READING PROJECT
ON
"EFFECT OF BREEDING POLICY ON MILK
PRODUCTION IN THE WEST INDIES"

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INTRODUCTION.

There were first brought in the West Indies soon after their discovery, a few cattle,  

BAHAMAS. 2. These were the native unimproved animals, the  

BARBADOS. 3. A few cattle and horses were brought from Spain and Portugal.  

BRITISH GUIANA. 5. Cattle of the Guianian type, which are said to have been brought from Brazil.  

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TABLE 1. 19.
Cattle were first brought to the West Indies soon after their discovery in 1492. These were mostly unimproved animals. The first European settlers, who were chiefly Spaniards and Portuguese, brought in livestock from their own countries, which are known in the West Indies as "Creole" stock. These cattle had a proportion of Zebu blood, due to two reasons:

(a) There was constant migration of cattle from North Africa to Spain and Portugal.

(b) The Settlers often brought cattle from the Spanish and Portuguese possessions on the West Coast of Africa.

The present day indigenous scrub cattle of the West Indies are derived from indiscriminate crossings of the *Bos Taurus* breeds and the old creole stock, together with some more recent *Bos Indicus* importations.

Pure-bred *Bos Taurus* stock are useless except under very suitable conditions of climate and management. However, they are maintained in most of the islands for cross-breeding with other types of cattle in efforts to produce good dairy animals.

Milk production is not high, and only limited supplies are available. Most of the islands have tried to correct this by adopting various breeding policies. The effects of these are numerous and varied, and they gave discouraging as well as encouraging results. These policies and their effects will be indicated, as each island is separately discussed in the following pages of this project.

**BAHAMAS.**

From 1920 to the present, there has been no improvement in the livestock industry as regards breeds or breeding. Most of the native stock was in-bred degraded stock of the poorest type. Although *Bos Taurus* breeds were imported to improve the type of animal, the general effect has been very small.
The people are ignorant about the raising and breeding of livestock; thus, the importation of new breeds has been stopped. A Veterinary Officer was appointed in 1944, and his aims are to educate the populace in animal husbandry.

There is one large privately owned dairy on one of the islands which contains about 600 cows of the Jersey, Guernsey and Holstein-Friesian breeds.

BARBADOS.

Until 1920, the animals used as dairy stock, were mainly the creole cattle and pure-bred or graded animals of the following Bos Taurus breeds were beginning to be used:—Devon, Sussex and Ayrshire.

Since then, the improvement of livestock went on largely as a matter of private enterprise. The only improvement carried out by the Government was on part of the dairy herd at the Government Mental Hospital. This situation continued until 1944.

Two policies, for improving stock, are now adopted, viz:—


(2) A private enterprise, namely the Barbados Dairy and Stock Breeder's Association. The Association maintains stud books and livestock registers, chiefly of dairy stock and small stock such as pigs and goats.

Exact dates of importations of dairy stock whether pure-bred or graded cannot be given. A few other Bos Taurus breeds introduced were:- Jersey, Holstein-Friesian and Guernsey. The graded Guernsey animal appears to be the most popular for dairy purposes, as it produces Milk of good quality and quantity, and is economic to maintain. Grade Holstein-Friesian cattle are not popular, as they require too much bulk fodder for local conditions, and they produce milk with a low fat content.
Very few people keep milk records, and it is hoped that laws will soon be made either to facilitate or enforce livestock improvement and record keeping. Dairy stock in 1946 numbered about 11,000. These were grade animals of the following breeds:Ayrshire, Jersey, Holstein-Friesian, Guernsey and Zebu.

It was found that pure-bred and highly graded Bos Taurus animals could maintain their production, provided that management and nutrition are on a sound basis. There are experiments now in progress on Holstein-Friesian and Guernsey animals as regards maintenance of production, fertility and other characteristics. The breeding policy adopted is crossbreeding. Pure-bred Holstein-Friesian and Guernsey bulls are maintained by Government for that purpose at stud centers throughout the island, and they are used on grade dairy cows. Cross-breeding is necessary for peasant cattle, if their animals are to produce milk economically. The aim is to cross-breed cattle for peasants, so that their cows would have at least \( \frac{1}{4} - \frac{1}{2} \) of Bos Indicus blood in its breeding. It has been recommended to the Government to maintain some Sahiwal bulls in order to maintain a percentage of Indian blood in peasant cattle, also to use artificial insemination in order to speed up the breeding programme.

