

**PRELIMINARY OBSERVATIONS ON MILK PRODUCTION  
AMONG THE FULANIS ON THE ACCRA PLAINS**

**BY**

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### SUMMARY.

An understanding of the peasant cattlemen, their knowledge of animal husbandry, their animals, the quality and level of production, is suggested as a starting point for improving dairy husbandry in Ghana.

Average take-off of Sangas maintained on free range, kraaled at night, with no supplemental feeds over a 240-day period of once a day milking was found to be 307.8 pints (384 lbs.). During the period of observation, grazing was of medium to poor nutritive quality.

The take-off, though adequate for family use, is considered to be too low to be a basis on which to establish a dairy industry in Ghana. The take-off does not in any way represent the full potential of the sangas under these environmental conditions. It is suggested that more work is needed to ascertain this.

Average butterfat for these Sangas was found to be 4.48%

### INTRODUCTION.

Many workers have found that greater progress in dairy cattle improvement may be achieved by greater concentration on environment rather than on heredity (Mahadevan, 1951; Weiner, 1960 etc. etc.). Montsma (1962) observed this also when working with Ghanaian cattle. Similar observations on the significant effect of improved environmental conditions on production potential of local African cattle have been made by other workers in East Africa (French, 1940; Boyns, 1947).

Relatively little work has been done in assessing the quality and quantity of milk given by our local cattle under peasant management. The few data available have usually been obtained under experimental station conditions where management is usually better than average. Even here, it has seldom been clearly recorded under what levels of feeding and management the production data were obtained.

If an attempt is to be made to start properly organised commercial dairy farming in Ghana based on the present peasant cattlemen, then one has first to understand their current conditions, their animals, the quality and level of production presently attained by them. Such knowledge will serve as a basis for measuring continuing progress in the near future. In this way it is hoped the objective and studies recorded in this paper shall have been achieved.

The first recorded attempt to measure the amount of butterfat in the milk of our local cattle was in 1937 (Report on the Dept. of Animal Health, 1936-37). However, real effort was not made to assess the milk yield of our animals until 1939.

Due perhaps, to (1) the absence of a well-planned breeding and selection programme for high milk yield; (2) lack of trained personnel; and (3) a possible subscription to the idea that tropical cattle are inherently poor milk producers, and do not respond readily to improvement, efforts to evolve an improved dairy animal for Ghana have not been followed up with the result that there is practically no organised dairy industry in Ghana.



In the North and in Southern Ghana, especially on the Accra Plains, a limited amount of milk is produced locally for restricted family use. In Ghana, cattle are kept mainly for beef and not for milk. In most cases, and especially on the Accra Plains, the cattle belong to absentee - cattle owners who employ Fulanis to look after their animals. The Fulanis are employed to tend the animals because of their traditional skill with animals. They are aware of the basic principles of animal husbandry. The Fulanis, by experience understand that a good sire is essential and their knowledge of good fodder impels them to seek the best natural pastures. They are quick to recognise signs of ill-health in their herds. Fulani-tended herds are generally known to be best, judged by local peasant standards.

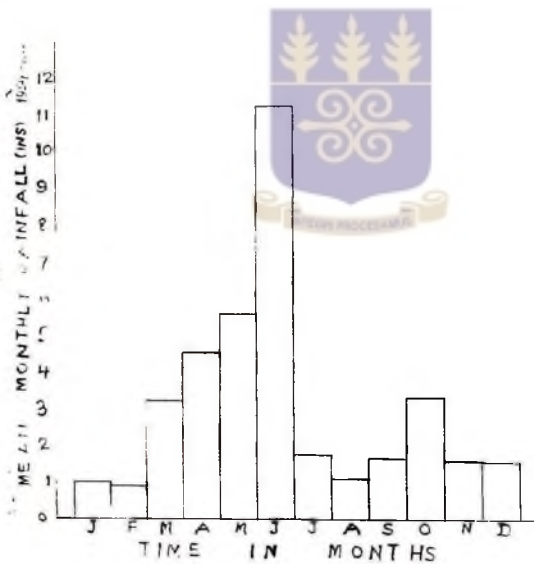
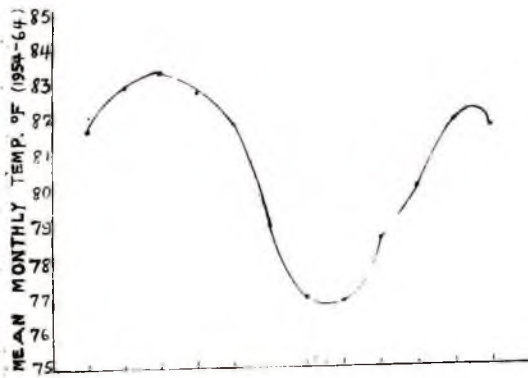
The Fulani herdsmen have the right to all the milk they can obtain from the cows which are known to be poor milkers generally. In most cases this is the only recompense received for their labours. In the exercise of this right to the milk, the calves are the immediate sufferers. The fact that, without supplemental feed, very few cows on the Accra Plains give more milk than is required by the calf for its own maintenance and growth, has been emphasised by Dontsma (1960, 1962).

A common, though not a universal practice, is for the absentee-cattle owner to give the Fulani the third calf born to any cow (Polly Hill, 1964).

#### CONDITIONS ON THE ACCRA PLAINS.

The Accra Plains is an area of about 1,400 square miles. It is a gently undulating country bounded by the Akwapim escarpment in the north, on the east by the Volta





**FIG. 1:** Mean monthly rainfall and temperature (1954-1964). Recorded at Pwani Agricultural Research Station.

River and the Ho-Keta Plains, and on the South by the Atlantic Seaboard.

