SURVEY OF THE DAIRY INDUSTRY

IN TRINIDAD.

By

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I. INTRODUCTION,
(1) The title of this paper may be rather misleading as it is not a survey in the strict sense of the word, rather, the writer by inspecting as many dairies and questioning as many people as possible hopes to present to the reader an accurate description of Trinidad's dairy industry. During the investigation the writer visited most of the medium and large sized dairies in Trinidad. Several dairies were also visited in Tobago. As many peasant dairy cow owners as possible were visited. Most of these visits were to peasants in the vicinity of the College, the writer being handicapped by the lack of transport. It is from these visits that most of the information in this paper was obtained.

(2) Today the population of the world cries out for milk, rich, clean, healthy milk. The West Indies are not behind in their demand for this nourishing food. From work carried out at the Imperial College of Tropical Agriculture, the staple diet of the West Indies was stated to be:

1) Rice (brown rice parboiled, milled but not polished)
2) White flour
3) Irish potatoes and local root crops
4) Salt fish
5) Sugar
6) Pulses (peas and beans).

The supplementary diet included:

1) Meat
2) Milk
3) Fruit
4) Eggs.

(3) The deficiency of protein and fats is a salient feature in the diet of the West Indies. The milk which is consumed is mostly tinned milk and can be counted as a partially defective food. In 1927 imports of condensed milk were to the value of £100,500,
which equalled three quarters the value of copra exported that year. The imports of tinned milk are still going up showing the big demand for this commodity and at the same time showing the lack of available fresh milk produced under sanitary conditions. The increase in imports from 1948-9 was $545,476. A table showing butter, cheese and milk imports can be seen in Appendix I.

(4) Hammond writes: "A supply of dairy produce would probably result in better health and more efficient labour, as well as the lowering of infantile mortality." The writer feels that a thriving dairy industry is part answer towards alleviating deficiencies in the diet of Trinidadians and also would help the island's economy by lowering the imports of condensed milk.

(5) As will be seen from the following report on the dairy industry there is still no policy or method in Trinidad dairying and that much improvement is needed before the industry can take its place in the Agriculture of the island.

(6) The report has been divided into sections to facilitate its writing and the sections respectively are:

1. Breeding policy, past and present.
2. Type of dairying.
3. Housing.
4. Feeding.
5. Standards of sanitation.
6. Disease.
7. Summary and recommendations.
(7) After years of work, there is no fixed type of dairy cow in Trinidad. One is amazed at the multiplicity of mixtures one sees when travelling through the island. Looking back into the history of dairy cattle it is not difficult to see how the present situation arose.

(8) The dairy cow of Trinidad is a mixture of Bos Indicus and Bos Taurus blood. Briefly, the genus Bos originated in the Hymalayas and differentiated into the Bos Taurus or Northern Type and the Zebu or Bos Indicus, Southern Type. Trinidad's humid climate (Appendix II) generally precludes the successful use of Bos Taurus due to the deterioration of these cattle in the Tropics. Bos Taurus can be kept under conditions approaching those of temperate climates, i.e. in the higher lands of the tropics, but these conditions cannot be regarded as normal. There were no bovines in the West Indies prior to the arrival of Spanish colonists in the 15th and 16th Centuries. It is assumed that the colonists brought cattle from Spain, Portugal and their West African Colonies, these cattle having a high proportion of African blood. These cattle were adapted to tropical conditions but their economic performance would have been low in comparison with European breeds.

(9) The past breeding policy has been to bring in European breeds for cross breeding with local cattle whose ancestors originally came from Spain and West Africa. Breeds imported for this purpose were Holstein, Jersey, Guernsey, Red Poll and many others. The Holstein however predominates amongst the cattle imported. This importation and cross breeding with Zebu resulted in a primary improved type with a higher milk yield than the indigenous cattle. Half-bred Friesans may give 800 gallons of milk with a fat content of 4%, their skin is black and they do not usually become infected with ticks. The Zebu is a poor milker but suffers little from tropical diseases. In an attempt in Jamaica to find the optimum amount of Zebu blood for milk production under tropical conditions...
by crossing Zebus with Jersey, Guernsey and Holstein, the half-bred was found to give maximum milk production. The Government Stock Farm of Trinidad found the optimum grade to be 3/4 Holstein, 1/4 Zebu. This grade was also highly thought of by the manager of Waterloo dairy (one of the dairies visited during the survey). After this grade an increase in Zebu blood causes degeneration.

(10) This has been the past policy of the island and has been encouraged by the Government Stock Farm. A word then to set down the functions of this farm. The Government Stock Farm is situated at Valsayn, St. Joseph. The farm was established in 1901 and is about 390 acres in size. The general objective of the farm is threefold.

(1) To produce improved livestock of all classes for distribution to peasant farmers, private owners and Governments of adjacent countries.

(2) The study and dissemination of improved animal practice.

(3) To maintain a milk supply for the Government institutions and for the 'milk for school children' scheme.

Present livestock is as follows:

- Cattle: 300 (approx.)
- Water buffaloes: 5
- Horses: 6
- Donkeys and mules: 7
- Goats: 45
- Poultry: 100

(11) Of the dairy herd some 70 cows are maintained in full milk production throughout the year. Milk production is now at about 1,400 lbs. per day. The milk is produced under modern conditions and is pasteurised and bottled on the farm. Milk is also purchased from other local dairies and pasteurised and sold. The cows are milk recorded, and periodic butterfat tests are made.
the milking herd was built up over many years by upgrading with Holstein bulls, largely of Canadian and American origin. The foundation cows were largely locally bred cows of heterogenous strain. In addition a herd of Nellore Zebus are maintained for downgrading.

(12) There are also a number of centres where approved breeding bulls are kept for use of the peasants. The peasant pays a small service charge and, where possible, records are kept.

(13) This is the position at present. Can this be called a breeding policy? To establish a fixed type, as under the above system, back crossing with Bos Indicus is necessary to maintain production, i.e. there is no fixed type. The continued use of the Holstein-Zebu cross for milk cannot be justified as two pure bred breeds have to be maintained and the second generation progeny have to be disposed of. This method may be successful where careful records are kept, such as at a big dairy, but does not solve the peasants' problems.

(14) At present there are three main schools of thought. (6)

(1) Hammond advocates grading up on a local foundation of Indian blood by the use of European dairy bulls, preferably Friesans, until the final product retains 1/8 to 1/4 Indian blood. (This has already been done with some measure of success in Jamaica and India.)

(2) Careful selection within established dairy breeds of India to fix a breed of dairy cattle for the tropics.

(3) Use Zebus for draught purposes and depend on a milking strain of water buffaloes.

(15) As stated before the first system was adopted at St. Joseph and has produced good initial results. The chief criticism of the system is that it does not produce permanent results. In 1939 a small scale start was made in trying out system (2) as above. The Caribbean Commission reports that in 1939 a shipment of Sahiwal
cattle arrived at the Stock Farm in Tobago. Milk yields were found to be poor but inquiries indicated that the cattle shipped were not from the selected Pusa Dairy herd but from the jungle. World War II interrupted further shipments. In December, 1947, a shipment of three progeny tested bulls and a cow in calf arrived. These newly arrived Sahiwal cattle will be used to improve the standard of the first importations. The advantage of these cattle is that they average 500 - 600 galls. and more per lactation and they readily stand up to tropical conditions, breed regularly and show excellent heat tolerance. Another Indian breed highly selected for milk production is the red Sindhi. Success depends on whether these breeds can stand the temperature and humidity and whether local fodder resources are sufficient for high yields and sound fitness. Experiments are being tried in Tanganyka with both these breeds. The difficulty seems to be in obtaining either of these breeds from India - the authorities show reluctance in exporting them. The writer feels that if such a breed could be established here in Trinidad, selection would produce reasonably high milking which would prove a boon to Trinidad's dairying industry.

