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THE REPRODUCTIVE PERFORMANCE OF DROUGHTMASTER AND AUSTRALIAN COMMERCIAL CROSS CATTLE IN RANCANGAN DAGING/PENUSU, JELAI-GEMAS, NEGERI SEMBILAN

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By

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ABSTRACT

The Reproductive Performance of Droughtmaster and Australian Commercial Cross Cattle in Rancangan Daging/Penusu, Jelai-Gemas Negeri Sembilan.

by Kevin Lazarus

Supervised by: Professor M.R. Jainudeen and Dr. Sharifuddin Wahab

The reproductive performance of Droughtmaster (DM) and Australian Commercial Cross (ACC) cattle was evaluated from a total of 206 records of breeding cows for the period from 1974 to 1985.

Rainfall and environmental temperature data from 1981 to 1985 were also analysed. Per cent calvings and conceptions occurring in wet and dry seasons were determined.

The mean age at first calving for the DM was 1420 days and for the ACC 1407 days. The average calving interval for the DM was 588 days and for the ACC 564 days. These differences for the two breeds were not significant ($P>0.05$).

From the pooled data for the two breeds, the mean calving interval was 576 days. The calving interval for the third parity was significantly greater than parities 1, 2, 5 and 6 ($P<0.05$). The third and fourth calving intervals were the longest with the first, second, fifth and sixth being shorter than the mean of all calving intervals.

Most calvings occurred during the two dry seasons from December to February (32.8%) and June to August (23.9%). This calvings corresponded to conceptions in the two wet seasons from March to May (33.8%) and September to November (25.9%).

From the results of this study, a 10-week restricted mating period coinciding with the two wet seasons is recommended for this herd.

ABSTRAK

Prestasi Reproduksi Lembu "Droughtmaster" dan "Australian Commercial Cross" di Rancangan Daging/Penusu, Jelai-Gemas, Negeri Sembilan.

oleh Kevin Lazarus

Penyelia: Professor M.R. Jainudeen dan Dr. Sharifuddin Wahab

Prestasi reproduksi lembu Droughtmaster (DM) dan Australian Commercial Cross (ACC) telah dinilaikan dari sejumlah 206 rekod pembiakan lembu dari tahun 1974 hingga 1985.

Data hujan harian dan suhu persekitaran dari tahun 1981 hingga 1985 telah dianalisa. Peratus kelahiran dan konsepsi yang berlaku pada musim hujan dan kering juga telah ditentukan.

Purata umur pada peranakkan pertama bagi DM ialah 1420 hari dan untuk ACC 1407 hari. Purata bagi jangkamasa antara peranakkan untuk DM ialah 588 hari dan untuk ACC 564 hari. Tiada perbezaan yang signifikan di antara kedua parameter tersebut bagi kedua baka lembu ($P>0.05$).

Purata untuk jangkamasa antara peranakkan untuk kedua-dua baka lembu ialah 576 hari. Jangkamasa antara peranakkan untuk pariti ketiga adalah lebih panjang daripada pariti 1,2,5 dan 6 ($P<0.05$). Jangkamasa antara peranakkan untuk pariti ketiga dan keempat adalah yang terpanjang, manakala jangkamasa antara peranakkan untuk pariti pertama, kedua, kelima dan keenam lebih pendek dari purata keseluruhan jangkamasa antara peranakkan.

Kebanyakan peranakkan berlaku pada musim kering dari Disember hingga Februari (32.8%) dan Jun hingga Ogos (23.9%). Kebanyakkan konsepsi berlaku pada musim hujan dari Mac hingga May (33.8%) dan September hingga November (25.9%).

Hasilan dari pengajian ini, tempoh pengkahwinan terhad selama 10 minggu yang serentak dengan musim hujan telah disyorkan untuk kumpulan lembu ini.

INTRODUCTION

The cattle industry in Malaysia is mainly limited to small-scale farming by peasants or smallholders. More than 80% of the beef herd in Peninsular Malaysia is in the hands of the small-holders (Samuel et al., 1984). The remaining 20% are distributed in larger farms both government and private.

