit, and the facilities which exist at present. The writer thinks that just as in a business concern, the intensification of the output of the soil will require more capital put into the soil as one of the first measures.

30. Other Rural Credit organisations are -

(1) The Agricultural Cooperative Societies (Ch.23 No.3) designed for the benefit of such Associations as the Cooperative Citrus Growers' Association;
Tobago Lime Growers' Association etc.

(2) The Sugar and Cocoa Estates have their own small credit societies.

PART II - Local Agricultural Situation in

Special relation to Pig Keeping.

31. With the background of the peasants described in Part I of the report it is now intended to superimpose the agricultural system generally, and pig husbandry specifically on those conditions.

32. (a) General Agricultural Systems practised in the Area -

It is in this part of the report where the differences mentioned previously between the North (Floradale area) and the South (Streatham Lodge area) add up to produce two different systems of agriculture.

33. It is proposed to deal with the Floradale area first. The majority of peasants found here are of African origin. They live in the villages and towns which skirt the Eastern Main Road and along the valleys which run into the Northern Range. The hillside peasant has a long walk up to his garden every morning and down again in the evening. He needs must carry his working implements, planting material etc. with him.

Extensive manuring of his land with F.Y.M. from livestock kept at his dwelling is out of the question. Where the gardens are situated on the lower slopes and near the fringes of the village, then the peasant will be found living on his garden.

34. The gardens are on a yearly lease to the cultivators who pay about $10 per acre per year. If the garden becomes unfruitful, the peasant will cheerfully seek out another part of the hills, clear it and burn the clearings. A characteristic of this hill cultivation is the loud cheerfulness with which it is practised. Shouted conversations are held all along the hillside. Cultivation occurs on land with varying slopes up to about 60%. Photograph No.3 reproduces the slope of land which is being cleared for cultivation.

-A part-
3. It is the writer's opinion that the cultivation of such slopes is a wrong policy and liable to produce catastrophic erosion of the hillsides. However, food is produced from this area and it is not intended to discuss this question in detail in this report. The crops grown on the hillsides are as follows:

- Pigeon Pea (Cajanus Cajan)
- Tannias (Xanthosoma sagittifolium)
- Yams (Dioscorea alata)
- Sweet potatoes (Ipomea batatas)
- Maize (Zea mais)
- Tomatoes (Lycopersicum esculentum)
- Cassava (Manihot spp.)
- String Beans (Phaseolus vulgaris)
- Okra (Hibiscus esculentus)
- Hill rice (Oryza sativa)
- Banana (Musa spp.)
- Spinach (Amaranthus spp.)

Tomatoes and beans are undoubtedly the cash crops of this system of cultivation. It was found that a man had acquired enough revenue from his tomatoes to build himself a fairly elaborate house.

Tannias are the main crop of the area. This plant does well and can be grown as an annual or perennial. As a perennial the tannia becomes a type of famine relief crop: that is, the peasant, who does not need to harvest the tannia for the time being, will neglect to cultivate around the plant. This has the effect of making the plant "mark time". When the tannia is required for food, the necessary cultivation will be accomplished and the tannia finished off before harvesting. The green tops of tannias are readily eaten by pigs as of course any other waste products of the plant.

Yams and sweet potatoes, particularly the latter are useful in producing green food for pigs. The unused waste parts of the tubers can also be profitably fed to pigs. The yields obtained from a maize crop...
do not make this a very profitable one, when the product is sold as dry shelled maize. However there would appear to be two other methods of sale which may prove to be more lucrative.

(1) By selling the maize when it is green, though obviously there will be a limited demand for this.

(2) By feeding the dry grain to livestock and in particular to pigs and selling the maize "on the hoof". With a good ration, which might include between 60% and 85%; the peasant turn out of porker pigs (120 lbs.) could be three times quicker than it is at the moment.

Cassava, spinach and bananas are all used in the diet of the peasant. The surplus will be taken to market and sold. Bananas skins are used exclusively by pig keepers for feeding to their swine.

Hill rice is being tried in a smallish way; it is completely dependent on the weather conditions of the season for success. Depending on the rain, planting would take place in June and harvesting in September and October. This crop is grown for home consumption and to avoid as much as possible, purchasing in the market.

36. Generally speaking, the pig belonging to this peasant is tethered up all day, it is fed in the morning on water containing scraps of potatoes, yams, tannias, breadfruit, skins of bananas, mangoes etc. He is given the same meal in the evening with the difference that water is poured off from the cooking of household meals and added to the pig ration, together with some green grass.
37. In the southern area, it is not intended to comment in detail on the cropping systems of the peasants. It has already been fully described by Bridgland in his "Survey of St. Augustine - Streatham Lodge area of Trinidad". To enumerate the systems as they are described, they are as follows -

"A - The sugar cane mixture: involving a crop of plant cane, followed usually by three ratoons, but also food crops between harvesting and replanting 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.

5. Illustrating cane mixture. In the foreground the land is devoted to subsidiary crops. The Northern Range hillside may be seen in the background.

"B - The rice rotation: Padi is the main or wet season crop but the padi fields carry okras, tomatoes, cucumbers, cowpeas, woody pyrol and eggplant during the dry season.

6. Illustrating hill padi, with crops of cane in the background, and vegetable crops in the foreground.

"C - Provisions Gardening: Neither cane nor rice is produced, the land being planted partly in yams, tannias, eddoes, cassava, pumpkin, cabbages, lettuce, peppers, pigeon peas, cucumbers, french beans, corn, okras etc., during the wet season in various mixtures. During the dry season the crops are almost the same as those as padi fields."
"D- Household gardening: Odd vegetables, spices, flavourings and fruits are grown around the house in "a more or less haphazard fashion, e.g. Amaranthus tumERIC, ginger, wabi bean."

38. There are a few points which spring to mind on witnessing the above systems of cropping -

(1) The greater variety of systems of cultivation in the south of the area, including the tendency of the land to hold a few dry weather crops.

(2) Although the majority of peasants of all the above systems own livestock of some description; grass crops are conspicuous by their absence. The livestock are maintained by roadside grazing and carted grass and cane tops during the dry weather. There are however exceptions where the land was allowed to remain under grass for the purpose of feeding livestock.

39. Included in the livestock kept by these peasants, are pigs. The pigs are usually kept near the house and fed in rather the same way as those belonging to the Floradale peasants, already described. The type of waste scraps and peels is determined by the cropping system, which the owner practices. The southern peasant lives on his land usually so that manure from livestock may be replaced on the land.

40. (b) The Necessity of a Pig Industry -

At this point it should be considered whether pigs are a valuable and necessary product to the Trinidad market. The answer here is that meat of all kinds particularly pork are in short supply. Purchases of pork may be required to pay black market prices to obtain a meat which has not been graded even. The system of grading being considered ludicrous when the commodity is in such short supply. The next consideration will be - is there room for improvement in the pig industry? The answer here is a visit to the Port-of-Spain slaughter house where about 1040 pigs are slaughtered per-
per month. In respect of the pigs which are supplied for slaughter, only, this must be one of the worst slaughter houses which exist. Pigs of all sizes, shapes and ages are eagerly received. The range goes from piglings not yet weaned to old boars.