The Government is at present increasing its dairy herd in order to have surplus heifers and bulls of good grading available for sale to the public. A milk recording society was started and efforts are being made to encourage the scientific breeding of livestock. Assistance is given to dairymen to help them dispose of their products, to avoid over-production and to encourage better distribution of produce.

Careful mating of "good" dams to imported sires was carried out in 1948, and progeny which measured up to fixed standards were retained, while the rest were sold. Good foundation dairy cows were obtained from outside countries, in order to breed animals for sale to the public. In three years over 4,500 services were recorded to tested sires; and this has gone a
long way to improve dairy herds.

An expansion of the dairy industry is expected in country areas, and care is being taken about the distribution of the produce to prevent over production in some areas.

BRITISH GUIANA.

Foundation stock is Creole cattle. There are no fixed types or standards.

By 1934, dairymen in the Georgetown area had already felt the need for good dairy animals. They had crossed their Creole stock with Holstein-Friesian bulls owned by the Government; and heifers, the progeny of this cross after having one calf showed great improvement on their dams in milk yield.

The Government herd was started in 1929 with two cows, and had totalled forty-eight by June 1938. This herd was made up of pure-bred Holstein-Friesian, Guernsey and grade cattle. In 1933, it was put on a commercial basis with the aim of breeding the best bulls to the best available cows in order to get improved milk production, and uniformity in type. This was gradually attained. Most dairymen by that time demanded grade milk cows, or heifers in calf, but were less inclined to buy good grade bulls to improve their herds.

The chief work done in grading up was crossing Creole stock with pure-bred Holstein bulls; the highest grade animals i.e. the fourth grade, showed characteristics of the pure-bred animal. In 1938 it was decided that for British Guiana, grading up was the cheapest, quickest and most economical method of herd improvement.

Some conclusions drawn by the Department of Agriculture, British Guiana, in 1938 were:-

(1) It was possible to build up a profitable grade herd of dairy cattle by using pure-bred bulls on Creole cows.

(2) In milk yield, the grade cow compared most favourable with
with the pure-bred animal, and it was hardier and more economical to feed.

(3) Creole cattle had no place in economical dairying.

(4) The cost of rearing calves could be considerably reduced by feeding a limited amount of whole milk and substituting a calf meal.

(5) With improvement of breed, there also had to be an improvement in food supply.

The later work of the Department was based on those conclusions, and a colony wide improvement programme was able to be undertaken. This was started in 1942.

The objective of this policy was to produce by cross-breeding a cow that would give the maximum of milk, for local conditions. The Holstein-Friesian breed was selected to be used in this programme. The pure-bred animal was found not entirely suitable to local conditions, for the milk was poor in fat and the animal did not possess the necessary hardiness. To make up for those short-comings in the pure-bred animal, Zebu blood was introduced into the Holstein. The most suitable animal was found will be that with $\frac{3}{8}$ Holstein x $\frac{1}{8}$ Zebu. The Zebu blood gave added stamina, and increased the fat content of the milk. Pure-bred animals adapt themselves to conditions on the coastlands, and the only good producers of milk today are pure-bred or highly graded Holstein cattle. Economic difficulties are caused by the low production of the $\frac{1}{8}$ Holstein x $\frac{1}{8}$ Zebu.

The Red-Polled breed was introduced in 1937, and was used in grading up creole cattle. The object was that heifers from that cross would give a higher milk yield, and unrequired males would mature earlier for beef production. The cows give good milk yields and were thrifty, and the bulls are useful on coastal areas as beef cattle. But animals with more than $5/8$ Red Polled are not advised. Trials are still being conducted with this breed.

Government has made available to the public, Zebu, Holstein-Friesian and Red Polled bulls and cows to be used for breeding,
through about 30 stud centers, distributed over the country. By these stud centers great improvement is noticed on the general type of animals seen in some districts. Government intends to increase the number of district stud centers. Some small dairymen and sugar estates maintain their own sires, which are essentially pure-bred or highly graded.

The Government has made pure-bred and high grade sires available to farmers by four main methods:-

(i) Placing breeding bulls at various centers along the coastal littoral.

(ii) Loaning out male breeding stock to sugar estates and individuals.