The national beef requirement is supplemented with buffaloes and draught and dairy type cattle. The current status of the beef industry in Malaysia is that the country can only meet 50% of its beef requirements (Samuel et al., 1984).

The indigenous zebu breed, the Kedah-Kelantan, is the major source for beef production in the country. Its productivity is low. Other sources of beef include other breeds, crossbreeds or types of cattle that have been imported into the country. These animals are distributed in the various government, private and smallholder cattle farms.

The Jelai-Gemas Beef Cattle Farm (Rancangan Daging/Penusu, Jelai-Gemas) in Negeri Sembilan is one such government farm. This farm was established in 1973, under Majuternak, a quasi government body, to conduct large scale cattle farming. Majuter-nak ceased functioning in May 1982 and the farm transferred to the Department of Veterinary Services (DVS). The initial stock of Local Indian Dairy, Australian Commercial Crosses and Drought-master cattle were slowly phased out until only Droughtmasters were left on the farm by 1985. At present, the farm serves as a multiplying unit for Droughtmasters for the country.

Reproductive performance is the most important factor in-fluencing economy of beef production. It is also the production

trait most sensitive to nutrition, environmental conditions and adaptability of cattle to their environment (Peacock, 1971). Important parameters to consider are age at first calving, calving interval and parity. Higher ages at first calving and long calving intervals mean greater losses to the farmer. Older cows may not produce calves as efficiently as young cows. The longer the time period a non-pregnant animal is maintained on the farm, the lower its productivity becomes. Plasse et al., (1968b) stated that with tropical beef cattle, the calving interval largely determines total cow productivity.

The tropical environment has many detrimental effects on reproduction in cattle. The effects of climate on efficient livestock production in the tropics are complex because of the many interacting factors involved (Jainudeen, 1976). The effects of climate on cattle may be exerted directly on physiological function or indirectly through nutrition. High environmental temperature adversely effects the reproductive processes in both male and female cattle. Rain may cool the environment, and also support growth of pasture and hence may have beneficial effects on cattle.

The farm at present practises a continuous mating system. Continuous mating is undesirable since it is an unnecessary waste of bulls, complicates management by extending the calving period and may perpetuate infectious causes of infertility (Swan, 1978). Proper management includes the routine control of the breeding season, culling procedures and the overall nutritional programme in the herd (Warnick, 1974). Restricting the breeding and calving seasons to relatively short periods is the first step in

achieving and maintaining a high level of reproductive performance in beef herds (Chenoweth, 1984).

The objectives of this project are:

a. to compare the reproductive performance of Australian Commercial Crosses (ACC) and Droughtmaster (DM) cattle in Rancangan Daging/Penusu, Jelai-Gemas.

b. to develop a restricted mating system for the DM herd in the farm.

LITERATURE REVIEW

The Droughtmaster is a new foundation breed developed in Australia by upgrading the Brahman with various British cattle breeds. The Droughtmaster was formally registered as a breed in 1956. It contains approximately half Brahman blood, is red in colour and founded chiefly on the Beef Shorthorn, but with some Hereford and Red Poll.

Ahmad et al. (1981) in Malaysia found the mean calving interval of DM to be 503 days whereas Francis (1972) in Queensland found it to be 11.5 months (345 days). The average age at first calving of DM heifers in Queensland was 25 months (750 days).

Australian Commercial Crosses (ACC's) are crossbreeds produced in Australia. These crossbreeds are basically of a Brahman foundation. They are the result of Brahmans being crossed with other temperate breeds of cattle. Not much information is available about them nor their performance.

The reproductive process of cattle is affected by high environmental temperatures. Adverse effects can occur in both the

male and female. Spermatogenesis is impaired in bulls exposed to heat stress. This effect on the bull may be reflected in the cows running with the bull as some form of infertility.

Heat stress can delay puberty in heifers raised in high environmental temperatures. As for estrous, its duration and intensity is decreased while the length of the estrous cycle is increased in heifers reared under hot climatic conditions. In beef cows an important reproductive problem under severe heat stress is anestrous.