The climate is equable with constant high temperatures, humidity, and evaporation levels. The mean monthly temperatures ranges from 76.8°F in August to 83.2°F in March. The mean monthly relative humidity ranges from 60% to 80%.

Rainfall is moderate and rather erratic and is distributed in a double-peaked manner, with a major season in June and a minor season in October. The annual drought from December to April may often be very severe. See Fig.1. Temperature and rainfall figures were obtained from the Nungua Agricultural Research Station and covered the period from 1954-1964.

#### VEGETATION.

The Accra Plains occupy the western side of the coastal savanna. The grasslands are largely proclimax in status (Rose Innes, 1962). Much of the grassland has been derived from the fringes of former forest or thicket under the compulsion of cultivation, frequent burning, and edaphic control.

The vegetation is sparse, coarse, and tussocky, rarely covering more than 25% of the ground at surface level (Lansbury et.al., 1965).

Woody species occurring in the grassland are confined to isolated, widely scattered active and inactive *Macrotermes termitaria*. Trees which occur in these clumps vary widely in height, density, and distribution. These thicket clumps contain trees like Antiaris africana, Baphia nitida, Milletia thonningii, and the shrub Griffonia simplicifolia and other trees and shrubs. It

must be emphasised that the population of leguminous species in these clumps is rather high. Of these, Griffonia, and Baphia among others have been shown to be valuable fodder plants with high crude protein and high digestibility (Mabey and Rose Innes, 1964 (a) and (b)). They produce an appreciable quantity of broad, lush, green leaves which are retained well into the dry season and they are relished by stock at these times.

#### BREEDS OF CATTLE KEPT BY THE FULANIS.

The cattle found in the Fulani herds are mainly Sangas, that is, crossbreds of the White Fulani (a Kebu) and the West African Shorthorn. These Sangas have marked Kebu characteristics - a prominent dewlap, humped, and are more long-legged and rangy than the West African Shorthorn. Since the bulls used are mainly White Fulanis, the Sangas are typically white - depending upon the amount of White Fulani blood in their genetic make-up, otherwise solid black, or a combination of black and white or fawn and white Sangas are also common depending upon the amount of West African Shorthorn blood present.

The cross-breeding practised here is: (1) to produce a large sized animal (a feature which all farmers generally desire), and (2) to increase the milk yield of the progeny. Cross-breeding at an earlier period was officially encouraged by the Department of Animal Health which issued approved White Fulani bulls to local farmers on the plains.

#### HOUSING.

The adult animals are kept in kraals which vary in shape from rectangular, square, to somewhat circular,

varying in size according to the number of animals kept in them. Kraals are generally constructed of Borasus palm or Mahogany beams. Each kraal houses about 40-100 adult cattle.

Calves are housed in a smaller kraal which is attached to and opens into the main kraal. The calf kraal can accommodate as many as 30-40 calves ranging in age from about a week to  $1\frac{1}{2}$  years. Invariably there is overcrowding. Boma infestation is consequently a serious problem among calves and scouring is frequent particularly with very young calves. This is so because there is only one small kraal attached to a bigger kraal and is used year after year with no alternative.

All local cattle farmers in the area of this study, with the exception of one, provide no shelter for the calves. During inclement weather there is high calf mortality.

#### BREEDING.

Breeding is permitted throughout the year. This system ensures that at any time of the year, there is some milk available for the market. This spreads the Fulanis' income, which is almost exclusively from the sale of milk throughout the year.

#### SELECTION AND CULLING OF BREEDERS.

Bulls are generally selected from good cows, taking into account size for age, healthiness, masculinity, temperament, and condition.

Extreme care is taken in selecting the herd sire. In instances where a herd sire is to be selected from one's own animals, the selected bull is not used in his own kraal but is transferred to another kraal. This is

an attempt to minimize the risk of in-breeding. Generally, the herd sire is acquired from a herd in another village. This is one of the sounder aspects of Fulani husbandry.

Delayed castration of bulls unwanted for breeding, and lack of separation of the sexes often lead to undesirable crosses by nondescripts so that parentage of some off-springs is seldom accurately known.

Herd sires are culled when they lose their vigour through age, and continuous dropping of calves that have noticeable defects e.g. Hernia.

Breeding females are culled if sterile and when they reach advanced age. See Plate 1. This cow had mastitis with the result that the two off-side quarters of her udder are non-functional and above all, she had a chronic skin disease. Because of her fertility, however, she has not been culled from the herd.

Though the males and females are herded together at all times, it was noted that heifers do not breed until they are about 2½-3 years of age in the Fulani herds. It is noteworthy that in spite of this uncontrolled breeding, the majority of the cows are fully developed and healthy.

No written records are kept by the Fulanis and they do not have any recognised method of determining the age of an animal. The Fulanis usually know the approximate age of their animals through living with them or base the approximate on the number of calves born.

#### FEEDING.

Cattle kept by the Fulanis are not given any supplementary feed in addition to their natural pasture, which, during the dry season of nearly six months duration,



is parched, fibrous, unnutritious standing hay. Silage and hay feeding is unknown as yet. The poor nutrient status of the native grasses of the Accra Plains has been demonstrated by Lansbury (1958). Lansbury et. al (1965) found that two weeks after the first rains the protein content of native grasses was high: 10 per cent on sandy soils and 13 per cent on the clay soils. All figures are based on dry matter. Six weeks later, these figures had fallen to 4.5 and 6 percent respectively and continued to decrease, with some fluctuation due to rainy periods, to minimum levels of 2.6% on sandy soils and 3.4% on clay soils.