41. It has been pointed out that a mixed farming system is necessary for peasant agriculture. This system implies that the peasant will put down part of his land to grass each year to maintain his livestock. The effect of temporary grass leys would be to rest the land and improve the crumb structure; with artificial manure and F.Y.M. generally maintain the fertility of the soil and improve crop yields. The ley itself would be productive by either folding livestock over it or by using the grass for soiling of livestock. Pigs are even more adaptable to grass soiling than cattle. To obtain the full value of these leys the livestock kept, must be as good in conformation etc. as is possible to obtain. The management of such stock cannot become a haphazard affair particularly with regard to feeding and nutrition. The Agricultural Department of Trinidad are aware of this necessity of better livestock, and it is here where the pig may become important. It is possible to produce a pig of bacon weight (200 lbs.) in seven months, in fact this is quite normal with proper feeding. This fact should make a "crop" of pigs comparable in the peasant mind to pidgeon peas as far as the early return for his money is concerned. If after an investigation into the economy it was found that such a pig was profitable in itself, the peasant has furthered the value to his fields by the use of grass and manures which contain the residues of his concentrate feeding, and which will reward him in his follow on crops.

42. It seems imperative to explore methods of greater production of food in Trinidad, where most foods are imported and where future demand will be greater than it is at the moment. This future demand will be regulated by the growth of population and the decreasing productivity of the soil. It is certain that the present system of cultivation by peasants is reducing the soil capital value each year.

43. To achieve the increased productivity of land and livestock, a great deal of investigational work and organisation must be made. Then the more difficult work of extension of these results to the peasant, and
A livestock show at Tunapuna held by the Agricultural Department. (Left) The cattle section. (Right) Pig section.

44. (c) Restrictions Regarding Pigs -

In certain prescribed areas or built up areas, the Health Department have forbidden the farming of pigs. An example of such an area is roughly described as all the land between the Eastern Main Road, and the Churchill-Roosevelt Highway. Other forms of livestock may be kept within this area but not pigs. In practice this rule is difficult to apply and although the area mentioned is largely built up, there are numerous peasants who own and keep pigs in it. The chief objections are raised by neighbours of pig keepers who dislike the small emitted from the sties; thus if manure and urine are suitably dealt with, by draining away over cement drains into seepage pits, the general consensus of opinion holds that there is little ground for complaint. This opinion will hold fairly firm until the pig keeper is ambitious enough to own more than one or two pigs, or until the good neighbourly relationship breaks down, when presumably the pig keeper is reported. He then disposes of his pigs as requested by the health authorities.

45. Many peasants of these areas prefer to live in village centres rather than on their land. In some cases their land occurs in the village centre, being only very small plots. It has already been pointed out that the Northern Range hillsides do not lend themselves to farm
dwellings and in any case the people who cultivate these slopes practise a shifting cultivation system. All these conditions are a severe handicap to the successful keeping of pigs. Happily there are peasants who are free to farm as they wish; farm and household are single units and far enough removed from the restrictions imposed. This type of peasant is able to attend to his livestock at any time of day and he can obtain a greater knowledge of them through observation of their habits. There are no restrictions regarding the disposal of pigs. To quote one peasant "That is the easiest part of pig keeping."

(d) Pig population of the Area -

46. It was found to be extremely difficult to assess the number of pigs in existence in the area. Some people were evasive even, in answering the question of whether they had experience in handling pigs. Application was made to the Agricultural Department who had apparently experienced the same difficulty with their census of agricultural practices. Figures given in "the census of Trinidad and Tobago" in 1946 are very wide of the mark in this area in 1949. Generally speaking the number of pigs per peasant is greater in the Floradale area.

47. The ownership of a pig may change hands several times, which also makes the computing of figures difficult. The breeders of pigs sell weaners as early as possible, which is usually at the age of six weeks. Then again a case was found where a peasant bought four pigs from his friend who was hard up, for $32 as a speculation. After looking around he sold each pig separately for $12 without much further cost to himself.

(e) Religion and Pigs -

48. The African type peasants as described in the Floradale area have no religious prohibitions regarding the keeping of pigs. The Hinduism of the East Indian community does have a bearing on this subject, as strictly speaking pigs are unclean from their point of view, for the higher castes. However there is a strong tendency of the East Indian population of this area to take a more practical view of the wisdom of this ruling. A number of Indian families were visited in the Steatham Lodge area and were questioned in the following way.
(1) Did the family keep pigs?
(2) If not, why not?

From twelve replies received, four answered "yes" to the first question. Replies from the other eight to the second question were mixed and are as follows:

(a) Replied that his religion forbade such a thing.

(b) Replied that he would like to, but that the Health Authorities had already warned him not to keep them.

(c) Replied in the same way as (a). (These were the only two to make this reply).

(d) Replied that he had kept them before but they had not been very profitable.

(e) Replied that he did not like them for their smell.

(f) Replied that he would like to but that his father would not permit him to do so. (Religious views of the older generation presumably).

(g) Replied that he did not like the idea of it though he was not prejudiced by religion, in fact his sister had kept pigs for a long time.

(h) Replied that the landlord had forbidden him to keep pigs.

These replied are interesting and have been produced here to indicate a few of the numerous small domestic reasons existing, which would limit pig production by the peasants. The first Indian peasant who admitted that he kept pigs, after further questioning on the delicate matter of religion, exclaimed to the effect; that a man could not ignore the means of his livelihood for the sake of his religion. This was a thoroughly practical man.

49. There is no doubt however that amongst these people, pig keeping is identified with low castes or class. It may be that the revenue from pigs are not as substantial as other forms of agriculture and this is not difficult to understand. The gilt will not be ready to breed until she is about 18 months to 2 years old, because of the poor diet on which she has grown. The lack of grown boars, and the consequent lack of suitable putting in farrow of the gilts is another reason for the not having up of profits. There are many more reasons.
50. In the extension of a pig policy in Trinidad it would be important to dispel this inferiority complex connected with pigs. It would be necessary to show that a profitable return could be made to place the pig even amongst the elite of the land.

51. Another aspect of the Hindu religion, which influences successful pig keeping is the belief that no living/should be killed. Thus it occurs, that a sow farrows down with more piglings than she can feed. Early recognition of this fact and subsequent culling of runts would greatly benefit the rest of the litter; but the situation is allowed to develop until all the litter are runt-like and a heavy natural culling takes place, leaving the survivors even to grow up a "non do-ers".

52. Apart from Hinduism, there are East Indians who are Moslems. In 1946 about 6% of the Island’s population followed the Moslem religion. Although no figures can be produced to support the idea, it is felt that these Moslems would have more strict regard for that part of their religion which forbids them to touch pigs.

(f) The Types of Pigs -

53. An agricultural show was held locally by the Department of Agriculture to emphasise the importance of livestock in farming. In the pig section for exhibition stood a terrible creature. It was a sow, but description of its shape and state of health would be difficult and unprofitable. Naturally the question was raised - how did such an animal get into the show, and for what purpose? The information came that the owner himself had never seen such an irregular shaped pig before, and counting on the fact that there could not be many more like it, he expected to walk off with the prize for that class. The incident is related to show the level of knowledge which exists and the point from which teaching must begin.

54. The main types of pig kept by peasants are Berkshire and Large Blacks, and mixtures of these types. These types have been tried by the Department on the Government Stock Farm and have proved to be useful pigs. The industry in Trinidad is concentrated on pork production. The Berkshire is more of a pork pig than is the Large Black, though the latter is often used for pork, where high grading standards rule out
the discoloured meat of the belly of the bacon size pig. Other types of pigs which will produce good pork and are worth a trial are discussed in Part III of this report.

10. A Berkshire boar at the Stock Farm.

11. Another Berkshire boar at the Stock Farm.

55. Although it has been mentioned that peasants maintaining Berkshires and Large Blacks, their pigs are in most cases far from being of a pure strain; but rather a mixture in which Large White is sometimes seen. Illustrations Nos. 12 and 13, although not good photographs, show this mixture.