(iii) Annual Sale of breeding stock at the Government Livestock Farm.

(iv) Anna Regina Agistment Scheme.

Improvement in dairy animals has been most marked in the East Dernarera district. Nevertheless in general, much is desired in feeding, management and particularly calf rearing.

Artificial insemination was tried but without much success. There are no cattle breeding associations, but attempts are being made to form a Cattle Breeding Society. No records of livestock are kept, except at the Government Livestock Farm, and large estates.

BRITISH HONDURAS.

The colony is very backward in the breeding of dairy cattle. Until recent years, no work had been done along those lines. The only cattle to be found were draft animals, used for hauling timber in the forests. The greater number of those are from crossing of Zebu cattle, which are the most predominant, with Aberdeen Angus, Red Pollad, Hereford, Holstein-Friesain, Jersey and Guernsey breeds. The local cattle at present are a very heterozygous group. Beef type cattle are more common than dairy type animals.
Cattle breeding was left to the individual. Recently however, the people have become interested in milk production, but only on a small scale can this be increased, due to lack of transport. The Government has ordered from outside countries a number of Holstein-Zebu grade bulls, to be placed at stud centers in various districts, with the aim of improving the milking capacity of local herds by grading up.

Private owners are trying to improve herds by introducing Jersey and Ayrshire blood to local stock in order to breed economic dairy cattle.

The government has no funds at present to employ a competent staff to deal with their breeding policy.

Before 1920, no attention was paid to any special breed of livestock whether considered for meat or milk production. The inhabitants only wanted animals to satisfy their household needs, and to serve as a miniature bank on four legs. For milk and meat were both sold at high prices.

Since then, Agricultural and Cattle Raising Societies have been founded in all the islands, and they receive government support. The aim of these societies is to support producers by helping them in rearing their animals, marketing their products and improving their breeds.

Dairy animals are now the most common, more so in the Leeward islands whose aims were always towards milk production. They have achieved a high standard of production, by importing pure-bred Holstein-Friesian bulls from Holland and the U.S.A, and crossing them with the local cattle.

By applying the above policy, at least half of the milk used today is locally produced. And the proportion is only half because of the great rise in population caused by immigrants. Dairy farming could be promoted to provide sufficient milk for all the islands.
islands, but the chief drawback is the shortage of labour for this industry.

2

FRENCH ISLANDS.

In Martinique, Guadeloupe and French Guiana, the common cattle among the natives are the creole cattle. No work has been done on cross-breeding or selection, or even in trying to adapt exotic breeds to local conditions.

In Martinique and Guadeloupe, pure-bred dairy animals are kept only on a small scale. The breeds maintained are Holstein-Friesian, Jersey, Guernsey and Normand.

It is planned in these places to import new pure-bred animals of the above breeds and cross them with the creole cattle, in order to obtain economical dairy animals.

JAMAICA.

This island has shown very marked improvement in milk production, by first forming and then executing a definite breeding policy. The foundation stock which existed for many years were the creole cattle. They were primarily used as dual purpose cattle.

Since 1910, large importations of Bos Taurus breeds of cattle were made. Many of these pure-bred stock died, due to enzootic diseases and local climatic conditions. The survivors were in grading up the creole stock and Zebu cattle that were on the island. When diseases were under control, more grading up and also rearing of pure-bred stock was done. By 1914, high grade and pure-bred bulls were being offered for sale to the public, and by 1916 cows were sold to the public. The above however were of all different breeds, as no definite breed had been decided on as the breed for Jamaican conditions.

It was proved by 1917, that half bred Jersey x Zebu animals were greatly superior to pure-bred Jerseys in size, vigour and milk production capacity, as a result of experiments carried out at the Hope Farm.
The percentage fat in the milk from the above cross was 5.3%, because both Jersey and Zebu cattle on their own gave milk of a high fat content. In 1918, more results were available and Zebu x Jersey crosses gave encouraging results, except in cases where too much Jersey blood was introduced. The Hope Farm was then supplying all the milk required by government institutions. The standard of milk fat averaged 4.87%. Further importations of pure-bred Jersey, Guernsey and Holstein-Friesian animals were made.

In this same year, it was concluded that Shorthorn cattle were not suitable for the local conditions, even when only 1/8 of the breed was present in a creole cow. They were unthrifty, undersized, and could not be used to produce dairy animals. Red Polled cattle when crossed with 1/2 and 1/4 bred Indian animals gave excellent results; most country breeders were demanding animals of the Red-Polled cross, and several were sold as stud animals.