Through experience of following some Fulanis and their cattle to the grazing ground and observing the zest with which the cattle browse Griffonia and Baphia, among other browse species, the author believes that these browse plants contribute considerably to the diet of these free ranging cattle, especially during the dry season.

The majority of the Fulani herdsmen on the Accra Plains kreal their animals from about six o'clock in the evening when they return from the day's grazing until about ten o'clock the next morning when they are sent out to graze again, that is, after the morning's milking.

Unlike the other Fulanis on the Accra Plains, the Fulanis at Ashaley-Botwe, which is a village on the western side of the Accra Plains, send their animals out to graze each morning about three o'clock and return about eight o'clock in the morning. The animals are milked and return to graze about eleven in the morning until about six o'clock in the evening.

### FEEDING OF THE CALVES.

In the Fulani herds, calves are reared on whole milk only. That is, they suckle their dams until weaning. The calves are given no supplementary feed such as milk substitutes or concentrates. They are introduced to natural pasture very early in life - about the second week of life.

In Ghana, cattle are kept mainly for beef and the Fulanis, who believe in great numbers of heads of cattle, know that the success of their industry depends upon the survival of the calves. Cows are not milked until the calves are about one to three months old. The length of this period depends upon how good a milker the particular dam is. Very poor milkers are not milked at all but they nurse their calves. This practice gives the calves a good start in life. Calves always get colostrum.

The Fulanis believe that it is unhealthy to bucket - or bottle-feed calves, claiming that calves which are bucket-or bottle-fed get stomach disorders resulting in scouring, and death. The author found this to be due to the inability of the herdsmen to keep either the buckets or bottles in which the calves are fed scrupulously clean. The water used when these containers are washed is not clean and most frequently they are not washed before they are used for the next feeding. At times, however, the Fulanis attempt to bottle-feed calves which have lost their dams, but these rarely survive. Consequently, calves are allowed to suckle their dams until they are weaned, weaning age depending mainly on how soon the dam becomes pregnant again after calving.



The Fulanis at Ashaley-Botwe herd their calves in the immediate vicinity of the kraals which is invariably overgrazed. This herding of calves is done by small boys who set off about five o'clock each morning. (See Plate 2. Small boys herding calves back to the kraals).

The other Fulanis on the Accra Plains do not send calves out to graze until the dams have been milked in the morning.

The Fulanis water their calves twice daily. The first watering is after the morning's suckling and they are on their way to graze, whilst the second is on their way back from grazing. It must be remarked here that it would be beneficial if these calves were watered after they have had their evening's milk. Drinking before the evening's suckling leaves little room for the milk which is much needed by the calves because of its nutritive value.

#### ROUTINE PRACTICES.

##### Weaning.

Weaning in the Fulani herds is mostly natural. Weaning age varies from nine months to about one and a half years depending upon how soon the dam becomes pregnant after calving. Artificial weaning is considered only when the dam has been pregnant for about six months and the calf is still suckling. Under such conditions, a piece of bush rope is cut with which the nose is ringed and a knot tied in front of the muzzle. This protrudes a little in front of the muzzle so that during suckling the dam is pinched by the knot and kicks the calf off. (See Plate 3. Note calf with knot dangling in front of the muzzle). In addition, the calf experiences some discomfort when suckling because the knot renews the

wound in the nose. These discourage the calf from suckling.

### Castration.

The male calves which are not wanted for breeding are not castrated till they are about two years of age. Castration is delayed because the Fulanis claim that more lean meat is put on thereby. It is claimed that if castration is done early, increase in weight is mostly fat. Castration is either by the open method or by crushing and pulping the testicles. The second method results in a considerable setback of the animals.

### Spraying.

Spraying of cattle is occasionally practised by the Fulani cattlemen on the Accra Plains. This is done to reduce tick infestation which is a serious problem to these farmers, especially during the rainy season. There is however no definite routine period for such spraying and is done only when the Fulanis find that there are too many ticks on the cattle. The availability of gamatox is also a serious consideration. Otherwise, when the cattle are heavily infested with ticks, the herdsmen cast the animals and remove the ticks manually.

Very few farmers possess hand spraying machines. The majority of these Fulanis wet pieces of cloth in diluted gamatox and smear it on the infested areas - chiefly around the rear udder attachment, under the tail, around the periphery of the ears and the brisket. (See Plate 4. Picture shows a tick infested rear udder of a heifer).

### MILKING.

Milk containers used by Fulanis on the Accra Plains are never sterilized before milk is put into them. These

containers (calabashes and buckets) are washed with cold water, the cleanliness of which is questionable. The containers are not cleaned soon after milking but just before the next milking.

The milkers' attire is invariably dirty, soiled with cow dung and milk and often stinking because it has not been washed over a long period. The milkers' hands are not washed before milking, or if washed at all, it is done in a perfunctory fashion. Talking, sneezing, coughing over milk pails or calabashes, and the chewing of cola or tobacco during milking is commonly noted. Milkers are never health-tested so the possibility exists of their transmitting infectious diseases notably T.B., dysentery and typhoid, to mention only a few, through careless handling of the milk.

In Fulani herds, milking is done in the kraal amidst the herd. The kraal is always full of manure. The dry dung, which is mostly powdery, during the dry season, due to its being stirred up by the cattle, is easily blown in the air. This is a fertile source for contaminating milk with bacteria because of the open containers used.