12. Illustrations showing the mixed blood of peasants' pigs. Showing also the construction of sties.
56. It was not noticed that Large Whites suffered in any way from the heat. In fact the best peasant owned boar seen during the year was mostly Large White. (Illustration No.14.)

57. On account of the few board which are kept by these people, the programme of breeding follows a rather haphazard course. Gilts are put in farrow by the nearest and cheapest boar which is available, regardless of type, constitution or anything else of the animal, who is to sire the subsequent litters. This state of affairs also interferes with the regular breeding of the sows: opportunities are easily missed and the sow becomes an uneconomic proposition.

58. The Government Stock Farm and other Department centres have livestock breeding units to assist the farmers in improving their farm animals, but it is obvious that this is not being taken advantage of to any great extent. The one or two bulls, and the one boar, allocated to serve the district would be grossly overworked, and unless great care was taken in the case of the bull it would be the best possible way of spreading breeding diseases to the cattle of the district.

59. Peasants starting up in the pig production line do not waste time selecting good gilts for their future breeding stock. The age of purchasing pig stock is at six weeks old. These are, of course, no records of dam and sire and so the future breeding sow is that, in name only.

(g) Farrow Rates and mortality of Pigs -

60. In the absence of figures relating to farrow rates and mortality of pigs of the area a general impression only can be given. It was found that the sows farrowed the normal number of piglings. The variation in
this respect of all pigs is large, but the usual litter consists of between five and ten piglings. In most cases, a severe natural culling takes place when the undernourished sow fails to produce enough milk. The sow with a litter should be treated on the same principles as a cow in milk; that is, she must be fed in a manner to increase and maintain her milk production. Without this treatment naturally the effect is very evident in the litter and the health of the sow. Very few peasants were found to give extra feed to the suckling sow. Mr. Edghill of Freeman Road however, was one pig keeper who did.

15.
A healthy litter of eight (Large Blacks) at the Government Stock Farm. The sow also is in good condition.

61. Farrowing rails in the pigsties, were not seen, and it is obvious that the squashing of piglings has been quite a big factor. All sorts of ideas to overcome this squashing were met with, except of course the farrowing rail. In quite a number of cases the sow and litter are kept apart, the young pigs only being brought to the sow at recognised feeding times, and then carefully watched, until the process is completed.

62. The pigs which survive to become weaners, seem to become incredibly resistant to malnutrition and lack of care, and continue to live their normal life span. There are few pigs only, kept beyond the porker stage except those gilts which are to be used for breeding purposes.

(h) Pig Sties

63. Photographic illustrations will best give the idea of the system of housing pigs. The photographs are taken from both areas of the survey.
Illustrations 16, 17, 18 showing typical pig sties used in the St. Augustine area of Trinidad.

19. The pig sties at the Government Stock Farm at St. Joseph, Trinidad.

64. In commenting upon them, it will be remembered that a sty should be dry, warm and free from draughts, easy to clean, and if possible secure against pests in whatever form they take, e.g., in Trinidad bats are a nuisance. With the climatic conditions which exist in Trinidad, there is probably little need for precaution against coldness and draughts.

65. Good thatching on a roof will make an ideal cover for the pig sty, but should be continued low enough over the side walls to allow ventilation but to prevent rain from beating in. The sties are all small with enough room usually for one pig only; very few feeding troughs are used.
used, the food is fed from buckets, from the floor of the sty, or from the ground in the area where the pig is tethered for grazing purposes. In most cases the sties have concrete floors to facilitate cleaning.

66. The sled type of sty is demonstrated at the El Reposo, the Agricultural Department district station at Sangre Grande. These sties seemed to be very useful for the purpose; their size was approximately 9 ft. by 6 ft. fitted inside with trough and farrowing rails. The pig was tethered to the house which may be moved from place to place by virtue of the sleds; these also keep the sty off the ground and dampness, which otherwise might do harm.

67. Other alternatives of pig sties are discussed in Part III of this report.

20. The front of the sled type sty seen at El Reposo.

21. The back view of the same sty showing the shutter used for shade.

(i) The feeding of Pigs

68. The method of feeding is the most important single item in the management of pigs. Unfortunately it is the limiting factor in Trinidad. It accounts for the fact that more pigs are not raised and the pigs which do exist, are generally in poor condition.

69. It is at this point where, under ideal conditions the peasant should knit in part of his other farming practices to maintain, or part maintain his livestock. The degree of maintenance must be such that he will derive full benefit from his livestock. In the case of pigs, in the St. Augustine Area, the peasant does wholly maintain his animals from his own farm produce and household waste, except perhaps for a bit

-of-
of grass: but he is not availing himself of the steady quick growth, which is characteristic of the pig.

70. Examples of feeding methods of pigs by peasants have been recorded and are as follows -

Pigkeeper A (Floradale Area):

Type of pigs: Large Blacks. Two gilts which were 4 months old and were approximately 40 - 50 lbs liveweight.

Feeding: The gilts were fed 3 times a day. Rations consisted of banana skins, tannia peelings, breadfruit, yam peelings and miscellaneous waste from the house. All this was hoiled up in water with salt. Water was provided at all times and fresh cut grass once a day. Apparently rice bran was purchased and fed to the pigs from time to time.

The gilts were kept for breeding purposes.

Pigkeeper B (Floradale Area):

Type of pig: Large Black - one gilt which was 6 months old and was approximately 60 lbs liveweight.

Feeding: As in the case of pigkeeper A, though quantities of food fed, depended entirely on the amount available from the house, and this varied from day to day in both cases. This peasant kept a garden on the high hills side and was accustomed to taking his gilt up the hill on a lead for a day's grazing. The gilt had adopted a surprising dog-like attitude to life and could be trusted off the lead, whilst the keeper enjoyed the time of day with a fellow pedestrian. When the time arrived to move off again the gilt was called up and followed patiently behind her master. There is a saying that "Cats look down on you, dogs look up to you, but pigs are equal" (Illustration 23). The writer would like to add after his experiences in the West Indies, "and very adaptable".
Type of pig: One Large Black sow which has already had several litters.

History: The care and feeding of this sow was affected by the history attached to the animal which is as follows:

Pigkeeper C is an African woman who purchased the sow in partnership with another woman. The two women paid five dollars each for the pig as a weaner at 6 weeks old. Keeper C had since maintained the pig, constructing a rough sty, attending to the feeding and management of the pig herself. When the sow started to breed, she felt entitled to take the full profit derived from the sale of weaners. This arrangement brought keeper C into conflict with her partner, so she decided to sell the pig and refund the partner five dollars. Here again a deadlock was reached as the partner demanded a half share of the sale. The result is that the sow is neither being put to the boar nor is it...
up for sale and the management of the pig is sadly neglected.

Feeding: The pig is fed on very poor rations which are
collected scraps from the household. Feelings of fruits and
vegetables etc. Keeper C said that she was fond of meat in the
house and that there were always scraps of this for the pig.
Numerous examples of feeding systems of pigs were obtained, but these
three types have been chosen for this report to show the diversity of
conditions existing around pigs; though they are all fed in more or less
the same way. The words "Household scraps" are substituted for "balanced
ration".

71. The writer had the good fortune to meet a Mr. Edghill, whose
methods of pig keeping are described in a later section of this report.
Mr. Edghill's methods of feeding and management of pigs are far more
advanced than those of the other pig keepers.

72. Details of pig rations as fed at the Government Stock Farm
were obtained and are as follows:

(1) A general ration fed to all pigs:

- 45% Coconut meal,
- 25% Rice bran,
- 10% Bran,
- 5% Linseed oil cake,
- 7% Crushed corn,
- 5% Fish meal,
- 2% Salt and 1% bone meal.