(16) The Indian water buffalo, Bos Bulalois is represented amongst domesticated animals by a number of distinct breeds with excellent qualities as milk producers under tropical conditions. It is semi aquatic in nature, seeking water holes in the heat of the day. It is immune to many bovine diseases and is able to survive on coarse fodders. The Murrah breed is considered as one of the superior breeds and lactations of 300 - 500 galls. per lactation are common with a butterfat content of 7.7 - 8.3%. Under certain conditions these milk producing water buffaloes may be an economic proposition.

(17) It is to be hoped that in the near future a clear cut breeding policy will be evolved which will produce suitable dairy cows for Trinidad's milk producers.
(18) Milk is the product desired in Trinidad. There is scarcely any butter or cheese produced. The milk itself is produced by three main classes.

(a) Large or Estate dairies.
(b) Medium dairies.
(c) Peasant dairies.

(19) In the 1946 Census, Farms are divided up into 1 - 15 acres of which there are 26,769 and farms of 15 acres and above, of which there are 3,798. The rest of the farms go under the heading of small plots which are pieces of land less than one acre in size. Below are given the cattle population split up into farms and small plots.

<table>
<thead>
<tr>
<th></th>
<th>FARMS</th>
<th>SMALL PLOTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves under 1 year</td>
<td>5,693</td>
<td>3,272</td>
</tr>
<tr>
<td>Heifers, 1 - 2 years</td>
<td>3,724</td>
<td>2,226</td>
</tr>
<tr>
<td>Cows, 2 years &amp; over</td>
<td>10,177</td>
<td>5,335</td>
</tr>
<tr>
<td>Bulls &amp; Oxen under 1 year</td>
<td>1,359</td>
<td>350</td>
</tr>
<tr>
<td>Bulls, over 1 year</td>
<td>3,769</td>
<td>1,919</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>24,722</strong></td>
<td><strong>13,102</strong></td>
</tr>
</tbody>
</table>

(20) Unfortunately no figures have come to the writer's notice which split the farms up into say 1 - 5 acre plots. However it is apparent that the number of cows kept by peasants exceeds that of those kept by the other two classes.

(21) The Census gives the total milk sold as 27,546 bottles, six bottles making 1 gall. of milk. Here the milk produced or rather the milk sold by farms larger than 5 acres is 13,662\(\frac{1}{2}\) bottles, and that sold by small plots is 13,883\(\frac{3}{4}\) bottles. Whereas these figures are no true estimate of the actual milk produced by the peasants they do show that the peasant plays an important part in Trinidad's milk production.
There are not many large dairies on the island. Two of the biggest dairies inspected belong to sugar cane estates. The other large dairy is the Stock Farm itself which has already been mentioned. A short description of the other two estate dairies follows here.

(23) **Usine, St. Madeleine Dairy.**

Some 205 head of stock are kept of which a herd of about 62 cows is kept milking. Land available is 75 acres of which 35 acres is pasture, the remainder being used for forage grasses. The aim of the dairy is to supply pasteurised milk to the company.

(24) **The stock kept are 1/2 and 3/4 bred Zebu-Holsteins.**

Four pure bred Friesan bulls are kept. The manager seems to prefer the half-bred. Management seems haphazard in many ways, milking being done twice a day normally but three times a day if milk is needed. A gascoine milking parlour is available but is not in use at present. The herd averages 2 galls. per cow per day. Records are kept; the animals are mated at 2½ years if big enough. A labour staff of 40 is kept for milking, cutting grass, etc.

(25) **The venture is intended to pay its way. An accurate system of costing is kept.** From figures given to the writer it can be seen that total cost of producing 1 gall. of milk was:

<table>
<thead>
<tr>
<th>Month</th>
<th>Cost (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
<td>112</td>
</tr>
<tr>
<td>August</td>
<td>76½</td>
</tr>
<tr>
<td>July</td>
<td>83</td>
</tr>
<tr>
<td>June</td>
<td>91½</td>
</tr>
<tr>
<td>April</td>
<td>81</td>
</tr>
<tr>
<td>February</td>
<td>80</td>
</tr>
</tbody>
</table>
This is counting labour, etc., for an 8 hour day:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>$1.08</td>
</tr>
<tr>
<td>Cost of living bonus</td>
<td>.15</td>
</tr>
<tr>
<td>Attendance</td>
<td>.20</td>
</tr>
<tr>
<td>+ 12½% increase</td>
<td>.18</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$1.61</td>
</tr>
</tbody>
</table>

The company as a concession sells the milk at $1.15 per gallon. If 120 gallons are sold per day the profit for a year selling at $1.15 theoretically should be $12,045. The profit if sold at the scheduled price of $1.36 per gallon would be $12,054. Thus it can be seen that theoretically at least from the above costs of milk production, a profit is made even when the milk is sold at reduced price.

(26) *Waterloo Estate Dairy.*

This dairy might be described as a model dairy. The land available is 40 acres split into 20 acres of guinea grass, 5 acres of elephant grass and 15 acres of pasture. Grass is also cut from traces and the ratoons from the cane crop are used in Jan. and Feb. Some of the pasture is divided up into paddocks for young stock, which are excellently suited for this purpose having Saman shade trees and water laid on in the field (see Plate No. I).

(27) The farm is stocked by 75 head of which a dairy herd of 32 cows is maintained. The stock are high grade Friesans 3/4 - 7/8 - 15/16 and some pure bred Friesans. Some of the present young stock are actually really pure bred as their grade is approximately 63/64. The stock was in excellent condition when inspected. The cows are milked three times a day, 4 a.m., 1 p.m. and 7 p.m. The programme during the day is as follows. The cows are left in from 8.30 a.m. to 3.30 p.m. to miss the heat of the day. Then they are turned out from 3.30 p.m. to 6.30 p.m. and then brought in for milk-
PLATE NO. I.

Waterloo Dairy Heifers.

Note: Shade, water tank on left side of picture, healthy appearance of stock.

PLATE NO. II.

'Milk Worth'

3/4 bred Friesan.

Dam: Blue Bell 5th.

Sire: Arabs.

Yield: 7,035 pints - 29 1/2 weeks.

1st Calf - Heifer, born 19/4/47.
out again at 9 p.m. and left out till 3 a.m., then finally turned out again between 5.15 a.m. and 8.30 a.m.

(28) A policy of close line breeding has been carried out for eleven years. In 1925 most of the cattle were high grade Zebu. In 1928 Holstein were imported from Canada. During the war pure bred Holstein bulls from the Government Stock Farm were used. In 1948 an importation of pure bred Holsteins from Essex was made. The milk yields are extremely good, some of the 3/4 breds giving very high yields (see Plate No. II). When visited in September, 24 cows were producing over 70 galls. of milk. The general average for the last four months had been three galls. per cow per day. For November the average was 3.4 galls. per cow per day. Bull calves from this herd are in big demand and are being sold to South America, etc. The herd is tested regularly for Tuberculosis and contagious abortion.

(29) This dairy has been dealt with at some length because of all the dairies seen in Trinidad it strikes one as a model. It must be noted although the main function of the dairy is the production of milk for estate staff, some of the milk which is pasteurised is also sold in bulk. It must also be noted that whereas the venture is expected to pay its way, no figures were made available to the writer. Also of note is the fact that here is an example of a high bred Holstein herd giving good yields under tropical conditions. There seems to be very little deterioration. Might this not be due to the factors of keeping records, excellent management and feeding?

