



UNIVERSITI PUTRA MALAYSIA

**A FIELD STUDY OF MANAGEMENT AND HUSBANDRY FACTORS
AFFECTING REPRODUCTIVE PERFORMANCE OF DAIRY COWS IN
MALACCA MALAYSIA**

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AFFECTING REPRODUCTIVE PERFORMANCE OF DAIRY COWS IN MALACCA,
MALAYSIA.

by

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LIST OF ABBREVIATIONS

AI	Artificial insemination
CI	Calving interval
CCI	Calving to conception interval
C%90	90% group pregnancy status
Chi Sq	Chi square value
CR	Conception rate
CSIRO	Council for Scientific and Industrial Research Organisation
df	Degrees of freedom
KG	Kilogram
LID	Local Indian Dairy
MCC	Milk collection centre
NM	Natural mating
NRC	National Research Council
OC	Other Cross
PFS	Professional Filing System
SxF	Sahiwal x Friesian Cross



An abstract of the thesis presented to the Senate of Universiti Pertanian Malaysia in partial fulfilment of the requirements for the degree of Master of Science.

A FIELD STUDY OF FACTORS AFFECTING PERFORMANCE OF DAIRY COWS

IN MALACCA, MALAYSIA

by

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Supervisor : Professor M.R. Jainudeen

Faculty : Veterinary Medicine and Animal Science

The problem of poor reproductive performance and lack of profit from smallholders' dairy cows in Malacca was addressed during the period July 1981 to May 1983. Performance of 290 cows on 82 farms with varying feeding and management regimes were studied over a period of at least one year.

Performance history and physical examination of the cows at repetitive visits provided data which was analysed for significant differences ($P < 0.05$) in productive and reproductive performance against variations in husbandry, and population characteristics of cows and farmers.

Increasing parity from one to three or greater decreased calving to conception interval mean by 4.2, median by 5.5 and for 90% of cows pregnant by 5.6 months at a level of feeding 0.5 NRC recommendations. With full feeding the corresponding figures were 1.8, 1.7 and 2.1 (but between parity one and two 2.7, 3.0 and 4.9). Parity exerted its greatest effect between



parity one and two. No increase in (milk) production peak occurred with increase in parity.

Increase in feeding level from 0.5 to full NRC recommendations decreased calving to conception interval mean for parities one, two and three with three plus by 3.2, 2.8 and 0.8 months, median by 4.0, 1.8 and 0.2 and for 90% of cows pregnant by 10.7, 9.8 and 7.2. Greatest effect of full feeding on reproductive performance was reduction of a less fertile tail.

Field data suggests that the increase to full feeding level would result in a milk production increase of 146% for the poorly fed cows. Of this 18% would be due to improved reproduction, 50% to increase in production peak and 32% to decrease in dry period (from 7.5 to 1.8 months). The calculations are supported by field observations.

Reproductive performance was unaffected by oestrus detection method and A.I. versus natural mating.

Maximum production peak and best reproductive performance was associated with optimum body condition.

Under cost/price conditions prevailing, effective extension of the facts established was able to achieve profit levels which exceeded planned targets.



Abstrak daripada tesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia untuk memenuhi sebahagian dari keperluan untuk Ijazah Master Sains.

SATU KAJIAN LADANG TERHADAP FAKTOR-FAKTOR PRESTASI
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Satu kajian terhadap kerendahan prestasi reproduksi dan keuntungan di kalangan penternak-penternak kecil lembu tenusu di Melaka telah dijalankan dari Julai 1981 sehingga Mei 1983. Prestasi 290 ekor lembu tenusu dari 82 buah ladang tenusu dengan berbagai-bagai regim pemakanan dan pengurusan telah dikaji sekurang-kurangnya selama setahun.

Data dari sejarah prestasi dan pemeriksaan fizikal di perolehi dari lawatan-lawatan yang sering dibuat dianalisiskan untuk perbezaan signifikan ($P < 0.05$) bagi prestasi pengeluaran dan reproduksi dari aspek pengurusan dan ciri-ciri populasi lembu dan penternak-penternak yang berbeza.

Kenaikan pariti dari satu hingga tiga atau lebih menyebabkan kejatuhan tempoh kelahiran ke konsepsi purata sebanyak 4.2, median sebanyak 5.5 dan bagi 90% lembu yang hamil sebanyak 5.6 bulan pada tahap pemakanan 0.5 mengikut syor NRC. Dengan pemakanan sepenuhnya, angka-angka di atas berubah seperti



berikut: 1.8, 1.7 dan 2.1 (tetapi antara pariti 1 dan 2 adalah 2.7, 3.0 dan 4.9). Pariti memberi kesan yang tertinggi diantara pariti satu dan dua. Tiada kenaikan dalam pengeluaran susu berlaku dengan penambahan pariti.

Kenaikan tahap pemakanan dari 0.5 hingga syor sepenuh NRC telah mengurangkan tempoh kelahiran ke konsepsi purata bagi pariti 1, 2 dan 3 atau lebih sebanyak 3.2, 2.8 dan 0.8 bulan; median sebanyak 4.0, 1.8 dan 0.2 dan bagi 90% lembu yang hamil sebanyak 10.7, 9.8 dan 7.2.