Stott and Williams (Cited by Jainudeen, 1976) found that the reproductive performance declines when cattle are bred during the hottest months of the year. The immediate period following breeding may be the time when the reproductive process of the cow is most susceptible to heat stress. Environmental temperatures of 32°C for 72 hrs immediately after breeding has a very detrimental effect on conception (Dunlap et al., 1971). However heat stress beginning 10 days after breeding has no adverse effect on fertility.

The breed of cattle may play a role in reproductive performance. There is evidence that sexual maturity is later and calving intervals longer in Bos indicus than Bos taurus cattle (Francis, 1972).

As to the effect of parity on calving interval, work done by Wilson et al. (1974b) on Brahman and Santa Gertrudis indicated that both breeds tended to have a long first interval and shorter subsequent intervals.

Climatic and environmental factors may influence conception and calving patterns in cattle in the tropics. A seasonal

pattern may be observed in herds where the bulls are run with the cows throughout the year. Willis et al. (1974a) working with Brahmans and Santa Gertrudis found that the wet season accounted for 57 to 65% of all calvings. They noted that other workers found a higher proportion of calves being born in the dry rather than the wet season.

Cattle breeds may also influence seasonality. It was found that there was a seasonal variation in sexual activity of Bos indicus cattle (Plasse et al., 1968a). This could result in a seasonality in calving patterns.

The reproductive performance of cattle is relatively low in many of the developing countries. The reasons for this are multiple and interrelated but may be listed as nutritional, environmental, disease and management factors (Warnick, 1974). To improve production, management should be geared towards efficient use of available resources. Restricting the breeding and calving seasons to relatively short periods is beneficial (Chenoweth, 1984). A controlled mating period should be designed to match the nutritional requirements of cows with pasture availability (Rudder et al., 1982). It has been demonstrated that reproductive rates can be increased and maintained with controlled joining.

MATERIALS AND METHODS

Source of Data

This study was conducted in the beef cattle farm Rancangan Daging/Penusu, Jelai-Gemas in Negeri Sembilan.

The farm is situated at the 8th mile, Gemas/Rompin Road in

Negeri Sembilan. At present, 1,875 acres of the farm are being utilised as pasture, buildings, ponds, roads etc. Another 2,377 acres are as yet uncultivated and remains as jungle.

The climate is equatorial with diurnal temperatures ranging from 24°C to 35°C. The total annual rainfall is about 1660 mm. The farm is situated in one of the driest districts in the country.

A rotational grazing system of feeding is practised for the adults. Panicum maximum and Bracharia decumbens are the most common pasture grasses in use. The calves are kept with the dams in the pastures until they are weaned at 6 months of age. The weaners are kept in the weaner unit for a month where they are fed palm kernel cake and fodder, ad lib. They are then turned out to pasture. This one month confinement is to prevent them from running back to the dams and also to overcome post-weaning stress.

A continuous mating system is practised, using a bull to cow ratio of 1:30.

Data Analysis

A total of 1170 records of breeding cows were analysed for age at first calving, calving interval and effect of parity on calving interval.

The raw data consisting of birth dates and calving dates were filed using the Database 3 Plus computer programme. The ages at first calving and calving intervals were computed using the Lotus 123 programme. The age at first calving was obtained by subtracting the birth date of the first calf from the birth

date of the dam.

Calving intervals were the intervals between calvings measured in days. The effect of parity on calving interval was examined for parities one to six. Parity 6 included parities greater than six for the purpose of analysis. Graphs were plotted using the Lotus 123 Printgraphics. Statistical analysis using the SPSSPC+ programme was the analysis of variance and the Duncan's procedure.

The mean monthly calvings were calculated by pooling all calvings in a particular month for the 12 year period and then dividing it by the total number of calvings for the same period. Percentage monthly calvings were then obtained.

The conception dates were extrapolated by subtracting 285 days from the calving dates using the Lotus 123 programme for the same period. Conceptions occuring monthly were calculated as for calvings.

The total rainfall for each month for each year was calculated. Then the mean monthly rainfall for the five year period was determined. The mean monthly maximum and minimum temperatures for the five year period was determined.

RESULTS

The average age at first calving was 1419.8 and 1406.6 days respectively for the DM and the ACC's (Table 1) ; this difference was not significant (P>0.05).