An approximate value of the digestible protein content of this ration
is 15.21%. The quantity fed to the pigs is based on age, that is, a \( \frac{1}{2} \) lb.
of the mixture is given for every fortnight of age of the pig; though the
total amount fed never exceeds 6 lbs. per day.

(2) A ration for pigs from the weaning stage to 110 lbs. liveweight:

- 20% Crushed corn,
- 50% Adlay,
- 25% Coconut meal,
- 7% Soya Beans,
- 5% Fish meal,
- 3% bone meal and salt.

-This-
This mixture contains approximately a 12.87% digestible protein value.

(3) A ration for pigs from 110 lbs. liveweight to 200 lbs. liveweight:
- 50% Adlay,
- 15% Rice bran,
- 10% Linseed oil cake,
- 5% Coconut meal,
- Minerals, salt etc.

This mixture contains approximately 9.67% digestible protein.

It should be stressed that the figures given for the percentage amounts of digestible proteins are only an approximation. The writer was unable to find generally accepted figures of protein values of the local meals and feeds, and has based calculations on isolated figures obtained from the Nutrition Department of the Imperial College of Tropical Agriculture. However if these figures are any indication it would seem that mixtures Nos. 2 and 3 are low in digestible protein content as compared with the normal accepted feeding standards for fattening pigs. This is probably due to the lack of protein rich foods in Trinidad. On the other hand presuming that the general ration is fed to breeding stock of over 200 lbs liveweight, a ration containing 10.7% digestible protein would have been sufficient.

74. The following table of suggested protein requirements has been drawn up from figures given by Crowther.

Suggested feeding standards for fattening pigs -

<table>
<thead>
<tr>
<th>Liveweight of Pigs</th>
<th>Weight of meal consumed daily</th>
<th>Amount of total protein required daily</th>
<th>Protein content of meal to meet requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 lbs</td>
<td>1.6 lbs</td>
<td>0.320 lbs</td>
<td>20.0%</td>
</tr>
<tr>
<td>40</td>
<td>2.1</td>
<td>0.375</td>
<td>17.8%</td>
</tr>
<tr>
<td>80</td>
<td>4.0</td>
<td>0.545</td>
<td>13.6%</td>
</tr>
<tr>
<td>100</td>
<td>4.6</td>
<td>0.615</td>
<td>13.4%</td>
</tr>
<tr>
<td>120</td>
<td>5.3</td>
<td>0.660</td>
<td>12.5%</td>
</tr>
<tr>
<td>140</td>
<td>5.9</td>
<td>0.690</td>
<td>11.7%</td>
</tr>
<tr>
<td>160</td>
<td>6.45</td>
<td>0.720</td>
<td>11.2%</td>
</tr>
<tr>
<td>180</td>
<td>6.7</td>
<td>0.740</td>
<td>11.0%</td>
</tr>
<tr>
<td>200</td>
<td>7.0</td>
<td>0.750</td>
<td>10.7%</td>
</tr>
</tbody>
</table>
75. It seems important that an accepted value of starch equivalent, digestible proteins and minerals of locally produced feeds, should be found and standardised, before any real progress can be made with balancing rations for livestock.

76. A system of grading pork and bacon pigs supplied to the market would accomplish much to induce the pig producer to examine his ration thoroughly, and see that he was getting the best value for his market pig, with the food at his disposal. If at a future date it became possible for the Colony to indulge in exportation of pork, a very real advantage would lie in the capability of supplying a standardised grade product. It is difficult to see how this can be accomplished when the scarcity of meat puts the premium value on any grade pork.

(j) Feed Supplies -

77. Information gained from the St. Joseph Food Market Depot revealed that the following feeds were handled at the price mentioned. These prices varied slightly from time to time.

- Wheat bran per 100 lbs $5.88
- Fish meal " " " 7.50
- Oats " " " 8.17
- Oilmeal (Linseed) per 100 lbs 7.50
- Pollards per 100 lbs 5.94
- Coconut meal " " 1.50
- Soya bean meal " " 9.75
- Cotton seed cake per 100 lbs 6.76
- Maize, crushed " " " 5.00
- Salt per 60 lbs 1.26

* indicates in easy free supply.

Bran, oats and pollards are imported from Canada and are fairly easy to obtain.

Maize - The supply is obtained chiefly from local production.

Rice Bran - Requirements are easily met from local production and importation from British Guiana. Unless the rice has been shelled first and the residue removed before hulling this is not a suitable food for pigs.
Soya Bean Meal - This is imported from Canada, but not in sufficient quantities. Good yields of soya beans may be obtained by growing the crop locally, as shown on the I.C.T.A. Farm. The proper processing and extraction plant is lacking in Trinidad. The Cooperative Coconut Growers' Association have agreed to extract the oil of soya beans providing the quantity for processing was over ten tons.

Coconut Meal - This is produced locally, though a little short of requirements. Production is spasmodic.

Cotton Seed Cake - This is imported from the Argentine. The supply is spasmodic; it is not a satisfactory food for pigs.

Fish Meal - This is usually imported from the Argentine. The supply is very spasmodic and other sources of supply are being looked for. This item is of great importance to pig producers if meat meal etc. are not obtainable. The possibility exists for the introduction of a processing plant, which would be set up at St. Joseph's Depot. The quantity obtained at the moment is about half of the total requirements.

The organisation for the importation of livestock feeds, and a price control, are regulated by Government in Trinidad.

78. A balanced ration produced by the St. Joseph Depot for cows and goats is sold by the Depot. This ration is changed from time to time according to the supply of its ingredients. It is as follows:

- Crushed maize: 15%
- Oats: 10%
- Pollards: 6%
- Wheat Bran: 6%
- Ground rice: 8%
- Rice Bran: 8%
- Cotton seed meal: 12%
- Coconut meal: 10%
- Linseed oil meal: 20%
- Salt and lime: 2%

In the above ration the starch equivalent value is approximately 67.2%.
and the digestible protein value is approximately 16.22%.

79. From the figures of costs of concentrated given above, it will be seen that the price of a balanced ration would vary somewhere between 1.5 cents and 9.7 cents per pound. If fed properly the pig can normally put on one pound of liveweight for every three pounds of food it is given, as an average throughout its career. If the ration fed costs 6 cents per pound, then under the circumstances mentioned above, the cost of production is about 18 cents per pound of liveweight pig. The local producer is paid in the region of 40 cents per pound for his pig at present day prices; the guaranteed minimum rate is 24 cents per pound. The pig producer also starts off with a weaner of 20 - 30 lbs. weight before he has started to feed it.

(k) Diseases and Feeds of Pigs

80. Internal Parasites: It is estimated that nearly 100% of the pigs in the area suffer in some degree from internal parasites. Samples of pig faeces were collected from four different piggeries and examined at the Nutrition Laboratory - I.C.T.A. All samples submitted showed infestation with eggs of the undermentioned parasites. Infestation was slight in samples 1, 2 and 3, but sample 4 was heavily infested with eggs of stomach worm. Eggs of the following parasites were found.

(1) Roundworm (Ascaris spp.) Rare in all samples.
(2) Nodul worm (Oesophagostomum spp.) Rare in samples 1 and 2.
(3) Oocysts of Eimeria, coccidia of swine - fairly abundant in all samples.
(4) Stomach worms (Ascarops and/or Hyostrongylus) fairly abundant in samples 1, 2 and 3; heavy infestation in sample 4.