(30) Another large herd of dairy cows is kept by Dr. Mason at Arima. This provides a contrast to the above. A herd of 55 3/4 bred cows and followers are kept of which about 40 are milking. Milking is done three times a day and the yield is about 70 galls. per day. The milk is sold retail in Arima and Sangre Grande without even cooling. There is some 60 acres of grazing under citrus and a further 50 acres of Guatemala grass is available for cutting.
The primary purpose of this herd however is not milk, but the cattle are kept to produce manure for the cacao plantation on which the dairy is situated. There is evidence that herd is not managed well and that milk is produced under not very good sanitary conditions. With just a little extra care clean milk could be produced here with profit and the desired manure would still be available.

For the purposes of this report, medium size dairies are those which contain a herd of 10 cows or more. Most of the dairies were found to be owned by East Indians, many European medium sized dairy farmers having given in due to the difficulties of obtaining good stock and feed, and the cost of selling the milk.

One European dairy farmer however was found making a living out of 10½ acres of steeply sloping hill land, exposed to bad erosion. This is Mr. Tucker of Tobago, who runs a herd of 32 milking cows. The animals range from pure Zebu to all other intermediate crosses with various European breeds. A 5/8 Holstein bull has just been purchased from the Government Stock Farm. The 10½ acres of land are divided into a number of small paddocks. In the past no breeding has been done, and he relies on buying replacements. The milk is sold retail at 17½ per pint to the St. Augustine area, the Imperial College and the Monastery. He produces about 30 gallons per day and buys a further 10 gallons from the Imperial College Dairy. The milk is not cooled but is delivered straight away.

The land is totally unfit for dairying (but was the only land available at the time) as it lies on a terrific slope, which is puddled by the treading of cattle and is being eroded. Mr. Tucker suggested that privately owned (European owned) milking herds are disappearing, and that the reasons are:

1. Black Market in food - high prices.
2. Deterioration in stock available.
There are several medium sized dairies run and owned by East Indians, but these mostly fit into the pattern of peasant dairy routine.

(35) **Peasant Dairies.**

It has already been stressed that the peasant makes an important contribution towards the island's milk production. When one sees the various ill assorted cattle gathered on the roadsides picking away at whatever forage they can find, one wonders how these cattle can produce as much as they do. What happens to the milk produced by the peasant, how is it produced, under what conditions is it marketed, how is it marketed? It is partly the purpose of this paper to answer these questions. Very little knowledge is available about peasant milk production. Obtaining accurate information is difficult, the peasants will answer yes or no to any leading question, depending on the answer they think you will like best. Due to the difficulties of transport most of the peasant examples of dairying have been taken in the vicinity of the College. These examples will be representative of the island with the one exception that the people in the vicinity of the College are mainly East Indians whose forefathers came to the island as indentured labourers from India. These people in the writer's opinion show themselves as better stockmen than the negroes.

(36) Even amongst peasants there are different types of dairy farmers, if one may term them as such. Firstly the writer is not considering the estate worker who keeps a cow to provide his family with milk. Emphasis is placed on those peasants who farm a piece of land as a full time occupation. Here we can define three groups:

1. The peasant who depends on vegetable crops, who may or may not keep a cow to supply his personal milk requirements.
2. The peasant who keeps 4 - 8 cows, forming the basis of his income but also has some vegetable crops, and maybe a field of rice to supplement his income.
3. The peasant who depends wholly on selling milk.
Without an accurate survey being made it is not legitimate to draw conclusions, but in the writer's opinion Group (2) is the most important contributor towards the island's milk supply.

(37) The milk itself is disposed of in a number of ways. The peasant uses the milk in his own household, and in some cases ghee is made. Ghee is clarified butter and is a means of preserving milk solids through the dry season. It is made more as a luxury than as a necessity in Trinidad. A certain amount of milk is sold to the neighbours and around the village community, but the majority of the milk is sold to the retailer. This man collects milk at the price of 12¢ per bottle and then sells it in Port of Spain and other towns at 17¢ per pint (6 bottles to the gallon). The milk which he buys should by law be only Tuberculin tested milk.

Another means of disposal is to the Government Stock Farm and the Trinidad Dairies. The fat content of the milk produced is usually good. A yield of 2 gallons per day or say 450 - 500 gallons is considered good and must be considerably higher than the average.

(38) To give the reader an idea of these small peasant dairies a few examples will be quoted.

Peasant A. Living on the holding were a young man, his wife and 2 children, and the young man's father. The land available was approximately 1½ acres. Four milking cows were kept, all in good condition, though one animal was off its food, but it had been examined by the vet. from the Government Farm. Three cows are milking at present, one is in calf. There were 2 healthy looking bull calves, the young man explaining that he had been unlucky, and the cows were always 'making' him bull calves. He uses the Government Stock Farm bull. A mule was also kept for collecting grass from the roadsides, waste land, etc. for his cow. No grass was grown on the holding. The animals were kept in all day, only being allowed out for a spell of exercise. (Note: This is not usual. Most peasants tether their stock on roadsides or waste land during the day). The manure was collected in a well made
midden and the urine which was collected in a concrete pit was poured over it, the heap being protected from the weather by coconut leaves, etc. The cowshed was of the pole and thatched roof type (see under Housing) with a concrete floor and was in good condition.  

(39) The milk is disposed of to a collector at 12¢ per bottle. The Tuberculin test is carried out once a year. At the time of the writer's visit, 36 bottles a day were being sold, i.e. 2 galls. per cow, plus milk used for calves and personal use. On questioning he finally agreed that throughout the year he averages 30 bottles per day. This is possibly rather high but the intake on milk must be in the neighbourhood of $1,314 per year. Besides this he grew pumpkins and eggplants for sale in the local market, also owns a small rice field and sells some of his manure. The sale of bull calves is an additional source of revenue.  

(40) This peasant is a good stockman and manages an efficient holding at a higher level than most peasants visited.  

(41) Peasant B. This man was not so informative and was very evasive in answering questions. There is no land attached to this holding. The stock consist of 9 cows of mixed origin, some calves and a water buffaloe to transport grass. The cows are tethered on the waste land during the day. The Government made him build a new shed for his milking herd (see Housing). Government Stock Farm bulls are used and the herd is Tuberculin tested. The milk is sold to a retailer in Tunapuna village. No reliable figures as to yield could be obtained. A man is employed to work with the cattle. Those cattle were not in good condition and were probably not yielding as much as those of Peasant A. This man also owned a lorry, and the son was a taxi driver, a much more "respectable" occupation than being a farmer, so not much attention was paid to the dairy.  

(42) Once can continue quoting examples of peasant dairies, but they all fall into the pattern. The condition of their stock varies immensely as to the type of stockman the owner is. Hindus, due to religious beliefs, usually keep their cattle well. It is
very difficult for the peasant to obtain a good type of dairy cow suited to his conditions. There is much scope for improvement in peasant dairies and the need for guidance and education is very great. (See photos of peasant dairy farming, Plates Nos. III, IV, V & VI).

(43) It can be seen then that there is a great diversity in the type of dairying to be found in Trinidad. Above all, stands out the factor that the peasant, far from being a minor producer of milk, is supplying more than half the island's milk and as such must not be overlooked.
3/4 bred Friesan on Peasant Holding.

Note: Cow tied to fence in heat of day, no cow shade or water.

3/4 bred Friesan.
Tethered on Railway Embankment.
PLATE NO. V.

Cattle tethered on Road side.

PLATE NO. VI.

Breeding Unit.

Showing Scale of Fees.
With the vital problems of breeding and feeding of dairy cattle in the tropics, the question of housing seems to have been neglected. The present situation is that much of the milk produced on the island is being produced in hovels where milking cows, calves, donkeys, mules and poultry are all housed together.

(a) Large Dairies.