From 1920 to the present day, several importations of the following Bos Taurus breeds were made: - Jersey, Guernsey, Holstein-Friesian, Zebu (sahiwal type) and Red Polled. Each of those breeds were used in the breeding programme for grading up local cattle. The results are various and will be discussed later on.

GUERNSEY: - Pure-bred animals did not thrive well under local conditions. When used to grade up local cattle, the half-bred animal resulting from a cross with Zebu (Sahiwal type) gave the best results as regards the following factors: - temperament, hardiness and milk production. Howe(7) stated that the pronounced rise in production may be due to either or both of the following two factors:

1. Greater ability of the animals with the higher amount of Zebu blood to withstand local conditions, and

2. Heterosis, resulting from the crossing of two genetically different types.

The above two factors also apply to Jersey and Holstein-Friesian. For average butter fat of grade animals see Table 1.
Grade Guernsey animals are fairly common nowadays, and are economical milk producers, depending on the percentage of Zebu blood in the individual animals. These animals will continue to be used as dairy type until they are bred out, since the government has stopped using this breed in their breeding programme.

**HOLSTEIN-FRIESIAN:** Pure-bred animals were continually being imported to keep up with the breeding programme. It was found that half-bred animals resulting from crosses between Zebu cows and pure-bred bulls gave the best results for quantity in milk production. Grade Holstein animals produced on the average 6,000 lbs milk per lactation. At present, the remaining Holstein-Friesian animals are being crossed with grade bulls to give a dairy animal of high milk production capability. In 1950, it was decided that the pure-bred animal did not give economic results, thus only grade animals would be used in the future. It was also found that Grade Holstein and Jersey cattle showed a marked increase in yield, if animals were sheltered at night, and given a daily grooming.

**JERSEY:** From 1910, pure-bred animals have been intermittently imported. In 1923, "Cognac 1st" broke farm records in Jamaica by giving 16.5 quarts of milk per day on first calving, and nearly 7,000 lbs milk per year on this lactation period. The grand dam of this heifer was a scrub cow that gave only 3 quarts of milk per day. The daughter of that cow which came by crossing it with a Jersey x Zebu bull, gave 10 quarts of milk per day; and the second cross gave "Cognac 1st" which broke the records. The Jersey breed has shown the greatest tolerance to tropical conditions, as found in Jamaica by experiments.

At present, the breeding policy is restricted to Jersey x Zebu crosses, and also to pure-bred Jersey animals. This breed has been selected as the most suitable for dairy production in Jamaica. The objective is to develop a grade Jersey ecto-type, suitable for the

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local conditions, based on the "Norbrook strain of Jerseys". For this reason, both pure-bred Jersey and Sahiwal animals are maintained. The "Norbrook" strain of Jerseys has been selected, as this strain has adapted itself to local conditions without having degenerated over seven generations, which started in 1910. Yields however, fluctuate according to the grade of the animals. An average yield of 7,000 lbs milk per lactation is aimed at, and this seems to be in sight. Using this strain of Jerseys has given some encouragement to the breeding programme. Another strain of Jerseys that will be used in the programme is the "Victoria" strain of the Honeybelle family. This strain was started around the same time as the "Norbrook strain".

Sahiwal: These animals were first imported in 1921, along with other Zebu types. The Sahiwal type proved to be the most successful for improving dairy animals. They are used in grading up other cattle, by crossbreeding. The most successful crosses of these animals are Sahiwal x Jersey; Sahiwal x Guernsey and Sahiwal x Holstein-Friesian. The best cross however is Sahiwal x Jersey, with the half-bred animals giving best performances.

At present, experiments are being conducted to find out the optimum amount of Zebu blood necessary for economical milk production and resistance to tropical conditions.

In general, the majority of the milk producing cattle are scrub cattle with no particular breeding programme. The productivity of such cattle can be quickly improved by introduction of "blood" containing high milk producing factors. For this reason, Government has started the following schemes:

1. Bulls are kept at stud in various centres of the island where they can be made use of by peasants: Best grades of animals are used.

2. Where there are no centers, owners are paid an amount by government for each service to cows brought in by peasants, by their bulls which should be of good grade.