81. Swine fever: During the last war swine fever occurred in Trinidad, but this has successfully been remedied by the active measures adopted by the Agricultural Department. The animals were slaughtered and compensation made wherever the disease was found. There has been no case reported since 1946.

82. Malnutrition: If malnutrition can be considered a disease of most wasting, it is the important one of this report.

(1) Mr. Edgill's Methods of Pig Management -
83. Mr. Edghill is of African origin, he lives in Freeman Road, which is the southern area of the survey. The condition of his pigs and the methods of his husbandry are startling when compared with others of the area. It was noticed about him that he was open to receiving ideas and views which might improve his stock, and similarly he was always ready to cooperate in allowing the writer to collect information and samples. On some occasions this amounted to tedious measurements of food, which were normally quickly judged by eye.

84. Although Mr. Edghill had other business interests, which took him away from his pigs, most of the day, he always personally supervised the early morning feeding. If he was unable to attend to the afternoon meal, by virtue of routine, it was ready and mixed from the morning preparation, and was simply given to the pigs by his servant. Cleaning up of sties every day, and the cutting and feeding of grass was also efficiently done by the servant. Mr. Edghill had had eight years experience with pigs and was of the opinion that it was well worthwhile and had paid dividends. He would recommend pig keeping to other people but added, that pigs require a lot of attention, which can only efficiently be given, if the farmer has a lively interest in them.

85. The pig sties are roughly built though they are adequate (Illustration 24). The pens are on the small side, but the whole building is generally kept clean.

86. The stock consists of four breeding sows and each has been seen with a litter. The litters have been fairly even and well: the average has been seven piglings. The boar is a Large White - Berkshire cross bred, with Large White colouring and characteristics predominant. 

-(Illustration)-
I llustration 14). He is of good length and shape without being too heavy in front. In the small pens the weaners are split up into groups of two and all pigs are kept in the sties.

**FEEDING**

87. A very real attempt is made to feed concentrates, but the rations are not as suitable as they might be through lack of knowledge on the subject. The food is mixed in four gallon tins as follows.

1-3/4 tins of household scrap food. (Collected from neighbours etc.)

2 tins full of old fish from market, together with rice husks. The amount of fish depends on how much is available at the market.

1 tin full of cut up breadfruit and ground provisions.

Water is added to each tin, which is then boiled up in preparation for the next day's feeding. At the early morning feeding these tins of food are all mixed together and to the mixture are added:

- 2 lbs. coconut meal
- 4 " linseed oil cake
- A ½-lb. of charcoal and some salt are fed twice a week. Grass is fed every afternoon and water is provided ad lib. The normal routine of feeding includes the addition of water to the mixture of food described above from the tins, together with the coconut meal and oil cake, in a barrel. From this each sty is fed so many pailfuls of swill according to the number and size of the inhabitants.

25. Pig food preparation, a tin of ground provisions and breadfruit being boiled up for the morning feed. Notice the well organised shelter with food in drums ready for mixing.

88. The method of feeding does not include weighing the food, but an effort was made to obtain these weights. The weights will apply only to the morning on which they were taken. They are as follows -

-(a)-
(a) For a suckling sow with her litter:
8 2/3 lbs. of air dry food in the morning,
4 " " " " " " " evening.

(b) For the boar of 250 lbs. liveweight approximately:
4 3/4 lbs. of air dry food in the morning,
2 " " " " " " " evening.

(c) For a small pig of about 80 lbs. destined to be sold as a porker:
3 1/2 lbs. of air dry food in the morning,
1 3/4 " " " " " " " evening.

The quantities given above show that Mr. Edghill had a fairly accurate knowledge of the amount of food that the different stages of pigs required.

89. A sample of the dry food was analysed at the College Nutrition Laboratories. The details of the analysis may be found in Appendix II and the results are shown in Table I.

Analysis

Table I - Percentage of Dry Matter of Food

<table>
<thead>
<tr>
<th>Ration (Mr. Edghill)</th>
<th>Ash</th>
<th>Crude Protein</th>
<th>Crude Fibre</th>
<th>Nitrogen Free Extract</th>
<th>Ether Extract</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.3</td>
<td>23.5</td>
<td>14.3</td>
<td>43.3</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Contained in Percentage ash figure is True ash - 7.96%
Silica - 5.35%

90. From the results it is noticed that the ash percentage is high and contained a large amount of silica, which is not favourable to the digestive organs of any animal, particularly the pig. Presumably, this is contained in the rice husks part of the ration. The crude protein value is pleasantly high. From the pig feed point of view the less crude fibre obtained the better the ration. In normal rations this is kept to about 5%, so that the value here is excessively high.

91. To obtain figures of the digestibility of this ration, a feeding trial was conducted with rats. Pigs were not available. The method of the trial is described in Appendix III. It was designed merely to give an indication of the digestibility of the food. The results are set out in Table II.
## TABLE II.
Showing total of food fractions fed, total faeces fractions, 
Percentage digestibility and nutrient value.

<table>
<thead>
<tr>
<th>Feed fraction</th>
<th>FEED</th>
<th>FAECE</th>
<th>Percentage Digestible Nutrients in 100 grms. D.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air dry</td>
<td>-</td>
<td>303.7</td>
<td>-</td>
</tr>
<tr>
<td>Dry Matter</td>
<td>89.7</td>
<td>272.5</td>
<td>121.2</td>
</tr>
<tr>
<td>Protein</td>
<td>23.5</td>
<td>64.0</td>
<td>19.6</td>
</tr>
<tr>
<td>Ether Extract</td>
<td>5.6</td>
<td>15.3</td>
<td>3.4</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>57.6</td>
<td>157.0</td>
<td>56.8</td>
</tr>
<tr>
<td>(N.F.E. + Crude Fibre)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T.D.N. an air dry basis = 50. T.D.N. an oven dry basis = 56.

Digestible protein value = 14.8%
Starch equivalent value = 55%. (This figure is an approximation.)

All figures are based on "Dry matter Basis".
Individual weights of food intake and faeces output of the rats is shown in Appendix II.

92. From these results the low value of total digestible nutrients indicates a low energy content of the ration. This is due to the low carbohydrate digestibility which in turn is accounted for by the high crude fibre value (14.3%). The protein digestibility percentage (63%) is well below the expected average, which may partly be due to the masking effects caused by endogenous metabolic nitrogen in the faeces; this being brought about by the irritating action of the crude fibre and the high proportion of silica in the intestines of the rats. The feed therefore is not an ideal ration and is uneconomic in its function. Maize substituted for rice husks would be worthy of a trial, and in all probability bring up the digestibility of the ration as a whole, and increase the energy content.

**GENERAL**

93. Mr. Edghill had experienced trouble with his sows, when they were feeding their litters. It was noticed that the piglings did a great deal of damage to the teats of the sow, with their small sharp teeth.
This damage developed into sores, which are capable of picking up mastitis. However this damage was remedied for the price of a pair of fingernail clippers. The tops of the two eye-teeth of the lower jaw and one of the upper jaw on each side of the pigling's mouth were clipped off.