The three large dairies have good buildings, each with a well ventilated, concrete cowshed. Of these Waterloo Dairy is once again a model example of dairy buildings. (See Plates Nos. VII & VIII). The cowshed itself is concrete and steel. The cows stand tail to tail and the shed is well ventilated. It is kept in excellent condition. There are tubular steel standings with separate feeding troughs, and water laid on. There are feeding passages each side of the shed. Electric light is laid on. The gangway is wide enough to take a tractor and trailer for cleaning out the manure. All the necessary accessory buildings are available, i.e. bull-pens, calf-pens, calving down pens. These buildings are excellently suited to housing a high milk producing herd. The buildings of the other 2 large farms, Government Stock Farm and Usine, are satisfactory too although they are much older and less polished.

(b) Medium Dairies.

The buildings of Tobago Dairy, which the writer takes for an example, are very crude and elementary. They were erected as cheaply as possible. (See Plates Nos. IX & X). Even so, they are possibly a rather better than average example of this group. As can be seen, ventilation is no problem in this type of building. The building consists of a concrete floor base with a tin roof supported by wooden posts. The animals are tied by rope onto wooden slats. There are no stall divisions. Water is taken to the animals by means of a tub which is filled by hosepipe. The surroundings to the building are puddled badly by cattle. The condition of the building, such as it is, is not too bad.
Waterloo Dairy

Note: Ample ventilation, lighting, tubular standings.

PLATE NO. VII.

Waterloo Dairy

Note: Dung grooves, wide centre gangway for clearing out manure. Overhead manure cert broken down.

PLATE NO. VIII.
PLATE NO. IX.

Tobago Dairy.

PLATE NO. X.

Tobago Dairy.

(Inside of Shed).
Most peasant farmers build their own cowhouse. Of necessity their outlay of capital is small. If they wish to sell their milk they must have Tuberculin tested cattle; also the cow house must come up to the standards set down in the sale of milk regulations (See section on Sanitation). In many cases these cow houses do not conform to the regulations, but inspection is not carried out thoroughly or frequently, and so the peasant is able to sell milk.

There are many different types of peasant cowhouses. One of the most common type seen is the pole and thatched roof type. The thatched roof is intended to give shade and is sloped to encourage the run off of rain. Most peasants do not place their shed with regard to the sun, but place it in any way which appears the most suitable, as a result of which many of the sheds do not give shade at the hottest part of the day. The thatching usually has to be renewed at the end of 3 or 4 years. The peasant buys the thatching material which is usually timite palm leaves. These can be bought locally at $9 per 1,000 leaves. The peasant usually does his own thatching, but may hire a man to do it for him. If milk is sold the shed should have a concrete floor which is also usually laid down by the peasant himself. The urine in some cases is collected in a concrete pit. This pit is usually covered by a wooden board and emptied every day. Instances were found where the pit had no cover and the urine was overflowing, making the surroundings of the cowhouse muddy and evil smelling. The manure was collected in a heap which was either used on the holding or sold. The cattle are usually tied by means of a rope to one of the poles supporting the roof. In some cases standings and concrete feeding troughs had been built in.

There are many variations of the above, some sheds having tin roofs and others wooden ones. The sheds vary greatly in condition, some being kept very clean and others being foul hovels.
Worthy of mention here is the type of shed being used in the Peasant Investigation experiments on the College Farm of the Imperial College. The principle of the building is the same, i.e. a thatched roof on poles. However the cattle stand in a shallow pit (See Plates Nos. XI & XII). The manure is not extracted every day but is allowed to accumulate and be consolidated by the treading of the cattle. Fresh bedding has to be added every day and at milking times in order to maintain sanitary conditions. The young stock are kept on the other side of the shed, (See Plate No. XI). Small mud walls inlaid with bamboo have been built for neatness and to partition off the two portions of the building. Ample shade is supplied by the low thatched roof. The animals are tied by rope to the wooden supports. The probability is that if this type of building came into use the peasants would not use enough bedding to maintain sanitary conditions. However such a building should be very suitable for the peasant who does not go in for selling milk but wishes to produce milk for his family and manure for his farm.

An example of improvement of buildings may be quoted here. This peasant produced a quantity of milk from 11 cows for sale. It was all produced in shed seen on Plate No. XIII. The Government made this man build another milking house (See Plates Nos. XIV & XV). This shed is obviously more suited to a farmer selling a considerable amount of milk.

The problem in the housing of cattle in Trinidad lies in evolving a suitable cowhouse, for the sanitary production of milk, made out of cheap local products which can be afforded by the peasant. It is no use aiming at expensive concrete buildings with tubular fitting, etc., rather the aim must be to produce sanitary conditions, general cleanliness and provision made for adequate shade and shelter. Also the disposal of manure and liquid run off must be considered. The description of cattle housing has of necessity been very short, but for further information, "A report on housing of all classes of livestock in Trinidad, with recommendations for its improvement,
PLATE NO. XI.

Peasant Holding at I.C.T.A.

Note: General cleanliness, shade, tidy manure heap in foreground.

PLATE NO. XII.

Peasant Holding at I.C.T.A.
(Inside of Shed).

Note: Shade, plenty of clean bedding.
Old Condemned Shed now used for calves and mule.

New Shed with 8 standings.

Note: Separate feeding troughs and concrete floor.
having in mind the circumstances of the small owner", is being written by D. J. Bettson at the Imperial College of Tropical Agriculture.

-'Building up a dairy industry, however an efficient breed of cattle is evolved in the tropics, they will not be efficient milk producers until they are managed correctly. Correct management is primarily good feeding. There are not many indications in Trinidad that milking cattle are either well fed or well managed. Many of the cattle kept by peasants, which were seen by the writer, looked in poor condition and were underfed. One has only to travel around the island and examine the cattle tethered on the roadside to see that some of them are undernourished. The large and medium sized dairy farmer presents a different picture and scantly feeds his stock according to the usual maintenance requirements and extra production feed per gallon of milk produced. Most of these farmers are enlightened on the subject of management and feeding and the writer does not intend to spend much space on the large or medium sized dairy farmer.

These better educated farmers mostly grow their own forage and pasture-grasses for the maintenance of their cattle. Unfortunately not very good pasture or forage grasses are available for these farmers to plant. The position as regards forages will be discussed in a later paragraph. These farmers also feed concentrates in a balanced ration on a lbs. per gallon basis.

Waterloo Estate dairy has an efficiently worked out feeding programme. There are some 25 acres of grass for cutting. This is split up into 10 acres of guinea grass and 5 acres of elephant grass. There are also 15 acres of grazing, mostly split up into paddocks in which water is laid on. Also Farr grass and Seabpoo grass are cut from the tracks in the estate and used for feeding the cattle. The returns from the grass crop are used in January and February. The cows are fed 6 lbs. of concentrates per
Whether one is considering temperate or tropical conditions the feeding of the dairy cows is one of the essential factors in building up a dairy industry. However, an efficient breed of cattle is evolved in the tropics, they will not be efficient milk producers until they are managed correctly. Correct management is primarily good feeding. There are not many indications in Trinidad that milking cattle are either well fed or well managed. Many of the cattle kept by peasants, which were seen by the writer, looked in poor condition and were underfed. One has only to travel around the island and examine the cattle tethered on the roadside to see that many of them are undernourished. The large and medium sized dairy farmer presents a different picture and mostly feeds his stock according to the usual maintenance requirements and extra production feed per gallon of milk produced. Most of these farmers are enlightened on the subject of management and feeding and the writer does not intend to spend much space on the large or medium sized dairy farmer.