Kesan yang paling nyata bagi pemakanan sepenuh terhadap prestasi reproduksi adalah kerendahan kesuburan.

Data dari ladang mencadangkan bahawa kenaikan kepada tahap pemakanan sepenuh boleh menyebabkan pertambahan dalam pengeluaran susu sebanyak 146% bagi lembu-lembu yang berkurangan makanan. Dari peratus ini, 18% disebabkan oleh reproduksi yang diperbaiki, 50% oleh peningkatan tahap maksima pengeluaran dan 32% oleh penyingkatan tempoh pengeringan (dari 7.5 hingga 1.8 bulan). Pengiraan tersebut adalah disokong oleh pemerhatian-pemerhatian di ladang.

Teknik mengesan estrus serta pernian beradas, berlawanan pembiakan dengan jantan, tidak memberi kesan terhadap prestasi reproduksi.

Tahap pengeluaran maksima dan prestasi reproduksi yang baik telah dikaitkan dengan keadaan badan yang optima.

Dalam keadaan kos/harga sekarang, pengluasan faktor-faktor yang terbukti dengan berkesan telah dapat menghasilkan pencapaian tahap keuntungan yang melebihi matalamat yang telah dijangkakan.



CHAPTER 1

INTRODUCTION

BACKGROUND

Dairying in the hot, humid, tropical regions of the world has come to be recognised as having special difficulties. Grasses which grow in these areas are characterised by lower digestibility than in temperate climates, and the rapidity of growth and maturity results in dramatic fluctuation in protein content. Also, many such areas are situated in countries where prevailing socio-economic conditions severely limit land available for cattle fodder production. These nutritional constraints, and the special adaptation necessitated by the tropical bovine disease spectrum and the climate per se, have led to the evolution of a particular type of local animal. Although admirably suited to survival in their environment, by world dairy standards such animals are small in stature, have low lactation capacity, and lack dairy temperament. Dairying in the Malaysian state of Malacca (Melaka), situated on the strait of the same name, less than three degrees north of the equator, topographically a coastal plain and subjected to monsoonal precipitation at fairly predictable times of the year, has all these problems.

Policies to effect twenty percent self sufficiency in dairy products by 1990, and of placing "emphasis on the socio-economic needs of the small farmer" (Osman Din and Ahmad Mustaffa Haji Babjee, 1978) had led to the rapid expansion of dairying in Malaysia. The Veterinary Division of the Ministry of Agriculture



was responsible for planning, development, administration and functioning of the expanding industry. Some technical input was provided by the West German and Australian governments as bi-lateral development assistance.

Prior to the present expansion, dairying in Malaysia was largely the preserve of the Indian section of the population, which satisfied the desire for dietary milk and the cattle husbanding tradition of these people. Milk, surplus to the needs of the household, was sold to the surrounding community, and general development and urbanisation was encouraging the establishment of small dairy enterprises. Production was based upon the LID (Local Indian Dairy) breed, which had spontaneously developed from a mixture of Bos indicus types brought in by early immigrants from Southern India (Hawari, 1982). This animal, well adapted to the prevailing low input husbandry environment, but small in stature by European breed standards, produces an average of only 502 kg of milk per lactation of 7.1 months. They calve first at the age of 2.5 to 3 years and average one calf every 13 months (Sivarajasingam and Kassim, 1974).

Studies indicated that such production levels, and a breedable population of about 30,000 LID cows, would not permit realisation of dairy programme goals. Cross-breeding trials with various Bos taurus breeds produced F1 animals with lactation yields considerably superior to the LID, and likely to achieve better life-time production in a tropical climate than the pure Bos taurus parent. The Friesian was judged as most suited for this cross-breeding purpose.

The requirement to achieve targets, and the recognition of



the superiority of cross-bred cows by participating farmers, necessitated the acquisition of numbers of animals in excess of what could be bred from the LID population. This was being achieved by contract breeding of Friesian cows with Sahiwal semen in Australia and New Zealand. About 15,000 of these animals had been imported into Malaysia by late 1982, and they had become the livestock basis of the dairy industry expansion. Plans for breeding beyond the F1 generation were being formulated, but did not include any attempt to establish a new breed.

The overall dairy expansion strategy adopted by the Veterinary Division provided the participating farmers with a complete industry package. This included provision of subsidised F1 Sahiwal X Friesian milking stock, organisation of milk collection, bulking, marketing, payment and provision of supporting services such as assistance with arrangement of loan finance, extension, supplementary fodder supply, veterinary service, AI breeding service and fodder grass establishment. The key units in this programme were the Milk Collection Centres (MCC's).

A survey had shown that Malacca was a suitable place to test the dairy industry expansion formula, and the Jasin MCC was established as a pilot in December 1974. By mid 1983 approximately 1500 Sahiwal X Friesian animals were supplying milk to this centre. As well, other centres had been, or were being established at Merlimau, Alor Gajah and Masjid Tanah.