94. Income was derived from the pigs in the following manner.

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacon size pig (live weight about 150 - 200 lbs)</td>
<td>$75.00</td>
</tr>
<tr>
<td>Pork &quot; ( 100 lbs. )</td>
<td>36.00</td>
</tr>
<tr>
<td>Weaners at six weeks old</td>
<td>10.00</td>
</tr>
<tr>
<td>Stud fee using Mr. Edghill's Large White boar</td>
<td>2.00</td>
</tr>
</tbody>
</table>

It has been mentioned that the useful types of pigs, viz., the Large White and the Berkshire, have already found their way to Trinidad. The two chief types are the Larg White and the Berkshire. However, this cannot be fully investigated at present, as it may be found necessary to alter the type of pigs to suit the conditions most comfortably with the other breeds of pigs already present. The type of pigs may very well influence the breed of pigs which we keep. Large White will do better than most other pigs in the breeding of permanently housed pigs suitable for piggeries. However, both Berkshire and Berkshire pigs are essentially "tramps." Foreign stock is not essential, but it would be wise to raise only their own breeds of pigs. They should be reared in a way that is more suitable for them than the Larg White. The difficulties in managing large-breeding farms in Trinidad would point to raising small flocks. The breeds in a large flock tend to maintain a good growth, while the smallest get overcrowded and become sickly. We can use the same methods here, as the climate is most suitable for them.
PART III.

Suggestions for investigations preliminary to a policy for pig keeping developments.

95. It is proposed to deal briefly with three aspects of pig keeping only, for preliminary investigations. There are numerous other points which require local trials before an extension of the policy may be embarked upon. There are also numerous points raised in the preceding pages where the local pig keeper's knowledge has been far removed from the accepted standards. Just how important these points are, can only be found out by trials with pigs.

The three aspects included here are -

(a) The types of pigs most suitable;
(b) The types of sties most suitable;
(c) The feeding of pigs.

(a) TYPES OF PIGS

96. It has been mentioned that two useful types of pigs, viz., the Large Black and the Berkshire, have already found their way to Trinidad and the West Indies generally. However this aspect for investigation is included, as it may be found necessary to alter the type of pig to fit in more comfortably with findings from the other investigational work. The type of pig sty may easily influence the breed of pig which is to be kept. Large Whites will do better than most pigs in the tropics if permanently housed in a suitable piggery. Wessex saddlebacks and Essex pigs are essentially "forage for themselves" animals and should be folded out over grass and stubbles. They could be contained in a very much less elaborate sty than the Large White. The difficulties in obtaining concentrate foods in Trinidad would point to trials with foraging pigs. The Wessex is a type which seems to maintain a quick growth with little concentrate feeding. They are good "porker" pigs also extremely good mothers and they are mostly black in colour which is favoured in the West Indies. These points would place the Wessex Saddle back pigs first for trials.

97. Trials of colour effects in the tropics, using the Large Whites should be made, to definitely establish the truth that white pigs are...
prone to sunstroke in Trinidad. In Kenya Colony 90% of the pigs are Large Whites, which do well, although kept on the Equator in a rarified atmosphere, probably more conducive to sunstroke. The cross between the Large White boar and the Wessex gilt is an extremely good bacon pig.

98. Finally it is suggested that all the investigations should aim at strengthening the economic position of the pig industry. It may be found that the local pig is the best proposition after all, having become completely adapted to the environment through breeding and natural selection, e.g., the swimming pigs of British Guiana. On the other hand new blood may make a large difference both in shape and economy.

(b) PIG STIES

99. In most instances the pig sties described are primitive and badly situated. It is not advocated that elaborate sties should be built, but rather simple constructions to include the following features.

(1) A dry sleeping place that is well ventilated but free from draughts.

(2) Protection from the direct rays of the sun.

(3) A hard floor that is impervious to liquids, sloping in such a way as to facilitate cleaning.

(4) A design and situation where another pen can easily be added on to the end if the necessity arises.

100. The sty illustrated in Plan 1 was designed with the advice of the Professor of Agriculture, Imperial College of Tropical Agriculture. Estimates for the construction of this sty were obtained and varied between $386.98 and $404.62. This cost did not include the actual thatching of the roof. The sty as illustrated in Plan 1 consists of four pens, and each pen would comfortably house six pork size pigs.

The details of an estimated cost of construction are given in Appendix IV.

101. Simplification of this type of pigsty may be obtained as shown in Plan 2. Elaborations including creeps are also possible to construct to this sty. The movable sty is demonstrated at the Agricultural Department Station - El Reposo. (Illustrations 20 and 21.)
W is constructed with teak palings.
X = " " bricks.
Floor - concrete 4" to 6" thick sloping to drain.
Roof - thatched.
Uprights - 6" diam. hardwood. (Rough round).
Plan II - A more simple construction than Plan I.

May be constructed of similar materials or with any building material which is cheap and convenient.
102. Compared with the cow, sheep and horse, the pig has a very simple digestive tract and is unprovided with any very adequate means of dealing with coarse fodders. The diet of the pig should therefore be of nutritious concentrated foods. The successful pig ration will contribute benefits in many directions which at first glance perhaps are not obvious. One instance is that internal parasites may be the direct outcome of mismanagement, and feeding may be at the root of the trouble. If the growth of the pig and his degree of health are checked by poor feeding standards, the parasites become more numerous.

103. In Trinidad there is a shortage of concentrate foods. It is possible that investigational work, combined with a higher standard of organisation of imports, distribution and checking the wastage of material, which is already available, would do much to overcome the difficulty.

104. To consider one aspect of investigational work, the most immense achievement would be to alter the types of crops grown in the area already described to include as part of a rotation, a plant which would be of use in feeding livestock. This may require a large amount of experimental work regarding the breeding of the plant etc. and a greater amount in extending the policy to the people. The situation is that an increased production of livestock in Trinidad is very desirable for its better economy. This situation has occurred in other countries from which example may be taken.

105. Very fair yields have been obtained at I.C.T.A. with soya beans. These yields certainly warrant further trials to obtain varieties with increased yields. The products of soya beans are extremely valuable to livestock and the legume habit of the plant would certainly benefit the peasants of the area studied. The importance attached to soya beans by American Agriculture may be judged from the following figures. In 1898 eight varieties were imported to America from Eastern Asia, and in 1907 about 50,000 acres were planted to this crop in the U.S.A. In 1943 there were more than 10,000 soya beans varieties and about 15 million acres planted to the crop, with a total yield of 200 million bushels per year. This has been described as a dramatic development in the History of American Agriculture. In Britain Holman & Garner state in
relation to its feed value "No food has become popular in this country more rapidly than soya bean ..... Soya bean products are palatable and a mixture of soya bean meal, dried yeast, ground chalk, fine flour and common salt may replace fish meal as a protein rich food for pigs on a pound for pound basis."

106. Investigation of the usefulness of other crops should also be made and provide alternatives for the arable programme of the stock keeper.

107. Rations, using as far as possible home produced foods, but keeping to the standards of digestible proteins and starch equivalent requirements, should be calculated and tried, and the economy of the trial noted. The feeding trial is very necessary for factors such as quality of protein; the mineral content and the vitamin content must be taken account of, when considering foods to make up a ration. These are not usually capable of quantitative expression and thus it is not always possible to build up a satisfactory ration by consideration only of the data given in a feeding standard.

108. A prerequisite to calculations of local foods for rations, is a recognised figure of the feeding standard of each grain or cake etc. e.g., the values set out in the pamphlet of the Veterinary Department of Kenya "Aids to the feeding of farm livestock, with special reference to Kenya local conditions 1947". These values relate to grasses found in Kenya during the dry and wet seasons; to grains and livestock food produced in Kenya.

109. Investigations in Nigeria showed that animal protein was found essential to rapid growth of pigs (Greenwood). "In feeding trials at Shika, dried blood meal has given some amazing results. Fed at the rate of 1 oz. per day, it gave a weight increment of 117 per cent. over controls and reduced the fattening period from 44 weeks to 28 weeks (fattening to 180 lbs.)." No further comments are necessary on the value of such a trial in Trinidad.

