GENERAL INTRODUCTION

In the tropics with a few exceptions, there has been and still there is a vigorous cross-breeding programme between the Bos taurus and Bos indicus dairy breeds either with a hope to evolve new breeds suitable to the environments there or with a view to improve milk yields.

In Jamaica the former objective is claimed to have been achieved (Lecky 1950). The latter policy similarly has resulted in very much higher milk yields of the Bos taurus grades than the indigenous zebu (Maule 1953). Unfortunately the literature when searched appears to reveal work done on the characteristics of the milk of those crosses. Neither are factors that affect milk quality namely breed, age, stage of lactation, feeding, season of the year and diseases available as for pure Bos taurus dairy breeds in the temperate countries.

In temperate regions it is known that due to inherited factors breeds differ in the content of butterfat and solids-not-fat in their milk, and also milk yield (Bailey 1952). The table below illustrates the points:-

Breed	Yields of milk in gals.	Approx. fat %	Approx. S.N.F. %
Jersey	670	5.18	9.30
Guernsey	720	4.88	9.29
Ayrshire	770	3.97	9.29
Shorthorn	700	3.78	9.04
Friesian	870	3.67	8.78

Milk yields of cattle increase up to 7 to 8 years of age and afterwards gradually decrease, i.e. after about the fifth lactation. Fat content decreased with age and solids-not-fat content falls slightly but steadily with increasing age. (Ferguson 1957)

Writing on the effect of the stage of lactation on the quality of milk Rowland (1951) said that solids-not-fat content in milk was high in the first two or three weeks of the lactation and then fell for about a month to a minimum level which persisted until the fifth month of pregnancy when it rose steadily until drying off was started. Butterfat on the other hand was high in the first week after calving and declined to a minimum level as milk yields increased.

From about the seventh month of lactation onwards fat content in the milk rose.

Good feeding is essential to maintain yields and quality of the milk. Changes in the diet tend to lower yields because of digestive disorders. Evidence suggests that linseed and soya bean increase fat content; and excess cod liver oil in the ration will decrease the fat percentage. Recent research suggests that spring grass has prolonged decreasing effect on the butterfat percentage. One of the reasons given is that young grass is low in crude fibre (Rowland 1951). On the other hand young grass boosts milk yield and improves solids-not-fat content. The reason given though somewhat inconclusive, is that oestrogens found in pasture plants, particularly during the phase of reproductive growth are responsible for such effects. (Bailey 1952).

The effect of season on the quqlity of milk as studied by Ferguson (1957) appeared to be closely linked with feeding. He found that fat percentage tended to be lowest in May and highest in November in Britain. The variation however, was not marked. Whilst solids-not-fat percentage prewar were highest during Winter, now they were highest in late Spring.

Ill health generally causes a reduction in milk yield and invariably an increase in butterfat and solids-not-fat. Rowland (1951) observed that clinical or sub-clinical streptococcal and staphylococcal mastitis reduced solids-not-fat content. Butterfat content was indifferent. The solids-not-fat fraction that was affected consisted of lactose, casein, calcium and phosphorus. Albumen, globulin and chlorides somewhat increased. Thus the milk had a salty taste.

Extremes of temperature reduce yield only temporarily. Low temperatures favour increase of both butterfat and solids-not-fat content in milk whilst high temperatures have a depressing effect (Ferguson 1957).

Shock or excitement causes a temporary reduction in yield and quality of milk due to secretion of epinephrine.

With equal night and day intervals there will be very little variation either in yield or quality, but there is usually a longer interval between p.m. and a.m. milking than the morning and evening milking. In this case the yield is greater in the morning and the fat percentage is greater in the evening. (Ahuja & Gautam 1956).

Quality of milk in the crosses between Bos taurus and Bos indicus as already stated has not been deliberately bred for. Except in Russia, most other countries that have undertaken the job of upgrading their indigenous cattle with Bos taurus seem to have regarded milk quality secondary to milk yield. An example of that nature that might be cited is the evolution of the Jamaican Jersey-zebu which is superior to the Friesian-zebu in butterfat (Howes 1949).

Bychkov (1951) in Russia, in crosses between Friesian cows and Ayrshire bull found that F1 first calf heifers were more superior than their contemporary pure Friesian heifers. They gave 4176 kg. of milk (919 gals.) containing 3.78% butterfat each in 300-day lactation. Whilst pure Friesian heifers gave 4.42 kg. of milk (911 gals.) containing 3.25% butterfat. Similarly Gerchikov and Pakhtusov (1956) working with Jersey and Friesian cross-breds found that F1 yielded about the same quantity of milk as their dams, but the average butterfat content of their milk was higher by 0.7% to 0.8%.

The Zebu-Red Steppe as regards milk yield with high butterfat content were found satisfactory; but unfortunately their liveweights were not up to the required standard. To bring the weights of the cross-breds up to the standard it was decided to breed them with Shorthorn (Mokeev & Buijana 1955).

Control of solids-not-fat content in milk is not easy. However, Robertson et al (1956) in the studies of solids-not-fat advocated that selection for milk yield alone was not likely to cause any great decline of solids-not-fat, and that solids-not-fat could be held in check by paying some attention to the fat content of milk and milk yield in the breeding programme. Ferguson (1957) believed that the reduction of calving intervals increased S.N.F. content in the milk.

The present project chose the Imperial College of Tropical Agriculture dairy herd for its studies. Prior to its commencement a graph showing the nature of milk yields of seven cows was drawn by the author and continued during the course of operation of the project. The graph which is attached showed great individual fluctuations. This aroused great interest. It was therefore decided to determine which factors (some of which have already been mentioned above) affected the curve. The factors chosen except one, embrace feeding and management problems.