Flies are also a considerable menace in and around the kraals. At close quarters, under such circumstances cattle are a sea of continuous motion due to switching of tails, shaking of ears, throwing of heads, and stamping of feet due to fly worry. (See Plate f. Picture shows some cows switching their tails to drive off flies).

The udders of the cows are never cleaned in any way before they are milked.

In Fulani herds, the calf is allowed to suckle its dam for about a minute before she is hand-milked. (See Plate 6. The calf in the picture is being allowed to suckle its dam before she is hand-milked. In the background is the milker who awaits patiently with his calabash, into which the cow is to be milked, lying on the dung-strewn ground). Suckling of the calf before milking initiates milk let-down. In a milk yield experiment at Pong-Tamale, it was observed that there was an increase in milk yield when calves were allowed to suckle their dams for half a minute before milking because this obviated cows holding up their milk, (Report on the Department of Animal Health, 1942 to 1943). Hewison (1945), working in East Africa came to the conclusion that native cows would not let-down their milk when their calves were removed during milking. However, Boyns (1947), also working in East Africa, disproved this. At Nungua Agricultural Research Station, Ghana, native cows have been successfully milked in the absence of their calves. This practice of the calf suckling the dam for a short time before milking has also been described by Murray (1958), in Northern Sierra Leone.

In the Fulani herds, the calf is tethered to the near side foreleg of its dam after it has suckled for about a minute (See Plate 7). The hind legs of the dam are tethered to prevent her from kicking. (See Plate 8).

The milker then squats on his toes to milk into the calabash held between his knees. Milking is invariably from the near side of the cow. (See Plate 8). In Northern Sierra Leone the milker is invariably a woman (Murray, 1958), but on the Accra Plains, the milkers are all men.



Milking is partial and the quantity of milk taken from each cow depends on the milker's experience and discretion. After milking the cow and calf are set free and the calf suckles the remainder of the milk. Milk in the calabash is emptied into buckets placed behind the kraal fence and guarded by one or two children of the family. (See Plate 9).

During the milking process, hundreds of flies alight on the sides of the calabash. Most of these get drowned during milking and a lot more drown when the milk is being poured into the open buckets.

After the morning's milking, a tea-strainer is used to strain the milk while it is being poured into kerosene tins or bottles. (See Plate 10). The straining rids the milk of dead flies and other particles that are too large to pass through the tea-strainer. The milk, thus strained, is head-loaded or taken by truck to Accra and its suburbs for sale at 12 pesewas per pint. It is sold mainly to suburban Fulanis. (See Plates 11 and 12).

#### Training the heifer for milking.

First calvers do not normally allow themselves to be milked and always tend to hold up their milk. Prior to each milking therefore, the first calver is restrained by tying a strong rope to the base of the horns, (one of the advantages of the horns on the Fulani cattle), and this rope is held tight by one of the herdsmen. The calf is allowed to suckle the dam for about a minute after which it is tied to the near side foreleg of the dam and the hind legs of the dam too are tied together. The milker then starts to milk. If the milk is not being let-down, which is frequent with heifers, the milker goes to the rear end of the animal. He opens the vulva with his hands and

blows air through his mouth into it till the animal arches her back. After this the milk flows surprisingly freely. This technique apparently stimulates milk let-down. This is repeated if the milk flow is impeded. This process is repeated at every milking till the animal becomes used to being milked.

Hewison (1945), reported that partial success of milk let-down was obtained by inflating the vaginas of native cows whose calves had been removed at milking.

#### MATERIALS AND METHOD.

The measurement of milk take-off under peasant management was carried out at Ashaley-Botwe - a village situated on the western side of the Accra Plains. This village is approximately one mile north-west of University of Ghana's Agricultural Research Station, Mungua.

Observations started in August, 1965 and continued till the end of March, 1966. Some of the trial animals are still being milked at time of writing this article. Table I gives rainfall data made available from the Mungua Agricultural Station during the trial period.

Fifteen local Sangas made available for these observations. Five were in their 1st, Six in their 2nd, 2 in their 3rd and 2 in their 4th lactations respectively. In this preliminary work, the milk take-off under partial hand-milking was measured using a Bex two-pint measurer. The animals were hand-milked by Fulanis after a preliminary one minute suckling by the calf. Milking was once a day, in the morning.

Under the peasant system, it was not possible to measure the milk take-off the beginning of lactation because the calf is fully suckled for at least the first

six weeks of life. The cows used were also those selected by the Fulani owner and trained for milking. It was therefore not possible to randomise the selection nor base it on the whole herd. However the selected constituted about 10 per cent of the dairy sector of the herd.

25-ml samples of the morning's milking from each cow were taken once a week for butterfat test. Gerber method was adopted.