110. If in the tropics, we can in the first place, purposefully practise as much of the knowledge gained in more advanced countries, as possible, investigational work will build up around difficulties and improvements to suit our local conditions.
PART IV - SUMMARY AND CONCLUSIONS

111. The pig is already established as part of the peasant system of agriculture. Unfortunately a minimum of attention is paid to the system, which is far from being ideal. The end point of the industry may be observed at the Port-of-Spain Slaughter House; here, the observer will be impressed by the poor quality and quantity, and the indifferent size of the pigs offered, and the disregard of everyone for the demand which exists for this type of farm produce. The ambition of this survey was to find the factors which influence this state of affairs in the small area of St. Augustine.

112. The survey reveals the fact that the lack of knowledge on the part of the peasant pigkeeper is the largest factor contributing to the poor qualities mentioned above. Knowledge of feeding, which is perhaps 70% of the knowledge required, is practically non-existent. Also, little is known or attempted to improve the general management as for example, using better types of pigs, using better and more permanent buildings for pig sties, a clearer knowledge of diseases, a plan of campaign against internal parasites. The other factor relating to the condition of the pig for slaughter is based upon the background which these people have. The items which influence this background are the origin and customs of the people who are the peasants, the system under which they hold the land, the general poor quality of the land, the lack of guaranteed tenure to effect improvements to this land either materially in buildings, or to safeguard the soil fertility. The resources of capital funds which the peasant has to call upon, very materially affects the pig industry, as a fair outlay is required to start it off properly. If the peasant hasnot got these funds behind him the method of obtaining loans has been studied. Religious principles and teachings affect the outlook of greater production of pigs, but not to the extent that was at first imagined.

113. Finally, the last factor influencing pig production is the lack of resources of food supplies. This requires a greater organisation. A check of wastage of material which may be used, e.g. the production of blood meal, bone meal etc. though small, would contribute...
to stabilising the demand for such things. A slight conversion of the arable cropping system to help with the more economic production of livestock generally; a closer knitting together of these two sides of peasant agriculture is required.

114. The conclusion is that the changes necessary to procure the outstanding need of more intensive use of the land in one item only - pigs, and in one small area - the St. Augustine area, is a large task in hand. When it is achieved the application to other items of agriculture and to other areas of Trinidad would be made much easier. It is impossible to assess whether the project of increasing pig farming will be economic by simply contemplating the subject, the indication is that it will be so, but there remain trials and investigations into the degree of economy, to be made. Necessity is the mother of invention, and in this case is the mother of change of custom, even a stubborn religious belief, may start to dissolve before an economic necessity. Finally, there is a definite place for an improved system of keeping pigs by the St. Augustine Area peasant, which will, in the opinion of this report, be to his advantage.
ACKNOWLEDGMENTS

I wish to acknowledge with thanks the assistance given to me in compiling this report by Mr. C.W. Lynn, Professor A. deK. Frampton, Professor F. Hardy, Mr. G.W.H. Webb, Mr. E.H. Achong, Mr. L.J.C. Evans and Mr. Giglioli. Also I wish to thank Mr. MacWilliams, Mr. Hutchinson and Capt. H.V.M. Metivier of the Department of Agriculture of Trinidad, and Mr. Flook of the St. Joseph Food Marketing Depot, for the information which they gladly gave.

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N.P. Bowen (compiled by) 1946 Census Album of Trinidad & Tobago.
L.A. Bridgland - Survey of St. Augustine.
H.J. Page - Address at the Agricultural Society of Trinidad on peasant holdings at Imperial College of Tropical Agriculture - 11.12.47.
E. Holman & E. Garner - Feeding farm animals.
E.G. Strand - Soya beans in American Farming.
Kenya Veterinary Department - Aids to feeding of farm livestock with special reference to Kenya local conditions.
V.C. Fishwick - Pigs, Their Breeding, Feeding and Management.
APPENDIX I.

The average rainfall figures recorded at Imperial College of Tropical Agriculture for 25 years up to 1947, and also those for 1948 are as follows:

<table>
<thead>
<tr>
<th>Rainfall average up to 1947</th>
<th>Rainfall for 1948</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>2.95 ins.</td>
</tr>
<tr>
<td>February</td>
<td>1.33</td>
</tr>
<tr>
<td>March</td>
<td>1.35</td>
</tr>
<tr>
<td>April</td>
<td>1.96</td>
</tr>
<tr>
<td>May</td>
<td>5.23</td>
</tr>
<tr>
<td>June</td>
<td>8.28</td>
</tr>
<tr>
<td>July</td>
<td>8.49</td>
</tr>
<tr>
<td>August</td>
<td>9.81</td>
</tr>
<tr>
<td>September</td>
<td>7.84</td>
</tr>
<tr>
<td>October</td>
<td>6.22</td>
</tr>
<tr>
<td>November</td>
<td>7.84</td>
</tr>
<tr>
<td>December</td>
<td>6.56</td>
</tr>
</tbody>
</table>

Data maximum and minimum temperature are given as well as the degree of humidity.

<table>
<thead>
<tr>
<th>Max. temp.</th>
<th>Min. temp.</th>
<th>Humidity at 8 a.m.</th>
<th>Humidity at 4 p.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. for 19 yrs.</td>
<td>Avg. for 19 yrs.</td>
<td>Avg. for 17 years</td>
<td>Avg. for 17 years</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>--------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>January</td>
<td>84</td>
<td>68</td>
<td>85</td>
</tr>
<tr>
<td>February</td>
<td>85</td>
<td>67</td>
<td>82</td>
</tr>
<tr>
<td>March</td>
<td>86</td>
<td>68</td>
<td>77</td>
</tr>
<tr>
<td>April</td>
<td>87</td>
<td>71</td>
<td>75</td>
</tr>
<tr>
<td>May</td>
<td>87</td>
<td>72</td>
<td>77</td>
</tr>
<tr>
<td>June</td>
<td>86</td>
<td>72</td>
<td>81</td>
</tr>
<tr>
<td>July</td>
<td>86</td>
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<td>83</td>
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<td>August</td>
<td>87</td>
<td>71</td>
<td>85</td>
</tr>
<tr>
<td>September</td>
<td>87</td>
<td>72</td>
<td>85</td>
</tr>
<tr>
<td>October</td>
<td>87</td>
<td>72</td>
<td>84</td>
</tr>
<tr>
<td>November</td>
<td>86</td>
<td>71</td>
<td>85</td>
</tr>
<tr>
<td>December</td>
<td>85</td>
<td>70</td>
<td>86</td>
</tr>
</tbody>
</table>
APPENDIX JZ  Showing measurements of two samples of Mr. Edghill's Pig ration taken for analysis.