3. If a man has a small herd, but cannot afford a bull, a pedigree bull is given him on loan by Government.

4. Approved peasants are given a heifer subject to certain conditions. The first heifer calf born, has to be returned to Government, and this is in turn given to another peasant.
Artificial insemination is carried out by Government. Many other schemes are being tried out in an attempt to increase the average milk production of the island. They are all based on cross-breeding by use of high milk producing animals.

**LEEWARD ISLANDS.**

These are a group of small islands, whose funds do not allow any prolonged experiments on livestock. But the following conclusions have been formed regarding pure-bred Bos Taurus cattle:

1. Animals can be imported between the age of 10-12 months, and they would maintain their production on becoming mature.
2. Animals must not be exposed to intense sunlight.
3. Animals must be kept on adequate and nutritious diet.
4. Animals must be kept free of enzootic diseases and external parasites.

If the four conditions above are observed and carried out, pure-bred Bos-Taurus dairy animals could be economically maintained. But the initial expense is too much for the ordinary peasant, thus the Governments concerned maintain pure-bred animals to carry out a breeding programme which is one of cross-breeding European cattle with creole cattle.

In St. Kitts, pure-bred Holstein-Friesian bulls are used on native cows for the first generation, and on the female progeny of this cross. The desired objective is to establish eventually two herds of and Holstein grading, and then to inter-breed these in order to determine the most desirable amount of Holstein blood required for best performance. The work is still in its experimental stages; no conclusions have been formed. But there is a definite increase in milk production of the progeny of the above crosses.

**ANTIGUA:** is concentrating on getting a dual purpose animal. The average animal seen is the creole animal. In the breeding programme, Red polled animals are crossed on Senegal animals, on top of which cross, pure-bred Red Polled blood of high milk producing strain is used. Results are promising.

**British VIRGIN ISLANDS:** are also forming a breeding programme
in an endeavour to increase milk production. Their foundation stock is the Creole cattle. Their objective is to produce a dual purpose animal as follows:-

Grade Holstein x Zebu bulls, and Red Polled sires are being used on the Creole stock.

NEVIS:— the average animals seen in the Zebu type. The breeding policy here is to cross \( \frac{3}{4} \) Holstein x Zebu bulls on the native cow, and so get good dairy animals.

PUERTO RICO

Creole cattle are common on the island. The breeding policy carried out is that of grading up creole stock with Bos Taurus dairy breeds. The Bos Taurus breeds introduced were Jersey, Guernsey, Holstein-Friesian, Brown Swiss, Ayrshire and Milking Shorthorn. Importations were made from 1910-1920. Due to lack of proper knowledge of the exotic breeds, many of the animals of the early importations were lost, as a result of tick fever and Texas fever.

By 1920 some improvement was noticed in the animals kept by the Government and large dairy owners. In 1930, the Government established free breeding services at nine Demonstration Farms. Bos Taurus breeds were used for service in an attempt to increase dairy population, as a slight rise was noticed from 1920 onwards. Nowadays records are kept of milk production, age, breeding and other factors, and they have been very useful in starting extension programmes. Holstein-Friesian and Guernsey are the two most popular breeds of the original number imported. Around 50% of all grades have some Holstein blood; the rest are mainly Guernseys, with some Jersey, Ayrshire, Brown Swiss and Milking Shorthorn.

By conclusions drawn from the various breeding programmes applied since 1920, it was found that the Holstein-Friesian animals whether pure-bred or highly graded are the best for economical milk production in coastal regions with abundant pastures all the year round. For the hilly regions, the Guernsey pure-bred or grade cattle are best, as they are medium sized and are good rulsters, and thrive better under those conditions. Ayrshire grade animals are promising for the steep and rugged
interior sections of the island, where there are scarce pastures. Milking shorthorns do well as dual purpose animals.

Dairy production in Puerto Rico is of two general types:—

1. Intensive and specialised production for milk, and
2. Extensive production in grazing areas with meat, milk and work steers as a three-fold enterprise.

Experiments have shown that the cattle population of a farm or given area in Puerto Rico can be doubled in ten years, if an adequate programme for breeding, feeding, management and disease control is developed.

The average production of 875 quarts of milk per cow per annum has to be increased to around 2,000 quarts; this is one of the aims of the breeding programme. This is possible, as the average cow under the intensive system of production, produces 2,200 quarts per annum.