The average calving intervals for the DM and ACC were 587.6 and 564.0 days respectively (Table 1). This difference was also not significant (P>0.05).

Since there was no significant difference between the breeds

for age at first calving and calving interval, the analysis for the effect of parity on calving interval was done collectively for the ACC and DM. The average calving interval for the two breeds is 575.8 days.

Table 2 shows that the calving intervals tended to increase from the first parity to the third, then decreased for the older parities. The interval for the third parity was significantly greater than the means for parities 1, 2, 5 and 6 ($P<0.05$).

The average monthly maximum and minimum temperature ranged from 30.3°C to 33.4°C and 20.0°C to 22.8°C respectively (Fig. 1).

Over a five-year period, two discernible peaks were observed in the annual rainfall pattern; the first from March to May (Wet 1) and the second from September to November (Wet 2) (Fig. 2). There are also two distinct dry seasons occuring from December to February (Dry 1) and June to August (Dry 2).

The calving and conception patterns for the DM were calculated according to rainy or dry seasons. Per cent calvings in the dry season were 32.8 in Dry 1 and 23.9 in Dry 2. In the wet season it was 21.9 in Wet 1 and 21.4 in Wet 2. Per cent conceptions in the dry season were 21.1 in Dry 1 and 19.4 in Dry 2. In the wet season it was 33.8 in Wet 1 and 25.7 in Wet 2 (Fig.3).

DISCUSSION

Age at first calving, calving interval and effect of parity on calving interval

The average age at first calving for the DM in the present study is much higher than that quoted by Francis (1972) who found it to be 25 months (750 days). There were no reports on the ACC.

The average calving interval for the DM is much higher than that found by Ahmad et al. (1981) and Francis (1972) who found it to be 503 days and 11.5 months (345 days) respectively.

It is beyond the scope of this study to comment on the factors that may be responsible for this poorer performance recorded. Comments would be reduced to mere speculations. It has been generally accepted that farm animals have a poor reproductive performance in the tropics. Warwick (Cited by Willis et al., 1974a) attributed the poor performance of cattle in the tropics to climatic and nutritional difficulties. Stress of lactation also contributes to anestrous.

Male fertility plays an important role in the reproductive performance of the herd. In the tropics, high ambient temperatures exert deleterious effects on male fertility and could cause drastic reductions in annual calf crops, even if adequate ratio of males to females is present (Bongso et al., 1981).

In this study, calving intervals were found to increase from parity one to three, then decrease in subsequent parities. The calving interval for the third parity was significantly greater than parities 1,2,5 and 6 ($P<0.05$). Pattie et al., (1978) working with DM and Santa Gertrudis crosses found that the length of the calving interval between the first and the second calf was significantly greater ($P<0.05$) than the mean of all calving intervals.

Wilson et al., (1974b) working with Brahman and Santa Gertrudis found that the first calving interval was the longest in both breeds with a slight tendency for older cows to have

shorter than average intervals. In this study, the third and fourth calving intervals are the longest with the first, second, fifth and sixth being shorter than the means of all intervals.

Development of a Restricted Mating System

The conception pattern was determined only for the DM because the farm only stocks these animals presently. This evaluation is for the purpose of developing a restricted mating system for the herd.

Fig. 3 shows that the highest percentage of conceptions in a year occurred in the two wet seasons - March to May and September to November. Jelai-Gemas is located in one of the driest districts in the country and the wet seasons there are not typical of wet seasons elsewhere in the country where total annual rainfall exceeds 3000mm (250mm per month). The wet season in Jelai-Gemas may be classified as moderately wet with monthly rainfall exceeding 142mm per month but less than 250mm per month. Annual rainfall less than 1700mm (142mm per month) is considered dry in this country (Lockwood J.G.,1976), and this coincided with the months December to February and June to August in Jelai-Gemas. It should be emphasised that even in the dry season, there is sufficient rain for grass growth although quantity and quality may not be the same.