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Waterloo Estate dairy has an efficiently worked out feeding programme. There are some 25 acres of grass for cutting. This is split up into 20 acres of guinea grass and 5 acres of elephant grass. There are also 15 acres of grazing, mostly split up into paddocks in which water is laid on. Also Para grass and Bamboo grass are cut from the traces in the estate and used for feeding the cattle. The ratoons from the cane crop are used in January and February. The cows are fed 5 lbs. of concentrates per
gall. of milk. This together with the forage fed covers maintenance and production. The ration is relatively high in protein as the farm manager believes that this keeps up the milk yield and makes up for the lower protein content of tropical forage in comparison with that of temperate forage. The concentrate mixture is made up on the farm and the concentrates are fed prior to milking.

(56) The ration for the milking herd is made up as follows:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linseed meal</td>
<td>200</td>
</tr>
<tr>
<td>Cotton seed meal</td>
<td>200</td>
</tr>
<tr>
<td>Good mixed feed*</td>
<td>200</td>
</tr>
<tr>
<td>Coconut meal</td>
<td>500</td>
</tr>
<tr>
<td>Crushed corn</td>
<td>125</td>
</tr>
<tr>
<td>Crushed oats</td>
<td>100</td>
</tr>
<tr>
<td>Rice or bran</td>
<td>100</td>
</tr>
<tr>
<td>Fish meal</td>
<td>75</td>
</tr>
<tr>
<td>Na Cl</td>
<td>25</td>
</tr>
<tr>
<td>Pulverised limestone</td>
<td>25</td>
</tr>
<tr>
<td>Bone meal</td>
<td>25</td>
</tr>
</tbody>
</table>

1,600

* See section on concentrate feeding.

This mixture is 24% protein and 80% total digestable nutrients, and is fed at a rate of 5 lbs. per gall. of milk produced.

(57) For calves and heifers a mixture with a lower protein content is made up.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton seed meal</td>
<td>140</td>
</tr>
<tr>
<td>Coconut meal</td>
<td>300 - 400</td>
</tr>
<tr>
<td>Crushed corn</td>
<td>160</td>
</tr>
<tr>
<td>Crushed oats</td>
<td>100</td>
</tr>
<tr>
<td>Rice bran, wheat bran</td>
<td>100</td>
</tr>
<tr>
<td>Fish meal</td>
<td>100</td>
</tr>
<tr>
<td>Limestone</td>
<td>100</td>
</tr>
<tr>
<td>Na Cl</td>
<td>12½</td>
</tr>
<tr>
<td>Bone meal</td>
<td>12½</td>
</tr>
</tbody>
</table>

This mixture contains 15 - 16% protein, 70 - 80% total digestable nutrients. The calves are left with the dam for the first four days. Then they are bucket fed and have concentrates and cut grass
available to them as soon as they desire them. They are weaned at 6 - 8 months and are then fed on forages and concentrates, and are turned into the paddocks to graze and for exercise. These paddocks have shade trees and water available.

(58) This is a well planned feeding programme and as such, together with sound management and breeding, is showing excellent results in perfect stock and high milk yields. If an animal in this herd does not show a good yield of milk it can be assumed that some factor other than lack of food is at fault. It is essential that concentrates are available for these enlightened dairy men to enable them to ensure maximum production from their stock.

(59) What about peasant owned cattle? How are they fed? It is very difficult indeed to obtain a clear cut picture of the feeding of the peasant dairy cow. It is difficult to extract information from the peasant as to what feeding he actually does. As has already been stated it is possible to come away with an entirely wrong conception if leading questions are put to the peasant, as his answers will always be in the negative or the affirmative according to which he thinks will please the interrogator more. A number of visits and the sorting of information received are necessary to obtain a fairly accurate idea of the feeding of the peasant dairy cow.

(60) To give the reader an idea of the peasant's standard of feeding it is as well to take an average example. This peasant owns four milking cows, three calves and a donkey. No grass is grown on the holding yet the mainstay of his feeding policy is grass. The cows are turned out onto the roadsides during the day to eat as much grass as they can find. A terrific amount of time is involved in collecting grass from waste ground by means of the donkey. This grass is fed to the animals twice a day. On questioning this peasant said that his policy was to feed grass, any scraps and concentrates to his best cows when he could afford them. The concentrates cost 9d per lb. and consist mainly of a mixture of coconut meal and oilmeal, and are fed as a gruel, i.e. mixed with water.
Very vague answers were given as to how often the cows were actually fed on concentrates, but it can only be assumed that his better cows get concentrates when they are available. Many peasants do not feed concentrates at all but rely entirely on collecting grasses and roadside tetherings. Only a very small percentage of peasants attempt to grow some of their own forage.

(61) The Utilization of Grasses as Feeding Stuffs.

As has already been stated, it is a common sight in Trinidad to see cattle tethered by the roadside as this is the peasants’ way of assuring feed for his animals. Needless to say, such grazing is not of the best quality. There is in Trinidad, as in most of the Tropics, a lack of suitable forages and fodder grasses holding up efficient production by the existing stock. Some research is being carried out at the Imperial College, but much more must be done to enable a healthy, vigorous cattle industry to be built up in the Tropics. In the foreword to "The Provision of Animal Fodder in Tropical and Sub-Tropical Countries" R.O. Whyte states:

"Research on grassland management and fodder production in the Tropics has not achieved the same stage of development as in temperate zones, but several factors now operating are tending to give it a more prominent place among the Agricultural investigations of a number of tropical and sub-tropical countries and regions. The main factors concerned are the development of mixed farming as a basis of a more settled and permanent system of agriculture, the realization of the value of a grass cover in conserving the soil, and the attempt to raise the level of nutrition in the countries concerned by a wider range of animal by-products."

Expansion in Animal Husbandry must be part of Trinidad's Agricultural policy and with this aim in view a thorough investigation must be carried out both in finding suitable species of grasses and in the
management of grassland once it is established. Grass as a cultivated crop has in the past held no important place in West Indian Agriculture.\(^{(8)}\) The rough pasturage available to the peasant has, during the years, decreased in value due to overstocking and cutting which has resulted in a decrease of the nutritive species. In Trinidad some roadside grazings consist of the following species.

- Paspalum fasciculatum: Bamboo grass
- Paspalum conjugatum: Sour grass
- Axonopus compressus: Savannah grass.

\(^{(62)}\) Paterson writes: \(^{(8)}\) "That the few scientific investigations of West Indian fodder grass (mostly done by Paterson) have proved that the chief factors concerned with the efficient production and management of cultivated forage and pastures in cooler climates are equally important in the tropics. For long term fodder crops and grasslands generally, a scientifically planned system of management, rotational mowing or grazing, appropriate manuring, the choice of a specimen variety and strain well suited to the environment, the feeding of young herbage in preference to old are all fundamental to sound farming practice."

It is, however, necessary to work out systems of management suited to the tropics.

\(^{(63)}\) The potential forage grasses of the West Indies as listed by Paterson are as follows:

(a) Pasture or Turf-forming species, comprising the more important bottom grasses capable of forming a more or less dense, close turf sward.

- Axonopus compressus: Savannah or carpet grass
- Cynodon dactylon: Bahama, devil or doob grass
- Stenotaphrum secundatum: Pimento or Buffalo grass
- Stenotaphrum secundatum: Crab or St. Augustine grass
- Eremochloa ophiuroides: Centipede grass
- Polytrias praemosa: Java grass.
(b) Trailing species, which do not form any turf but produce a thick tangled cover 1 - 3 ft. in height, composed of a profusion of intertwined leafy runners.

- Brachiaria mutica: Para or Mauritius grass.
- Melinis minutiflora: Molasses or Wynne grass.
- Andropogon putusus: Barbados sour grass.
- Cynodon plectostachyum: Star grass.

(c) Tufted or stool forming species, mainly tall erect cane like grasses.