Table I - Rainfall data during the trial\*

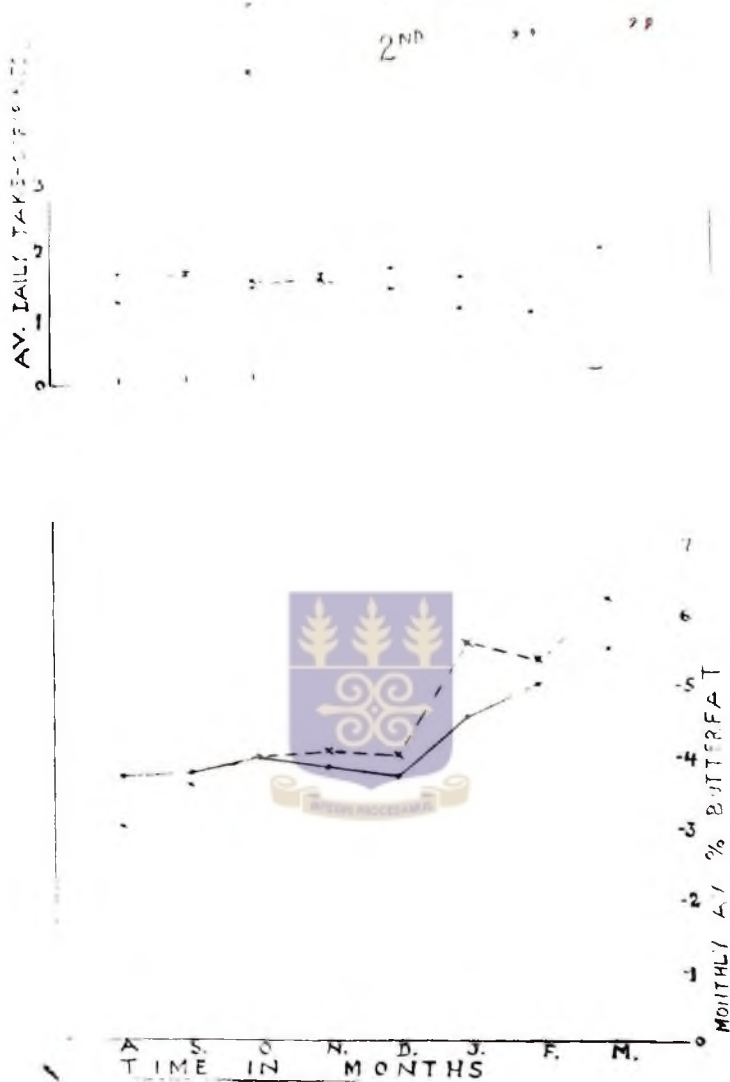
Month and Year	No. of Rainy Days	Rainfall (Inches)
August, 1965	8	2.13
September	4	1.25
October	7	2.79
November	8	3.37
December	4	1.65
January, 1966	1	0.58
February	3	0.63
March	6	4.11
Totals	41	16.51

\*Source: Nungua Agricultural Research Station.

RESULTS AND DISCUSSION.

It must be noted that figures on milk take-off do not fully represent the inherent milk yield capabilities of the experimental animals because these figures do not include the amount of milk taken by the calves, and above all, milking was only once a day. That increased frequency of milking increases total milk production has been investigated by Agarwala and Sundaresan (1955) and Turner





**FIG. 2:** Daily milk take-off/cow and percentage butterfat - monthly averages.

(cited by Eckles and Anthony, 1950). However, since the Fulanis on the Accra Plains do not milk poor milkers, (by their standards), and the amount of milk taken from a particular cow depends on her milking ability, the take-off figures presented only give a general indication of the milk yielding capabilities of the cows.

Butterfat percentage - monthly averages, and <sup>average</sup>/<sub>daily</sub> milk take-off per cow for 1st to 4th lactation groups are presented in Tables 2 and 3. Fig. 2 gives the graphic presentation of the figures in Tables 2 and 3 for the 1st and 2nd lactation groups.

The take-off figures for lactation groups recorded in Tables 3 and 4 indicate a yield order of merit of 1st, 2nd, 4th and 3rd lactations respectively or 360 pints (450 lbs.), 309 pints (387.4 lbs.) 302.4 pints (378.0 lbs.) and 259.2 pints (324.0 lbs.) respectively for the 240-day observation period. Since the experimental animals were all Sangas, i.e. crossbreds of the White Fulani and the West African Shorthorn, kept under the same feeding regime and identical peasant husbandry, it is most probable that any differences observed could be due to inherent capabilities. Thus, the results obtained on take-off suggest that peak production in these animals is in the 1st lactation and that production declines thereafter. This suggestion is however contrary to the findings of Mahadevan (1953), Stonaker (1953), and MacLaughlin (1955), namely that peak production in tropical cattle is obtained usually by the 3rd to 4th lactation. It is also known that temperate dairy cattle in their home environment attain peak production by about the 5th to 7th lactation.

**Table 2 - Butterfat Percentage - Monthly Averages**

Year and Month	1st Lac-tation	2nd Lac-tation	3rd Lac-tation	4th Lac-tation
1965, August	3.80	3.08	4.50	4.38
September	3.84	3.68	4.17	3.55
October	4.05	4.06	4.65	4.66
November	3.90	4.12	4.31	3.95
December	3.74	4.08	4.53	4.00
1966, January	4.59	5.66	5.85	-
February	5.05	5.41	6.08	-
March	5.53	6.23	5.48	-
Mean for the Trial	4.31	4.54	4.95	4.11

**Table 3 - Daily Milk take-off (Pints) - Monthly Averages.**

Year and Month	1st Lac-tation	2nd Lac-tation	3rd Lac-tation	4th Lac-tation
1965, August	1.58	1.21	1.64	1.41
September	1.56	1.63	1.01	1.22
October	1.37	1.44	0.95	0.98
November	1.48	1.45	1.18	1.01
December	1.56	1.25	1.19	1.66
1966, January	1.39	0.97	1.19	-
February	1.36	0.88	0.78	-
March	1.73	1.49	0.72	-
Mean for the Trial	1.50	1.29	1.08	1.26

From Tables 3 and 4 and their composite graphic presentations in Figs. 2 and 3, it is observed that there are fluctuations in the monthly averages of the daily milk