Although Holstein and Guernsey bulls were the chief ones used in grading up native cows, in order to develop a superior strain or breed for use in Puerto Rico and similar areas, new interests are now on other breeds due to experiments carried out. It was found that by crossing Brown Swiss, Jersey and Holstein-Friesian bulls on native cows, animals are got which are high milk producers as well as high beef producers: and they also contain the adaptability factor of the native cow.

Records are kept on most animals as regards milk production, breeding, butter fat content of milk, reproduction, and pedigree information: also weights at birth, 6 months, 1, 2, 3, and 4 years of age. Also on colour and striking notes on body confirmation.

SURINAM.

Basic stock in this colony is the creole cattle. Some importations of Bos Taurus breeds were made, chiefly Guernsey and Shorthorn. The first cross of these with the native stock, i.e. half-breed animals were found to be rather good. But the products of further crossing could not withstand the general change in climate, disease and feed, when Bos Taurus blood was more than one-half. The best cross as learnt by ex-

experience
perience are those with Zebu animals, but lack of funds prevent importation of sufficient amounts of these animals.

Dairy cattle, are practically non-existent due to climatic conditions, enzootic diseases, and lack of locally produced concentrates. The endeavour now is to import twelve Holstein-Friesian herd-book bulls from Holland, for grading-up the native cows, and for crossing with Zebu cattle.

TRINIDAD.

The average animal seen is non-descript. Very many of them show a preponderance of one breed or another, but there is no fixed type or confirmation. The reasons for this are the various breeding policies tried. Many Bos Taurus dairy breeds were imported in an effort to raise milk production, and the Holstein-Friesian breed together with Sahiwal type Zebu cattle have been chosen to carry out the breeding programme.

In 1879, the Government Stock Farm was established, and in 1902, it was transferred to its present position at St. Joseph. Its first purpose was as a dairy to supply fresh milk to government institutions, but later on its main purpose was that of a breeding station for livestock of the colony. Among breeds introduced to do grading up work in the colony were Horsey, Guernsey, Red Polled, Devon, Ayrshire, Milking Shorthorn and Holstein-Friesian. These animals when crossed with Zebu cattle produced offsprings whose milk was very high in butter fat. Some gave good quantities of milk, while others were unsatisfactory in production and general performance. The Holstein Grade animals were found to be the best. Short-horn grade animals were long haired and very delicate, thus unsuitable to local conditions. Ayrshire animals did not cross well with Zebu animals, for the offsprings were of a very excitable nature. The Red Polled graded animals were fairly hardy, but gave a rather low milk yield, high in butter fat; and because of hornlessness the half-bred oxen were not popular for draft purposes.

In 1923, a new policy was adopted at the Government Stock Farm, and the colony in general. This policy was grading up Zebu and creole cattle by use of pure-bred or high grade Holstein animals. It was
found that the half-bred animal gave 40 lbs milk per day when fresh, and that it had well marked dairy characteristics. In 1925, it was decided to rear calves by hand so that they would have proper attention.

In 1928, milk yields were doubled at the Government Stock Farm, and produced at a cheaper cost. And whereas over 40% of the cattle sold at annual auction sales at the farm went to the butchers, from 1923-1928, only five animals out of one hundred and fifty sold were sent to the abattoir. Grade animals were producing milk economically by this time, and improved on each stage upwards. When half-bred bulls were used on local scrub cattle, marked improvement was achieved, and the results corresponded to results got in India and Ceylon around the same time. The bulls were suitable for draft purposes, whereas those of other breeds could not stand up to hard work.

From 1929, exhibitions in which livestock took a leading place were started, in order to increase their popularity, and to give peasants a guide at which to aim. This has been the cause for livestock improvement in England, Barbados and other West Indian islands. These shows are now held annually in districts, and prizes awarded to the best exhibit of every different class.

Due to the greater use of Holstein blood in Trinidad for the last 10-15 years in the breeding programme, most of the dairy cattle show the characteristics of this breed.

Cattle owned by peasants and small farmers, are very unthrifty looking and stunted in growth, both when young and mature; they have long staring coats, are thin and obviously suffer from malnutrition.