- Pennisetum purpureum: Elephant grass
- Tripsacum laxum: Guatemala grass
- Panicum maximum: Guinea grass
- Saccharum sinense: Uba or other thin sugar canes.
- *Paspalum conjugatum: Sour grass of Trinidad.

In addition to the above, worthy of mention are:

- Panicum maximum var. Colonial: Colonial grass
- Sorghum vulgare, Sudan-ense: Sudan grass.

(64) There is not space here to discuss each grass in turn. However the chemical composition of most of these grasses is now known. As yet no varieties and strains have been evolved to suit any particular ecological conditions. Very little work has been done on actual feeding trials and management of these grasses. Some work is being done on several of these grasses; for example K.D. Guyadeen at the Imperial College is working with Guatemala grass and Colonial grass.

(65) At present it is the general opinion that the tall cane like grasses give the highest yield of good nutritious herbage. For example Elephant grass is capable of yielding 60 - 70 tons of young herbage per acre per annum. This grass is very succulent and palatable. The average consumption of Elephant grass by dairy cows is 51 lbs., this is approximately half that normally consumed by Temperate zone cows. Some work however shows that it is an unsatisfactory roughage for cows in milk and that owing to its inferior nutritional value (inferior to temperate grasses) and the low level of consumption, heavy feeding of supplementary concentrates is
necessary. However Elephant grass remains for the present one of the most commonly used grasses.

The search for a protein rich forage legume suitable for growth in the tropics still goes on. Since 1936 the Imperial College has imported from various tropical countries a number of species and varieties of semi-perennial forage legumes, but none of these have passed the observation stage and their potential value has still to be determined. The following perennials are able to give a fair cover of the ground under Trinidad conditions.

- *Indigofera subulata*
- *Indigofera endecaphylla*
- *Pueraria Javanica (Tropical Kudzu)*
- *Centrosema pubescens*
- *Calopogonium mucunoides.*

All above are perennials and set viable seed. They are slow in development and need careful management to prevent their killing out by weeds. *Indigofera endecaphylla*, Trailing Indigo, is the most promising. It is said to be toxic to stock, but no ill effects were found at the Imperial College. Stock seem to relish legume and grass mixtures grown at the Imperial College. The procedure is to plant the grass first and allow it to become established. Then the legume seed is planted after the first cutting of the grass. Concentrated sulphuric acid treatment gives better germination. The following mixtures have been or are being grown at the Imperial College:

1. *Indigofera endecaphylla & Uganda grass* — Grazed well.
2. *Indigofera endecaphylla & Merker grass*
4. *Calopogonium mucunoides & Merker grass* — Calopogonium died out.
5. *Calopogonium mucunoides & Uganda grass* — N.B. Merker and Uganda are two varieties of Elephant grass.

There is much work to be done if a suitable tropical legume is to be found. There is in the West Indies and the tropics on the whole a great need to find a legume that will take the place...
of the clover and the lucerne of the temperate countries. In parts of the West Indies, Puerto Rico and Tobago, attempts are being made to improve the average protein of the forage fed to livestock by establishing on the grazing grounds and among the fodder grasses a number of leguminous shrubs and trees.\(^8\) The young shoots and foliage from these young trees are rich in protein and thus may produce a better protein balance. The taller trees are pollarded and a profuse growth of new shoots and leaves within reach of the animals is encouraged. These trees may also act as wind breaks, shade and as soil recuperative agents. More information however is needed before this idea can be put into practice. Some of the species suggested are:

- Bucare
- Nicaraguan shade
- Wild Tamarind
- Women's tongue
- Mesquit bean
- Erythrina butuvana
- Gliricidia maculata
- Luccaena glauca
- Albizzia lebbeck
- Prosopis chilensis

\(^{69}\) The problem of pastures in Trinidad will not be solved alone by finding suitable species. With suitable species systems of sound management will have to be established, including rotational grazing, rotational cutting, rotational stocking, manuring and liming, drainage, water supply and the establishment of shade trees. Lack of space forbids enlargement on these points but their importance is as great in the tropics as in temperate grass lands.

\(^{70}\) We must now consider briefly the possibilities of storage of grass to bridge the gap of the dry season. Sugar cane estates are fortunate in having a supply of cane tops to feed at this time. Hay making and grass drying, two common methods of preserving grass in temperate regions are impractical in the tropics. The climate is unsuited for making good quality hay. The grass drying method is also unsuitable due to the expense of setting up grass drying units. Storage of grass as silage would seem to be the best method of preserving grass in the tropics. Some investigations have been carried out on silage making. From preliminary investigations\(^{10}\) it seems
certain that silage made by a low temperature fermentation process in the middle of the rainy season is practicable. Losses are not excessive provided necessary precautions are taken in filling the silo. Only young grass, i.e. nutritious forage with a dry matter content of 20% or more should be ensiled. A legume grass mixture from 1:4 to 1:1 has distinct advantages over grass silage alone. Bulk silage can be successfully made in pits without any special facilities or equipment. Choice of site for drainage is important. It must be noted that in a feeding trial where Elephant grass under irrigation was compared with Elephant grass silage, milk production when fed on the silage was reduced by $4.23 + 1.682$. Further investigations must be carried out. Cost accounts must be kept and the Economics of silage making must be worked out. Mixtures of grasses and legumes must be ensiled and their nutritive value tested.

(71) Mr. Clay after his tour of the West Indies stated at the Jamaica Conference -

"Further investigation is needed on (i) the feeding value of pasture and fodder grasses, particularly to increase their protein content and palatability, (ii) improvement of pasture and legume mixtures and (iii) the use of silage, e.g. cane tops during the crop season."

The need for investigation in these matters is realised by the authorities, and yet there is no grassland research station in the West Indies. Conditions in the West Indies are different from those in East Africa, a species may do well there but may fail completely in Trinidad. There is a need for Agronomists to evolve strains of species suited to the West Indian islands and to make trials of species found in other parts of the tropics. It may seem to the reader that much space in this report has been taken up with this matter of forages, but grass is the backbone of feeding of dairy stock, whether one deals with temperate regions or the tropics.
As has already been mentioned the large dairies and some of the middle size dairy owners feed concentrates regularly, and to a set production system. The maintenance of a dairy cow works at 6 lbs. starch equivalent and 6 lbs. protein equivalent. The maintenance should be supplied forages where possible. The maintenance requirements of an average sized cow of a few of the commoner local fodders are as follows.

(a) 55 lbs. cane tops. 
(b) 45 lbs. Uba cane and tops. 
(c) 80 lbs. Elephant and Para grass.

If larger amounts of young protein rich grasses are fed some of the production ration is also derived from the forages. The production ration per gallon of milk is 2.5 lbs. of starch equivalent and .6 lb. of protein equivalent. At the Government Stock Farm, St. Joseph, the following mixtures have given good results fed at the rate of 4 lbs. per gallon of milk produced. Feeds are two feeds a day and mixed with water. A mineral mixture at the rate of 5%, consisting of 2 lbs. of air slaked lime, 2 lbs. salt, 1 lbs. bone meal, forms part of this ration.

No. 1.

1 lb. Cotton seed meal or soya bean meal
1 lb. Bran
½ lb. Linseed oil meal
½ lb. Coconut meal
1 lb. Molasses.

No. 2.