It is rare for development, such as the Malaysian dairy industry was experiencing, to be unaccompanied by technical problems relating to reproduction and health (McDowell, 1982 a). This is particularly so when the established husbandry practices

must be reoriented to allow a different animal to be established in the existing environment. The introduction of the larger, more productive Sahiwal X Friesian cow, with its need for improved standards of husbandry and nutrition, had produced the predictable on farm problems associated with higher producing animals in lower producing environments.

The problem of a low reproductive rate, with its disrupting effect on optimum dairy performance was a cause of concern to the Veterinary Division as a constraint to its dairy development programme.

THE PROBLEM

Evidence for the existence of an infertility problem in Sahiwal X Friesian females came from feed-back from farmers milking the animals, and from performance data compiled at Institut Haiwan, Kluang. As expressed by farmers the problem was characterised by:

- delayed onset of oestrus after calving
- recurrence of oestrus at protracted periods unrelated to normal bovine cyclicity
- many intercalving intervals greatly in excess of one year
- dry periods of nine months or more being common
- lack of expected profits and return to capital

The farmers' complaints tended to be supported by studies of the productive and reproductive performance of F1 Zebu X Friesian cattle at Institut Haiwan. Data analysed for cattle on that station by Ganabathi (1981), showed the following averages:

milk yield per lactation	1870 kg
lactation length	269 days

intercalving period	426 days
service period	146 days
dry period	154 days
services per conception	1.85
gestation period	280 days

The possibility of making immediate comparisons between the Institut Haiwan cattle and those in the hands of farmers in Malacca was precluded by the general lack of written records. Attempts to institute this desirable practice so fundamental to progress, and to aggregate the data had been made at Jasin MCC but had lapsed due to the absence of appropriate man power. On farm visual appraisal and conversational evidence did produce the observations that:

- there was a production/reproduction/profit loss problem to be addressed
- there was considerable variation in the appearance and performance of the cattle
- there was apparent variation in the application of well proven husbandry practices by the farmers

STUDY OBJECTIVES

The objectives of the study were to attempt to answer questions essential to adequate resolution of the problem. These questions were:

1. What are the productive and reproductive performances of dairy cows in Malacca?
2. What variation exists which is due to intrinsic cattle population factors?
3. What variation exists which is due to differences in husbandry and management practices between farms?
4. What is the relationship of productive and reproductive performance to the cattle population and farm practice variations observed?

5. What are the economic effects upon profit of the productive and reproductive performance of the various cattle population and farm practice groups?
6. What are the best strategies to employ to minimise the effects of factors causing economic loss?

CHAPTER 2

LITERATURE REVIEW

2.1 SUITABLE CATTLE BREEDS

There is little doubt that the performance of dairy cattle with approximately half Bos taurus and half locally adapted Bos indicus blood is superior to that of either parent in the low altitude tropics. Zebu cattle are uniquely suited to hot climates due to genetic attributes affecting coat, skin and haematological characteristics. Compared with Bos taurus cattle, however, they have a lower reproduction rate, are slower growing, lower in milk production and in beef quality. Cross-breeding provides a compromise between the special adaptability of the zebu and the higher productive traits of the Bos taurus and large amounts of heterosis (Turner, 1980).

A review of cross-breeding experiments in 48 herds, from seven countries in the tropical region revealed that, on the average, such cross-breds, from one of six recognized dairy breeds originating from cooler climates produced 220% more milk in the same herds as did the native cattle. In the cross-breds, length of lactation was 134% longer, average age at first calving was 7.4 months lower and calving interval was 7% less than that of the native cattle. Also, calf losses in the cross-breds were 59% of those suffered by the native animals (McDowell, 1972).

Although continued up-grading with Bos taurus cattle may result in greater milk yields, in some cases the opposite effect



has been recorded. Where increased yields have been effected, the age at first calving and the length of calving interval have been greater than those for the first crosses. Also such increases, in terms of yield per day of calving interval, are dependent upon improvement in the husbandry and environment. Where these factors cannot be easily improved inter se mating among the F1 animals has appeared to have produced better results (McDowell, 1972).

In Malaysia, these findings in favour of the cross-bred have been supported by various studies with the locally adapted LID (Local Indian Dairy) breed, various Bos taurus breeds and the cross-bred. Included in some of these studies has been consideration of the dairy merit of the Sahiwal X Friesian cattle imported from New Zealand and Australia to more rapidly satisfy dairy cattle requirements (Sivarajasingam and Kassim, 1974; Hassan and Devendra, 1982; Luxton and Manefield, 1982).

Sahiwal X Friesian cows have been found to be very satisfactory producers in India (Singh et al, 1980; Dhillon and Jain, 1977) and there was no benefit in increasing the Friesian blood beyond 50% (Ram and Chaudhary, 1976; Jain and Dhillon, 1975).

Work on the standardisation of the Sahiwal X Friesian as a breed suitable for the tropics has been proceeding in Australia for a number of years (The Australian Friesian Sahiwal) and, although producing 70% - 79% of the yield of pure Friesians under the same conditions, it has been reported as being satisfactory (Colditz and Brown, 1976). Compared to known production for tropical zebu breeds, further reports have supported this finding in the F2 and F3 generation and also noted that these