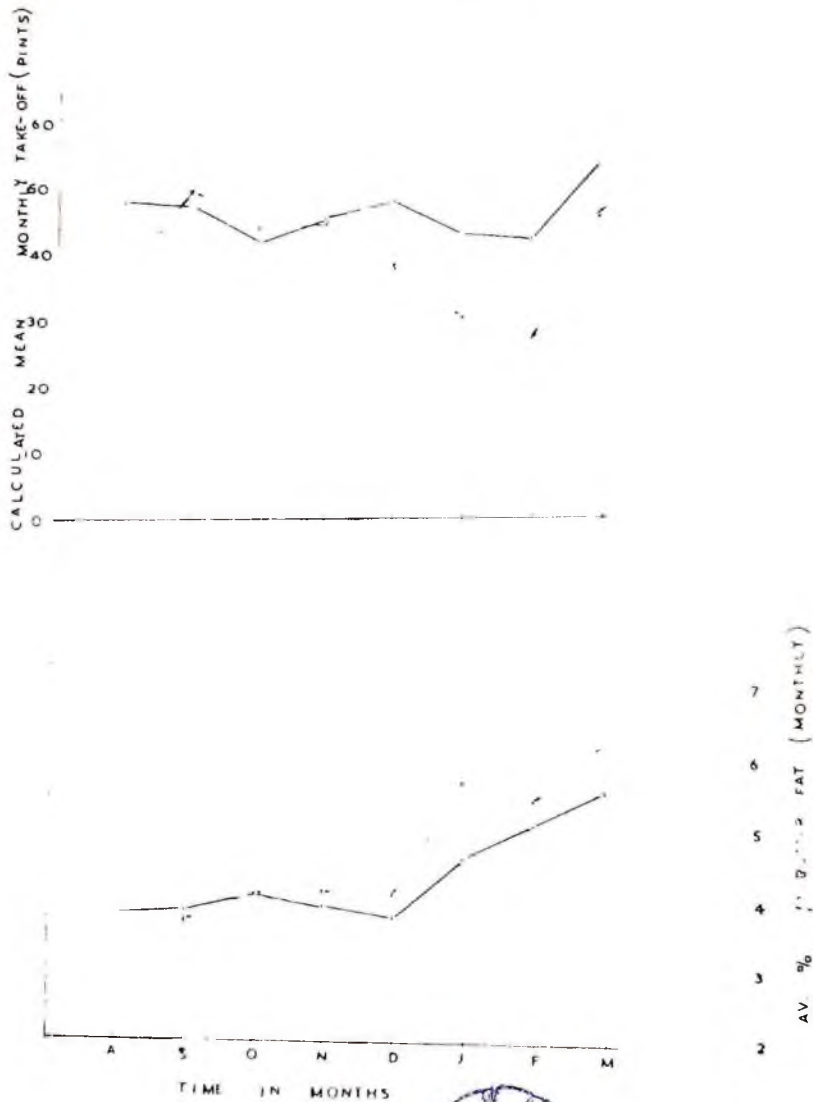


FIG. 3: Calculated milk take-off and percentage butterfat - Monthly averages.

take-off and therefore in the calculated average monthly take-off. Considering these fluctuations in relation to the rainfall figures in Table 1, and consequently the state and availability of natural pasture on which the animals were fed, the results indicate that the upward trends coincide with either months in which the rainfall was high or the month just following and the downward trends coincide with months of low rainfall. The results therefore suggest that the cows give more milk when pasture was abundant. This is demonstrated by the fact that when the rains started in early March, and therefore the availability of fresh nutritious grass, the take-off rose significantly in March despite the advanced stage of lactation. This reflects the effect of the feeding regime on the milk yield of the animals. This agrees with the findings of Montsma (1962, 1963), and at Pong-Tamale (Report on the Department of Animal Health, 1951-52), that lower milk yields are obtained from cows during the dry season when pasture is scarce and feeding is not supplemented with concentrates. The positive effect of the plane of nutrition on milk production of African native cattle has also been stressed by Boyne (1947), Hewison (1945), and French (1940).

Bunge and Kanya (1951) working in East Africa, estimated that, for a period of about 9 months, Zebu cows which are partly hand-milked and partly suckled by their calves need a balancing factor of about 900 lbs. to be added to the recorded take-off to give an indication of their actual milk yield. This figure, however, is about 40% below the 1,500 lbs. of milk suggested by Montsma (1963) as being required for rearing a Sokoto Gudali calf (also a Zebu) over nearly the same period. It is envisaged



**Table 4 - Calculated Mean Monthly Take-Off**

Year and Month	1st Lac- tation	2nd Lac- tation	3rd Lac- tation	4th Lac- tation
1965, August	47.26 Pts. 59.08 lbs.	36.41 Pts. 45.51 lbs.	49.32 Pts. 61.65 lbs.	42.30 Pts. 52.88 lbs.
September	46.92 Pts 58.65 lbs	48.88 Pts 61.10 lbs	30.21 Pts 37.76 lbs	36.68 Pts 45.85 lbs
October	41.12 Pts 51.40 lbs	43.33 Pts 54.16 lbs	28.58 Pts 35.73 lbs	29.46 Pts 36.83 lbs
November	44.49 Pts 55.61 lbs	43.55 Pts 54.44 lbs	35.26 Pts 44.08 lbs	30.23 Pts 37.79 lbs
December	46.94 Pts 58.68 lbs	37.37 Pts 46.71 lbs	35.66 Pts 44.58 lbs	49.89 Pts 62.36 lbs
1966, January	41.75 Pts 51.19 lbs	29.24 Pts 36.55 lbs	35.66 Pts 44.58 lbs	-
February	40.76 Pts 50.95 lbs	26.14 Pts 32.68 lbs	23.30 Pts 29.13 lbs	-
March	52.04 Pts 65.05 lbs	44.78 Pts 55.98 lbs	21.59 Pts 26.99 lbs	-

that further trials will have to be undertaken on the average amount of milk consumed by a calf suckling its dam before any concrete correction factor could be suggested but from the above figures it seems the correction factor could safely be estimated at about 1,000 lbs. Thus, adding this correction factor to the calculated average take-off (384 lbs) for the trial animals, it is realised that their calculated average yield is about 1,384 lbs. This is quite low compared with the average production of 3,000 lbs. in

250-300 days for cows in elite herds in Nigeria (Hill, 1964). It must be emphasised that the animals in the Fulani herds have not been reared for high milk production.