1 lb. Linseed Oil Meal
1 lb. Soya bean meal
1 lb. Cotton seed meal
3 lbs. Coconut meal
6 lbs. Molasses.
(73) The Government Marketing board at St. Joseph also produces a concentrate feed available for sale to the dairy owners and peasants on the island. There are complaints that this mixture is not all that it should be and that it is low in Protein. The mixture is fed at 4 lbs. per gallon of milk and is made up as follows:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>10</td>
</tr>
<tr>
<td>Oats</td>
<td>10</td>
</tr>
<tr>
<td>Rice bran</td>
<td>13</td>
</tr>
<tr>
<td>Flour</td>
<td>5</td>
</tr>
<tr>
<td>Cotton Seed meal</td>
<td>25</td>
</tr>
<tr>
<td>Oil meal</td>
<td>20</td>
</tr>
<tr>
<td>Crushed lentils</td>
<td>8</td>
</tr>
<tr>
<td>Dried yeast</td>
<td>5</td>
</tr>
<tr>
<td>Lime</td>
<td>1</td>
</tr>
<tr>
<td>Salt</td>
<td>2</td>
</tr>
<tr>
<td>Bone meal</td>
<td>1</td>
</tr>
</tbody>
</table>

(74) This mixture contains 19% Protein equivalent compared with 24% Protein of Waterloo dairy mixture. The mixture is sold at 6¢ per lb., 40 lbs. being the minimum amount sold. Another concentrate, coconut meal, produced on the island itself is often difficult to buy due to a shortage, and is often available to the peasant on the black market only. See Appendix C for the imports of grains and meals on the island. The question is, how many peasants feed their cows on concentrates. The marketing and co-operative division have estimated that only 10% of the total number of cows on the island are fed regularly on concentrates. The facts would seem to be that although a number of peasants feed their cattle on concentrates, very few feed them regularly. It is always a question as to whether the peasant can afford to buy the concentrates and whether they are always available.

(75) The position as regards concentrate feeding then is that the estate dairies and the bigger producers of milk use concentrates
regularly, some buying the Government mixture and augmenting it, others making their own mixtures. A percentage of peasants feed concentrates to their cattle at one time or another, but few do so regularly.

(76) Briefly then to summarize feeding of dairy on the island. The estate dairies and the middle sized dairy farmers have a sound system of feeding for the production of milk. They are handicapped in producing more milk more economically by the absence of suitable pastures containing nutritious forage legume mixtures. Also concentrates are not always available to them. Taking the other side of the picture, the peasant is feeding his cattle in a very inefficient way. Most of his time is taken up in collecting not very nutritious grasses and transporting them to his cow house. He is further handicapped by lacking land to grow any forage on, (though it would take much education before he could be persuaded to grow grass as a crop on his own land), and by the lack of suitable grazing pastures. Attempts are made by the Department of Agriculture to educate the peasant by issuing pamphlets free of charge, "On the proper care and management of dairy cattle under local conditions."
Standards of sanitation vary immensely over the whole of the island. Of the estate and medium sized dairies Waterloo once again sets a fine example. The cowsheds were kept cleaned out and swilled down. There are concrete approaches to the cowshed. The cows are hosed down every day. The milkers don clean overalls for milking. All the equipment is sterilised. No criticism can be made about the conditions prevailing at Waterloo dairy and its cleanliness and general good appearance gives credit to the dairy manager.

Some of the other dairies visited were not in such excellent condition though the standard of sanitation was by no means bad. One eccentric educated farmer keeping 55 dairy cows does not bother to cool his milk, but bottles warm and then delivers, supposedly immediately. The dairy inspector told this farmer to use two buckets, one for washing the cows with and the other to milk into. The writer was asked what was wrong in using the same bucket, i.e. washing the cow first, pouring away the water and then milking into it? If this is the attitude an educated European takes it must be understood that it will be very difficult to educate the peasant to produce clean milk.

Some of the conditions under which the peasant produces milk are bad. The sheds are dirty, the equipment is dirty, the milkers are unclean and their clothes are not very suitable. The sale of milk regulations are enclosed at the end of this section. As can be seen these regulations state that all milk vessels must be approved and clean, also that all retail milk sellers must cleanse their vessels by steam or boiling water. It would seem of benefit if a clause was included to ensure the sterilising or boiling of all equipment used by the wholesalers. After all many of the peasants sell their milk wholesale to nearby dairies and therefore to ensure that the dairy obtains clean milk sterilised equipment should be used by the producer. It is not suggested that the peasant boils his vessels after every milking, but a boiling at least once or twice a week is advocated together with a thorough scrubbing and
cleansing after every milking.

(80) Several of the peasants were found to have the cesspits of their cowsheds overflowing and the yard was a mixture of urine and mud. This gave rise to unpleasant odours and fly nuisance. This must be discouraged and the peasant must be instructed that it is essential for him to empty the pit and keep it from overflowing. A cover should be kept over every such pit.

(81) A precis of the sale of milk regulations follows here:

1. No person shall keep cows unless he is registered as a cowkeeper.

2. No person shall keep cows in any place for the sale of milk unless the place is licensed, unless

   a) every cow within the proposed place has within a period of 6 months come from an accredited herd or has been tested by the Tuberculin test without reaction.

   b) the cattle have been inspected.

Cleansing of Dairies.

(a) They must be cleansed frequently.

(b) They must be limewashed at least twice a year except painted parts which can be cleaned otherwise.

(c) Floors must be kept swept and refuse removed at least once a day.

Drainage of Dairies.

Liquid has to be conveyed by a suitable channel to a 'drain inlet situate in the open air at a proper distance from any door or window of such dairy'.

Situation of Shed.

This must not be less than 12 Ft. from house, kitchen or a cesspit.

Construction of Shed.

(a) The floor must not be below level of adjoining ground.
(b) The floor must be laid with stone, brick, concrete or some other impervious material.

(c) Liquid must be conveyed by slope or channel to a drain outside the shed.

(d) The shed must be wholly or partly provided with a roof so constructed as to be water-tight.

(e) No cowshed shall be used for any other purpose than stalling and milking of cows.

Precautions to be taken against contamination of milk.

(a) Cows must be milked in a clean shed.

(b) Cows must be washed.

(c) Milker must be clean.

(d) Milker must wear clean outer garments.

(e) Milk must not be deposited anywhere liable to infection (in sleeping quarters or cess-pool).

(f) Milk vessels must be clean and approved. All retail milk sellers must cleanse their vessels by steam or boiling water.

(3) No person shall sell milk without a license.

(4) No person shall sell milk which comes from dairies or other places not observing above regulations.

(* Cowhouse).

(82) With regard to Rule No. 4, unfortunately far too much milk is sold from places not observing the above regulations. To summarise: most peasant cowsheds house mules or donkeys, many sheds are not kept in a clean condition. The precaution against contamination of milk as stated above are not taken in most instances. The regulations are simple and sound and the writer feels that by education, propaganda in the local press and even in the local cinema, accompanied by stricter enforcement of the regulations, would do much to raise the standards of sanitation on the island and thus lead to clean milk production.
On the whole the Island is comparatively free of diseases. The cattle are tested annually by the Government for Tuberculosis and not many reactions are found. Compensation to the extent of 80% of a maximum of $350 is paid for cattle found infected. In May, 1951, out of 1,800 cattle tested in the Port of Spain area, there were only 19 reactions, i.e. one per cent. Mastitis and bovine abortion have appeared mildly but have been quickly eradicated. Bat rabies, which used to be common on the island, is now under control. Imported stock are liable to contract Red water disease. To counteract this all cattle are treated before importation, while local stock becomes immune at birth.

Greatest losses and deterioration of health are through internal worm parasites. It is recommended to treat young stock with a drench of copper sulphate or phenothiozene once a month. This is the standard routine in large and some of the medium sized herds, though it is scarcely ever done by peasants. As regards external parasites, there is some natural resistance shown by animals having Bos Indicus blood. However loss of blood and the irritation set up must tend to decreased milk yields. Spraying with Arsenic compounds every three weeks or when there are signs of infestations is advisable. There is no spraying or dipping done by the peasant. Cattle ticks (Bcophilus species) can be controlled by D.D.T. spraying, but it is only effective if carried out on all the cattle in an area simultaneously.