In this study, it was found that calvings did occur throughout the year, but a higher percentage of these calvings 32.8 and 23.9 per cent occurred in the two dry seasons Dry 1 and Dry 2 respectively (Fig.3). The present data confirmed the observations of Barrios (Cited by Willis et al.,1974a) who found that a high

proportion of calvings occurred in the dry season but not those of Willis et al., (1974a) who found that the wet season accounted for 57 to 65 percent of all calvings.

Conceptions were found to occur mainly in the wet seasons although they did occur throughout the year. The wet seasons, Wet 1 and Wet 2, had 33.8 and 25.7 per cent conceptions respectively.

The higher conception rates of the cattle during the wet season was probably related to better nutrition and hence better body condition of the animals resulting from lush pasture growth. It is likely that there is maximum ovarian function in the cows and reasonable semen quality and libido in the bulls (Hodge, 1978).

It appeared that environmental temperature might not have a significant effect on the higher conception rates occurring during the wet season here, because the maximum temperature remained high throughout the year (Fig.2), and in fact maximum temperature appeared to be higher during the rainy season. This high temperature undoubtedly would play a role in infertility in cattle.

From these findings, the best time for joining of bulls in a seasonal mating system would be during the wet seasons since the findings indicated that the cattle conceived better during those seasons. Restricting the breeding season and calving season to relatively short periods is the first step in achieving and maintaining a high level of reproductive performance in beef herds (Chenoweth, 1984). Seasonal mating for 10 to 12 weeks helped to concentrate the calving period, allowed early recog-

nition of and disposal of infertile cows and generally assisted the organisation of management (Swan, 1978).

Accordingly, two mating seasons of ten weeks duration each, coinciding with the wet seasons were recommended. Bulls can be joined with the breeding cows from the middle of March to May and from the middle of September to November. By doing so cows will be on a better plane of nutrition resulting from lush pasture growth during the mating period.

Also by restricting the mating season to ten weeks, calvings would occur in the dry season and end at the beginning of the next rainy season. Calves born in the dry season have a better chance for survival compared with those born in the wet season. As the wet season starts again cows would again be on a better plane of nutrition.

A 10-week mating period was recommended because it would allow cows about three estrous cycles within the mating period. Non-pregnant cows should be separated from the pregnant herd and be given a second chance during the next mating period. If cows failed to conceive after 2 mating periods they should be culled.

It was also recommended that the physical condition of the bulls be monitored throughout the year. A premating examination should be made for breeding soundness, and if possible this should include at least a test of the serving ability of each bull (Stafford et al.,1984). Scrotal circumference measurements, coupled with clinical examinations and semen evaluations, were useful parameters for the estimation of breeding soundness and gave a good indication of a bulls fertility (Bongso et al.,1981).

Another aspect of farm management that was overlooked but one that is important was a regular evaluation of the farm records, to detect and if possible overcome problems early. Evaluation of records could pin-point managerial or husbandry inadequacies.

Further studies could be conducted to investigate the actual causes of the high ages at first calving and long calving intervals. Probably an indepth study of female reproduction in relation to nutrition and climate should be conducted. The role of the bull in this should also be investigated. Also studies may be conducted on the environmental effects contributing to male and female infertility, particularly the effects of high environmental temperature in association with the relative humidity of the environment.

CONCLUSION

The conclusions that can be made from this study are as follows:-

i) There was no significant difference statistically, when the reproductive performance of the DM and ACC was compared.

ii) Most of the calvings were found to occur in the dry seasons and most of the conceptions in the wet seasons.

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APPENDICES

TABLE 1. AGE AT FIRST CALVING AND CALVING INTERVAL DATA FOR DROUGHTMASTER AND AUSTRALIAN COMMERCIAL CROSS CATTLE

Breed	Age at 1st Calving		Calving Interval	
	N	Mean + SE	N	Mean + SE
DM	73	1419.8+47.8	209	587.6±21.8
ACC	133	1406.6+37.2	326	564.0+19.7

TABLE 2. EFFECT OF PARITY ON POOLED CALVING INTERVALS FOR DROUGHTMASTER AND AUSTRALIAN COMMERCIAL CROSS CATTLE

Parity	N	Mean* + SE
1	247	530.8±17.7 a
2	135	563.8+29.9 a
3	90	688.1+47.6 b
4	69	617.6±43.4 ab
5	47	523.6+40.9 a
6	28	515.5+53.6 a