Hill (1964) has suggested that an average milk yield of 3,500 lbs is necessary for economic returns where sale of fresh milk is anticipated, whilst Montsma (1963) indicates an average of 2,500 lbs. Based on these figures, it would seem that production in the Fulani herds is much too low to allow of economic returns from fresh milk sales in Ghana. It must however be emphasised that animals in the Fulani herds on the Accra Plains are not given any supplementary feeds and that any amount received from the sale of milk might be considered as profit.

That Ghanaian cattle are poor milk producers generally has been shown by Montsma (1960). While the results of this trial indicate that the natural feeding regime contributes to this low milk yield, it must be pointed out that research shows that lactating cows which are subjected to heavy attacks of biting flies may produce 20% less milk than protected cows (Knippling and McDuffie, 1956). Fly disturbance (See Plate 5) which is a very serious problem in the Fulani herds observed, could be a contributory factor to the low milk yield of cattle kept by the Fulanis on the Accra Plains.

The effect of incomplete milking on milk yield in dairy cattle has been indicated by Eckles and Anthony (1950). Incomplete milking practised by the Fulanis on the Accra Plains most probably also contributes to the low milk yield of Ghanaian cattle.

Table 2 gives the average monthly percentage butterfat whilst Fig.3 gives the graphic presenta-



tion of the calculated average monthly milk take-off in relation to the average monthly percentage butterfat (all according to lactation groups).

The mean butterfat percentage for the 1st, 2nd, 3rd, and 4th lactation groups are 4.31, 4.54, 4.95, and 4.11 respectively. The above results were obtained from 132, 133, 58, and 26 samples for the 1st, 2nd, 3rd and 4th lactation groups respectively. The average for the total of 349 samples of milk, consisting of once a day milking was 4.48%. The average butterfat for sansas kept at Song-Tamale was 4.21% for the period 1936-39 (Report on the Department of Animal Health, 1936-39).

It is observed from Table 2 and Fig. 3 that the percentage butterfat tests rose sharply after December. This could be due to the effect of the dry season or the stage of lactation. This period of high fat test coincides with the period of high mean monthly temperatures (See Fig.1) when grazing is relatively scarce. That the season has a positive influence on the percentage butterfat test has been noted by Fekles and Anthony (1950) whilst the positive effect of stage of lactation on percentage butterfat has been investigated by Ragsdale and Turner (1922). Figs. 2 and 3 show that percent butterfat in this trial was low at the initial stages but rose as the lactation progressed. Since temperatures on the Accra Plains are generally very high from December to March and the period of sharp rise in butterfat tests occurred within this period, it is suggested that the temperature may have contributed to this phenomenon. That temperature has a positive effect on the percentage butterfat test in cows has been recorded by Ragsdale and Brody (1922).

It is observed from Table 2 that the average percentage butterfat test rose gradually from the first lactation group to the 3rd lactation group and then dropped in the 4th lactation group. This suggests that age has a relatively slight influence on the butterfat content of these trial animals. This indication agrees with the findings of Roadhouse and Henderson (1950). It must be noted that the averages for the 3rd and 4th lactation groups were obtained from 58 and 26 tests respectively and that there were only two animals in each group. More tests would therefore be needed to substantiate these findings.

Research has established the fact that the first milk drawn from a cow contains a low percentage of fat and that the strippings are higher in fat when compared with the fore or middle milk. It has also been established that thorough massage of the udder before milking decreases the difference between the fore milk and the strippings (Pekles and Anthony, 1950). The Fulanis on the Accra Plains always milk partially and then allow the calves to suckle the remainder. Tests for fat based on the milk take-off may not therefore give a true average for animals under such management practice. If preliminary suckling by the calves is equated by thorough massaging of the udder, the difference would be obviated to an extent that the average percentage butterfat of 4.48 obtained from this trial could be accepted as a very close approximation of the true average for Sangas kept by Fulanis on the Accra Plains.

### CONCLUSIONS.

On the basis of the results recorded, it appears that: Peak production occurs in the 1st lactation.

The average milk take-off in a 240-day period is only 307.8 pints (384.8 lbs.).

Poor grazing contributes to low milk yield in the Fulani-managed herds.

Percentage butterfat is affected by age, stage of lactation, and the season.

Average butterfat for Sangas in Fulani herds on the Accra Plains is 4.48%.