This causes grave concern, for it was recently found that half-bred Zebu x Holstein, give good confirmation and performance, but further crosses with the pure-bred result in a decline of constitution, and if with local blood a decline in performance. To combat this, cattle of the Mysore type of *Bos indicus* were imported from time to time, probably to "bolster up" by back crossing, the constitution of the cross-breds and/or to provide better draught oxen than would result from the crossing of *Bos Taurus* breeds and the original local cattle.

At present, Government maintains two farms, one in Trinidad and the other at Tobago. On each of these farms a different policy is
adopted, for the Department of Agriculture is trying to decide the best way to fix a type of cow suitable for the Trinidad climate.

The policies adopted are:

(1) At the Trinidad Stock Farm, and the island in general, the crossing of Bos Taurus, of which the Holstein-Friesian breed has been chosen, and Bos Indicus is going on.

(2) The breeding of indigenous tropical dairy cattle is being carried out at the Tobago Stock Farm.

It has been decided that since the present maintains his cattle under hardy conditions, he should not be encouraged to have dairy animals with less than 50% Zebu blood; but where intensive management is practised, he may be allowed to have 1/4 Bos Taurus blood in his animals. The Government provides bulls of different grades and maintains them in Breeding Units which are established in central places all over the island.

The Government imported some Sahiwal cattle from India before the last World War, but they were not of the high milking strain. They were sent to Tobago to be crossed with the local cattle. The aim was to have animals of the Sahiwal type ready for crossing with with pure Sahiwals of the milking strain when they were available. These animals became available in 1949, and at present they are used in crossbreeding in Tobago, in conjunction with the other strain, so that Sahiwal-type cattle will eventually become the dairy animal on that island.

UNITED STATES VIRGIN ISLANDS.

There are neither breeding organisations nor fixed breeding policies. Native stock is of the Senegal breed, which are believed to have been introduced from the West Coast of Africa.

Pure-bred Bos Taurus sires have been imported from the United States; e.g. Holstein-Friesian, Red Polled and Hereford. When the native stock are crossed with Holstein-Friesian cattle, the offsprings are very desirable. The cows give 10-15 quarts of milk per day, as compared to the average local cow which gives 2-3 quarts milk daily.
WINDWARD ISLANDS

Local types are crossed with Bos Taurus breeds to give a cow which pays economically for its food, management, and maintenance by good enough production of milk.

In Dominica, the importance of milk production lies on pure-bred or grade Holstein-Friesian and Jersey cattle.

In Grenada, Jersey cattle are being crossed experimentally with the Neithropp cattle which are a dual purpose type.

In St. Lucia, grade Guernsey cattle are used for milk production.

In St. Vincent, Holstein and Jersey breeds are being crossed with native stock to give economical dairy cattle.

CONCLUSION

There has been considerable work in developing lines best suited to tropics under varying climatic conditions and methods of management. Experience with Bos Taurus breeds has indicated that degeneration sets in, especially under extensive management. Future dairy breeds of Tropics will be evolved from breed carrying a percentage of Bos Indicus or creole blood. There is evidence that pure bred Bos Taurus breeds can be maintained at reasonably high productivity and fertility under intensive management, but at high cost, putting milk out of reach of those needing it most. Hence, local cattle are being graded up, to produce milk in sufficient quantity, and at a cheap cost.

RECOMMENDATIONS

Different breeding policies for increasing milk production should be carried out according to climatic conditions.

(i) Where conditions are mild, high grade animals of Bos Taurus breeds should be kept and if possible pure-bred. Otherwise ectotypes may be developed.

(ii) Where climatic conditions are more severe, any one of the three methods mentioned below may be carried out:

(a) Selection from "creole" stock.

(b) Introduction of indigenous tropical dairy cattle e.g. Sahiwal or Red Sindhi.
or Red Sindhi.

c) Grading up by crossing *Bos Taurus* breeds with *Bos Indicus* types or with "creole" stock.

These methods should be tried where the present policy is not satisfactory.

### SUMMARY

1) A review was made of the breeding policies adopted in the different West Indian islands for milk production.

2) The breeding policy adopted in every island is grading up native stock by use of *Bos Taurus* dairy breeds.

3) Cattle population is heterozygous; and milk production is uneconomical in general.

4) In Jamaica, Trinidad and Tobago, indigenous tropical dairy cattle are being introduced to be used in grading up local stock.

5) Recording societies for milk yield, breed, confirmation, were started in some areas, and plans are to establish them in all the islands.

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THE END.