* Means with the same superscripts are not significantly different (P<0.05)

FIG 1. AVERAGE MONTHLY TEMPERATURE('C)

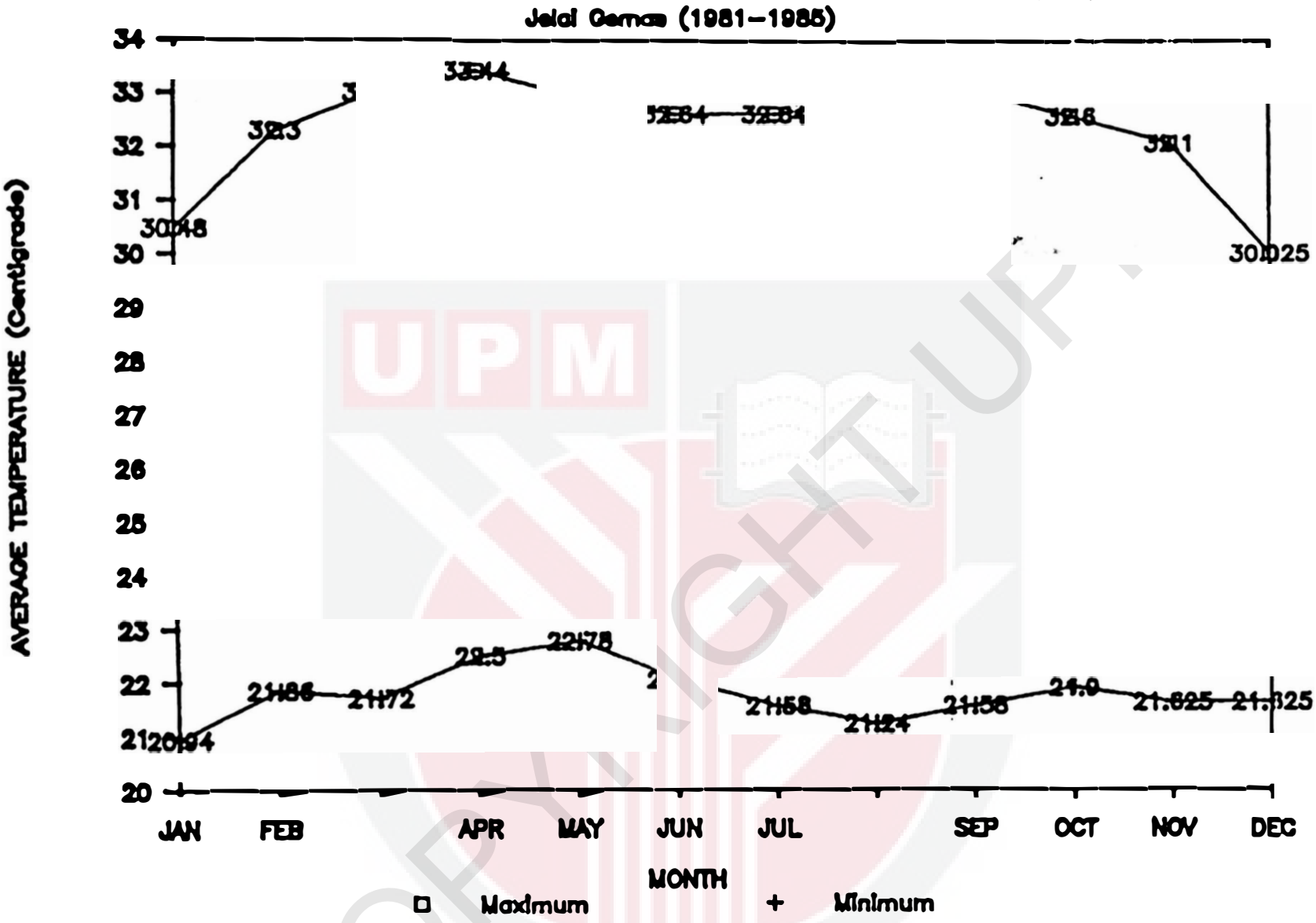

FIG2. AVERAGE MONTHLY RAINFALL

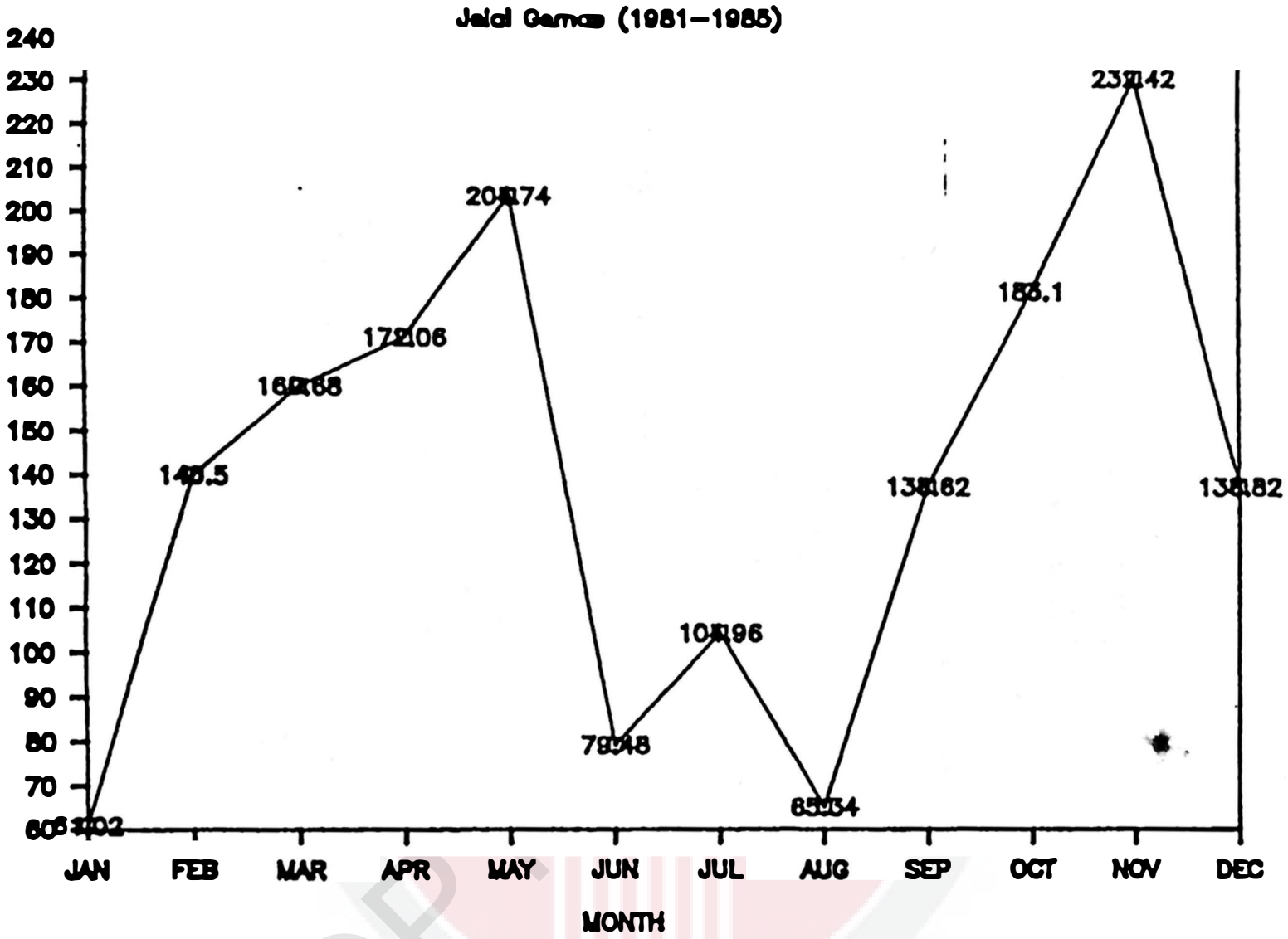

FIG 3. CONCEPTION & CALVING PATTERNS