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REFERENCES

1. Mahadevan, P. (1951). "The effect of environment and heredity on lactation. I. Milk yield". J. of Agric. Sci., Vol.41.
2. Weiner, G. (1960). "Factors influencing average milk yields of herds at two levels of production". Anim. Prod., Vol.2,117.
3. Montsma, G.(1962). "Observations on milk yield, and calf growth and conversion rate of 3 types of cattle in Ghana - II. Effects of Nutrition". Trop. Agric., Trin., Vol.39, No.2. 123-124.
4. French, M.H. (1940). "Cattle-breeding in Tanganyika Territory and some developmental problems relating thereto". Emp. J. Exp. Agric., Vol.8, No.29.
5. Boyns, B.M. (1947). "Sudanese cattle as milk producers". Emp. J. Exp. Agric., Vol.15, 27-41.
6. Report on the Department of Animal Health, 1936-37.
7. Report on the Department of Animal Health, 1938-39.
8. Reports on the Department of Animal Health, 1948-54.
9. Montsma, G. (1960). "Sale of Milk and Rearing of calves in Ghana". Ghana Farmer; vol. 4, No.1, page 12.
10. Polly Hill (1964). "A socio-economic report on cattle-ownership and Fulani herdsmen in the Ashaiman/Dodowa district of the Accra Plains". Institute of African Studies, University of Ghana (Winco).



11. Rose Innes, R. (1962). "Grasslands, Pastures and Fodder Production". Chapter 23 in Agriculture and Land Use in Ghana. London: Oxford University Press.
12. Lansbury, T.J., Rose Innes, R., and Mabey, G.L. (1965) "Studies on Ghana Grasslands: Yield and Composition on the Accra Plains". Trop. Agric., Trin., Vol.42, No.1, January, 1965.
13. Mabey, G.L., and Rose Innes, R. (1964a). "Studies on Browse Plants in Ghana.II. Digestibility: (a) The digestibility of Griffonia simplicifolia from Accra Plains using local cattle as experimental animals". Emp. J. Expt. Agric., Vol.32, No.126, 125-130.
14. Mabey, G.L., and Rose Innes, R., (1964b). "Studies on Browse Plants in Ghana II. Digestibility: (b) Digestibility of Baphia nitida from the Accra Plains, using local cattle as experimental animals. Emp. J. Expt. Agric., Vol.32, No.128, 274-278.
15. Lansbury, T.J. (1958). "The composition and digestibility of some conserved fodder crops for Dry Season Feeding in Ghana - I. Natural Grassland Way". Trop. Agric., Vol.35, No.2, 114-118.
16. Report on the Department of Animal Health, 1942-43.

17. Hewison, J.W. (1945). "Dairy Farming in the Northern Sudan". E. Afr. Agric. Journal, Vol.11: 104-109.
18. Murray, A.K. (1958). "The Fula cattle owners of Northern Sierra Leone, their cattle and methods of management". Trop. Agric., Trin., Vol.35, No.2
19. Agarwala, O.P., and Sundaresan, D. (1955). "Influence of frequency of milking on milk production". Indian J. Dairy Sci., 8: 94-99.
20. Eckles, C.H., and Anthony, E.L. (1950). "Dairy Cattle and Milk Production". 4th ed. New York: Macmillan Company.
21. Mahadevan, P. (1953). "The general life and Production Statistics of Sinhala cattle of Ceylon". Emp. J. exp. Agric., Vol.21, No.81:55-60.
22. Stonaker, H.H. (1953). "Estimates of genetic changes in an Indian Herd of Red Sindhi Dairy Cattle". J. Dairy Sci., Vol.36: 688-697. A.B.A., 22, No.1167.
23. MacLaughlin, E.A. (1955). "The cattle of the Fung: a local variant of the short-horned zebu, indigenous to the Northern Sudan". Emp. J. exp. Agric., Vol.23: 188-201. A.B.A., 24, No.5067.
24. Bunge, V.A., and Kanya, F. (1951). "The amount of milk consumed by suckling calves from birth to weaning". E.Afri. agric. J., Vol.17, No.2.

25. Hill, D.H. (1964). "Animal breeding and Improvement in Nigeria". Outlook on Agriculture, Vol.4, No.2.
26. Montsma, G. (1963). "A preliminary report on the production characters of three types of cattle in Ghana". Neth. J. Agric. Sci., Vol.11, No.5.
27. Knipling, E.F., and McDuffie (1956). "Flies that affect livestock". Year book of Agriculture, 1956; Animal Diseases. The U.S. Govt. Printing Office, Washington, D.C.
28. Ragsdale, A.C. and Turner, C.W. (1922). "The stage of lactation as a factor in the variation of percentage butterfat in cows milk". J. Dairy Sci., Vol.5, pp.22-26.
29. Ragsdale, A.C., and Brody, S. (1922). "The effect of temperature on percentage butterfat." J. Dairy Sci., Vol.5, pp.379-395.
30. Roadhouse, C.H., and Henderson, J.L. (1950). "The Market-Milk Industry". 2nd ed. McGraw-Hill Book Company, Inc. New York.



PLATE 1

Savage cow with a chronic skin disease. The two off-side quarters of her udder are useless because of mastitis but has not been culled from the herd because of her fertility.

PLATE 2

Small boys herding calves.



PLATE 3

Weaning - Sanga calf with knot dangling in front of the muzzle.



PLATE 4

A Sanga heifer that is infested with ticks.



PLATE 5

Sanga cows switching their tails to drive off flies.



PLATE 6

Calf preliminarily suckling dam before she is hand-milked. The milker is seen in the background with the calabash into which the cow is to be milked lying on the dung-strewn ground.

PLATE 7

Sanga calf tethered to the rear-side foreleg of its dam.



PLATE 8

Sanga cow with hindlegs tethered to prevent her from kicking the milker. Calabash is held between the knees of the milker.



PLATE 9

Milk being poured into open buckets behind the kraal fence. The milk is guarded by a young girl in the Fulani's family.



PLATE 10

Milk being poured into bottles.





PLATE 11

Milk in kerosene tins ready to be sent to urban Fulani families.



PLATE 12

Milk in kerosene tins being loaded into a truck.