### MOISTURE.

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>No. Weighing Bottle</th>
<th>Wt. of Weighing Bottle</th>
<th>Wt. of W.B. + Sample</th>
<th>Wt. of W.B. + Sample (After Drying)</th>
<th>Wt. Water</th>
<th>% Water</th>
<th>Mean of a + b</th>
</tr>
</thead>
<tbody>
<tr>
<td>507</td>
<td>1</td>
<td>23.2600</td>
<td>25.0148</td>
<td>1.7548</td>
<td>24.9030</td>
<td>24.9000</td>
<td>0.1148 6.54%</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>24.4150</td>
<td>26.1760</td>
<td>1.7610</td>
<td>26.0632</td>
<td>26.0600</td>
<td>0.1160 6.57%</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Crucible No.</th>
<th>Wt. of Crucible (Ignited)</th>
<th>Wt. of Crucible + Sample</th>
<th>Dry Wt. of Sample</th>
<th>Wt. of Crucible and Ash (After Ignition)</th>
<th>Wt. of Ash</th>
<th>Gr. Ash per 100 Gm. Dry Wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>507</td>
<td>L 10</td>
<td>14.8848</td>
<td>16.3258</td>
<td>1.4410</td>
<td>15.0654</td>
<td>0.1806</td>
<td>13.41%</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>12.0580</td>
<td>13.9040</td>
<td>1.8460</td>
<td>12.2858</td>
<td>0.2270</td>
<td>13.21%</td>
</tr>
</tbody>
</table>

Silica determination:

<table>
<thead>
<tr>
<th>Crucible No.</th>
<th>Wt. of Sample</th>
<th>Wt. of Ash</th>
<th>Gr. Ash per 100 Gm. Dry Wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 10</td>
<td>14.8848</td>
<td>0.0706</td>
<td>5.6%</td>
</tr>
<tr>
<td>14</td>
<td>12.0580</td>
<td>0.0680</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

True Ash = 7.96%

Silica = 5.35%
### Total NITROGEN

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Flask No.</th>
<th>Wt. W.B. + Sample</th>
<th>Wt. W.B. Sample</th>
<th>Wt. of Dry Wt. Sample</th>
<th>vol. N/10 H₃SO₄</th>
<th>Titration ml. N/10 NaOH</th>
<th>Blank-t mg. N</th>
<th>Gm. Nitrogen per 100 Gm. D.W.</th>
<th>% Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>507</td>
<td>A</td>
<td>7.6362</td>
<td>6.1772</td>
<td>1.4590</td>
<td>1.3631</td>
<td>50 ccs.</td>
<td>15.4 ccs.</td>
<td>34.2</td>
<td>47.88</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>7.6462</td>
<td>6.1768</td>
<td>1.4690</td>
<td>1.3725</td>
<td>50 ccs.</td>
<td>10.3 ccs.</td>
<td>39.3</td>
<td>50.02</td>
</tr>
<tr>
<td>Sample No.</td>
<td>Flask No.</td>
<td>Wt. of Flask</td>
<td>Thimble No.</td>
<td>Wt. of Thimble</td>
<td>Wt. of Sample</td>
<td>Dry Wt. + Sample</td>
<td>Wt. of Flask</td>
<td>Ether extractives</td>
<td>Wt. of Ether Extract</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
<td>--------------</td>
<td>-------------</td>
<td>---------------</td>
<td>---------------</td>
<td>------------------</td>
<td>--------------</td>
<td>-------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>507</td>
<td>5</td>
<td>79.8078</td>
<td>A</td>
<td>1.4434</td>
<td>2.9606</td>
<td>1.5172</td>
<td>1.4175</td>
<td>79.8838</td>
<td>79.8830</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>82.3472</td>
<td>B</td>
<td>1.2852</td>
<td>4.3330</td>
<td>3.0478</td>
<td>2.8476</td>
<td>82.5230</td>
<td>82.5150</td>
</tr>
<tr>
<td>Sample No.</td>
<td>Thimble No.</td>
<td>Dry Wt. of Sample (cf. Ether Ext.)</td>
<td>Crucible No.</td>
<td>Wt. of Crucible + Residue after Digestion (After Drying)</td>
<td>Wt. of Crucible + Residue after Digestion (After Ignition)</td>
<td>Wt. of Crude Fibre</td>
<td>Gm. Crude Fibre per 100 Gm. D. Wt. of Sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>----------------------------------</td>
<td>--------------</td>
<td>-------------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
<td>-------------------</td>
<td>------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>507</td>
<td>A</td>
<td>1.4175</td>
<td>D</td>
<td>15.3838</td>
<td>15.1878</td>
<td>0.1960</td>
<td>13.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>2.8476</td>
<td>E</td>
<td>15.0840</td>
<td>14.6664</td>
<td>0.4176</td>
<td>14.7%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean: 14.25%
APPENDIX III.

A digestibility trial was made, using Mr. Edghill’s pig ration. The trial was made on five rats at the Nutrition Laboratory of the Imperial College of Tropical Agriculture.

The rats were fed on the ration for two days, April 26th to April 28th prior to the commencement of the trial. The Trial was started on 28.4.49 and was concluded on 3.5.49.

Each rat was fed liberally on the ration and water was provided. A record of the amount of food consumed by each rat was taken, and the faeces of each rat were collected every twenty-four hours.

Calculations were all based on dry matter weights. The actual intake and the weights of faeces for individual rats were as follows:

<table>
<thead>
<tr>
<th></th>
<th>INTAKE</th>
<th>FAECES</th>
<th>DIGESTED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oven dry wt.</td>
<td>Oven dry wt.</td>
<td>in grms.</td>
</tr>
<tr>
<td>Rat 1</td>
<td>66.3</td>
<td>30.0</td>
<td>36.3</td>
</tr>
<tr>
<td>&quot; 2</td>
<td>54.0</td>
<td>23.7</td>
<td>30.3</td>
</tr>
<tr>
<td>&quot; 3</td>
<td>48.6</td>
<td>21.5</td>
<td>27.1</td>
</tr>
<tr>
<td>&quot; 4</td>
<td>43.9</td>
<td>19.0</td>
<td>24.9</td>
</tr>
<tr>
<td>&quot; 5</td>
<td>59.7</td>
<td>27.0</td>
<td>32.7</td>
</tr>
<tr>
<td>Average</td>
<td>54.5</td>
<td>24.25</td>
<td>30.25</td>
</tr>
</tbody>
</table>

The analysis of the faeces gave the following information:

<table>
<thead>
<tr>
<th></th>
<th>Ash</th>
<th>Crude Protein</th>
<th>Crude Fibre</th>
<th>N.F. Extract</th>
<th>Ether Extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faeces</td>
<td>20.2</td>
<td>19.6</td>
<td>27.8</td>
<td>29.0</td>
<td>3.4</td>
</tr>
</tbody>
</table>

(Figures are expressed as percentages of dry matter.)
An estimate was obtained for the building of the sty shown in Plan 1 of the report. This estimate is based on prices of materials existing in the first half year of 1949.

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity/Details</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>650 x 4&quot; lathe</td>
<td></td>
<td>$32.50</td>
</tr>
<tr>
<td>20 posts</td>
<td></td>
<td>20.00</td>
</tr>
<tr>
<td>500 clay blocks 4&quot;x6&quot;x12&quot; (and transport)</td>
<td></td>
<td>56.00</td>
</tr>
<tr>
<td>20 rafters 2&quot;x3&quot;x16'</td>
<td></td>
<td>22.40</td>
</tr>
<tr>
<td>10 &quot; 2&quot;x3&quot;x16'</td>
<td></td>
<td>11.20</td>
</tr>
<tr>
<td>24 laths 2&quot;x3&quot;x12'</td>
<td></td>
<td>5.76</td>
</tr>
<tr>
<td>5 loads of gravel</td>
<td></td>
<td>35.00</td>
</tr>
<tr>
<td>2 loads of sand</td>
<td></td>
<td>14.00</td>
</tr>
<tr>
<td>20 bags of cement</td>
<td></td>
<td>41.20</td>
</tr>
<tr>
<td>50 lbs. nails 2½&quot;</td>
<td></td>
<td>15.00</td>
</tr>
<tr>
<td>4prs. hinges</td>
<td></td>
<td>1.92</td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td>20.00</td>
</tr>
<tr>
<td>Labour</td>
<td></td>
<td>120.00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>$394.98</td>
</tr>
</tbody>
</table>