The main signs of ill health of cattle on the island are probably due to underfeeding and mis-management. Eradication of internal and external parasites together with a high standard of feeding would make the cattle of Trinidad as healthy as could be desired. Care must be taken not to import any diseases by bringing infected cattle into the island.
(7) SUMMARY AND RECOMMENDATIONS.

Summary.

It is shown:

(1) That there is an urgent need for the production of more fresh milk in Trinidad.

(2) That there is no set breeding policy on the island and yet there is a need of better cattle suited for the humid tropical conditions of the island.

(3) That the milk producers are split into (a) Large or Estate dairies, (b) Middle-sized dairies, and (c) Peasant dairies.

(4) That the peasant plays an important part in milk production and produces over half the island's milk supply.

(5) That whereas housing on the large dairies is good and is in good condition, housing of peasant cattle is usually inefficient.

(6) That the large and medium dairies usually work to a set feeding programme whereas the peasant's cow is fed mainly on roadside grazings and scraps.

(7) That there is an urgent need for the finding of suitable grass legume mixtures composed of nutritious and high yielding strains, which can be grown successfully on the island.

(8) That only 10 - 15% of the cows on the island are fed regularly on concentrates.

(9) That the milk regulations are sound but due to lack of enforcement, standards of sanitation amongst the peasants are bad.

(10) That diseases fortunately are not very prominent amongst cattle in Trinidad.
Recommendations.

It is an easy matter to criticise conditions as found in any given area, it is not such an easy matter to criticise constructively, to give practical advice, advice which will change conditions for the better. However in Trinidad much needs to be done to improve the dairy industry. To begin with, one is faced with immense difficulties, peoples who are not accustomed to the handling of dairy animals, no true village centre, no land for the individual to grow forages on, no true dairy breed and so on. With the exception of some East Indians, the farmers of the island must be taught the handling of cattle. Dairy cattle are sensitive beings, even some of the scrub animals of Trinidad occasionally look well kept. This shows the hand of a true cattleman. In Trinidad indeed a policy of 'Back to the land' must be endorsed. The writer has seen too many aged couples looking after the small dairy herd whilst the son is off in the city, driving his new American taxi, making money the easy way. Who is to carry on when these aged farmers die out? The Government must show the people that there is a living to be made in farming, that there is honour and not shame in working on the land.

The Estate dairies and medium dairies do not present too large a problem; they can educate their labour to handle cattle and instill in them the spirit of the efficient dairyman. These men may later start on their own and spread the gospel. Waterloo Dairy has shown that high bred Friesans, (theoretically now most of Waterloo dairy herd is actually pure bred) can be maintained successfully, giving high yields if supplied with the 'amenities' that Waterloo supplies. By these amenities is meant, cool buildings, shade in the paddocks, water constantly available, good feeding, and above all excellent management. Waterloo is already selling bull calves, which are in high demand, to South America, etc. Other Estates should be encouraged to keep a dairy herd. Waterloo could supply some of the foundation stock. Such concerns should be an economic proposition, as there is no need for their buildings, etc. to be such a show place
as Waterloo dairy. The important factor here would be that of sound management and the training of efficient labour. The opening up of such dairy farms would mean more fresh milk distributed amongst estate workers, etc., and would, as Hammond states, result in better health and more efficient labour as well as some profit to the estate concerned.

(89) However the peasant dairy farmer presents a totally different picture. If the peasant were given one of Waterloo's high bred Friesan-Zebu heifers it would degenerate very fast indeed under the peasants conditions of feeding and management. There is no future for crossbred cattle amongst the peasants. Peasants do not have the facilities to maintain a high bred Friesan-Zebu cross herd. Another solution must be found for the peasant. A herd of cattle must be evolved to withstand the climatic conditions of the island, to remain relatively free from diseases and pests and to give a suitably high milk yield of say 400 - 600 gallons per lactation, when fed on local food supplies, assisted by imported or locally grown concentrates. As has been stated possibilities lie in the established dairy breeds of India, such as the Sahiwal and the Red Sindhi. It is important to fit an animal into an environment as similar as possible to the one it had in its evolution and origin. (12) The writer feels that thought should be given to bringing into the island one of these herds, in large numbers than the few Sahiwals at the Tobago stock farm at present, and selecting from this herd a strain suitable to conditions in Trinidad. Success of one of these breeds on the island would only solve part of the problem for then education in management must take place. It must be stressed again and again, that sound breeding must go hand in hand with sound management and feeding policy.

(90) The other tremendous problem in peasant dairying is the lack of suitable feed for the animals. Most peasants have too little land to warrant the encouragement of growing grass on their land. However, as in Jamaica, the peasant could be encouraged to grow
Elephant or Guatemala grass on all his borders and boundaries of his land. He must be taught to cut this rotationally at 7-8 week intervals. These strips would save a certain amount of the time and labour spent in collecting grasses from the road side. The writer feels that some thought should be given to communal pastures. In Trinidad as there is no true village the Department of Agriculture would have to manage these pastures. Some of the many waste lands could be drained, manured and put down to pasture. These pastures could also act as experimental pastures in trying out in practice some of the new species evolved. The peasant would have to pay a certain amount for each animal he grazed on these pastures, the amount to be decided by the Department. A number of these pastures in each area would enable the pastures to be grazed rotationally. The Department would have to appoint a man to visit these pastures regularly, to decide when to switch from one pasture to the next. Once the peasant is educated to realise that his cattle will produce more milk if fed efficiently, and he sees he is being helped by the provision of pastures, the next step is to encourage concentrate feeding for bigger production.

(91) Finally, as mentioned before, the standards of sanitation laid down must be enforced. The Press, wireless and the cinemas should be utilised to advise and educate the peasant dairy farmer.

(92) There is no easy solution to the problem of milk production on an efficient basis in Trinidad. The wet tropics are not ideally suited to milk production, but with care it is possible to produce fresh milk. In Trinidad many commissions and livestock officers have recognised the need for improving the industry but have been unable to get the Department of Agriculture to fix a policy or to get much-needed Research work done.
REFERENCES

(2) Hammond, J. Report on Cattle Breeding in Jamaica and Trinidad.
(6) Shannon, J.L. The Breeding, Care and Management of Dairy Cattle in the Tropics. Trinidad & Tobago Dept. of Agriculture.
### Caribbean Commission on Dairying

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**Monthly Maximum**: 80°F. to 90°F.

**Monthly Minimum**: 60°F. to 70°F.

**Temperatures as high as 95°F. and as low as 60°F. are frequently recorded.**

**Humidity**: High.

Atmosphere saturated with water vapour at night.

**Average monthly minimum humidity**: 

**Dry Season** - 50% of saturation

**Wet Season** - 70% of saturation.
APPENDIX B.

Climate.

Ref. Agriculture in the West Indies, Colonial Development and Welfare in the West Indies.

Climate: Can be described as fully Tropical.

There is a marked wet and dry season.

Dry Season - Jan. to mid May
Wet Season - May to December.

Annual Precipitation of Rain - From less than 50" to more than 120".

Maximum rainfall being in the Eastern part of the Northern Range.

Minimum rainfall being on the Western and extreme South-Eastern coasts.

Temperature.

Monthly Maximum - 85°F. to 89°F.
Monthly Minimum - 66°F. to 72°F.

Temperatures as high as 95°F. and as low as 62°F. are frequently recorded.

Humidity - High.

Atmosphere saturated with water vapour at night.

Average monthly minimum humidity:

Dry Season - 50% of saturation
Wet Season - 70% of saturation.
## APPENDIX C.

**Imports of grains and meals for 1948.**

(Marketing and Cooperative Division).

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