

SELECTION METHODS USED IN THE DEVELOPMENT OF THE AFS BREED OF TROPICAL DAIRY CATTLE

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SUMMARY

The AFS breed of tropical dairy cattle has been developed to combine the high milk production characteristics of the *Bos taurus* breeds with the tropical adaptation characteristics of the *Bos indicus* breeds.

Early selection was based on the elimination of cows which failed to let down milk in the absence of the calf. Subsequent selection involved the development of a progeny testing programme for AFS bulls.

A multiple ovulation and embryo transfer (MOET) programme was established in 1985 to further develop the breed. Details of this MOET programme are described.

INTRODUCTION

The AFS breed of tropical dairy cattle has been developed by the Queensland Department of Primary Industries as a breed particularly suitable to tropical environments.

Its development was commenced in the early 1960s when Holstein-Friesian cows were mated to Sahiwal bulls. This combined the high milk production of the Holstein-Friesian breed with the tropical adaptation characteristics of the Sahiwal breed.

The development of the breed has been through three distinct phases:-

- (a) Culling of F1 (first-cross) females to eliminate problems due to failure to let down milk;
- (b) Progeny testing of young bulls to ensure genetically superior bulls for use through artificial insemination;
- (c) More rapid development of the breed using a multiple ovulation and embryo transfer (MOET) programme.

MATERIAL AND METHODS

Failure to let down milk in the absence of the calf has been a problem experienced with virtually all first-cross *Bos indicus* x *Bos taurus* dairy cows. Hayman (1973) reported a culling rate of 59% with the Australian Milking Zebu (AMZ) breed,

DISCUSSION

The development of the AFS breed of tropical dairy cattle provides an example of the use of changing selection methods in the development of a new breed.

Initial selection was based on eliminating the let-down problems experienced in the F1 cows. This very heavy culling (up to 60% on average) restricted the progress that could be made in the early days, but overcame this serious problem.

When sufficient cows were being recorded in herds throughout Queensland and the Northern Territory, it was possible to put a progeny testing programme in place in those states. There would be advantages in extending this progeny testing programme into tropical dairy industries outside of Australia.

This would allow greater numbers to be involved in the programme and allow evaluation under true tropical conditions. Attempts at extending such programmes into developing industries have been difficult due to small herd numbers, problems with identification and problems with establishing accurate production recording systems. These problems are currently being addressed by the Queensland Department of Primary Industries.

While the progeny testing programme in the AFS breed has been successful, the relatively low numbers of bulls that can currently be evaluated each year prompted the establishment of a MOET programme to assist in the more rapid genetic development of the breed.

The MOET programme will allow more intense selection on the female side and reduced generation intervals, leading to more rapid progress. The fact that the Queensland Department of Primary Industries either owned or had access to all purebred cows in the breed assisted in the development of the MOET programme.

The programme should consolidate the breed's role in the development of dairying industries in tropical environments.

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RESULTS

The early selection against the milk let-down problems seen in the F1 generation has been successful in reducing the problem to acceptable levels.

Of 86 cows in the herd at the Animal Genetics Centre that completed lactations in the 1988-89 herd recording year, 44 (51%) had lactations of 300 days or more. A further 18 cows (21%) had lactations lasting between 250 and 299 days and 14 cows (16%) had lactations lasting between 200 and 249 days. Only 10 cows (12%) had lactations lasting less than 200 days. Some of these cows with short lactations had been dried off to fit into embryo transfer programme requirements.

Progeny testing has been successful in identifying a number of bulls for use within tropical dairy industries. There are currently seven proven AFS bulls with semen available. The highest ABV for milk of any of the proven bulls is +520 litres and the highest ABV for fat plus protein is +26 kg.

The average of the seven proven bulls is +266 litres of milk and +17 kg of fat plus protein. The current averages for all bulls within the AFS breed are +4 litres of milk and 0 kg of fat plus protein.

As a result of the selection to date, the AFS breed has considerable advantages over *Bos taurus* breeds in terms of both production and reproduction under tropical environments (Tierney 1989). These advantages have been quantified by McMENAMIN (pers. Comm.) in terms of net income per cow under tropical conditions as:-

Breed	Net Income per Cow per year
AFS	\$1,103
Holstein Friesian	\$ 628
Other <i>Bos taurus</i>	\$ -516

In the MOET programme, the first donor cows selected for embryo transfer were those with productions in the top 10 to 15% of the herd.

The first embryo transfer cows have now completed their first lactations. Of the 25 cows selected for use as donors during 1990, over 50 per cent. were heifers resulting from embryo transfers.

Over the next few years it is anticipated that nearly all donor cows will come from the embryo transfer programme. Bulls for use in the programme will be selected on the basis of the performance of their full - and half - sisters, not on their progeny. This will reduce the generation interval on the male side from 6-7 years down to 3-4 years.

while Alexander *et al.* (1984) reported a culling rate of 60% for the AFS. The culling rate in the AFS breed varied between different Sahiwal sires from 28% to 85%.

To overcome this problem, all first-cross heifers were milked in Departmental herds. Any heifers that failed to milk for at least 120 days were culled. Daughters of failed heifers were also milked in Departmental herds, and a similar culling procedure was adopted.

A progeny testing programme in the AFS breed was commenced in 1976 and has continued with four or five bulls being tested each year. This programme has followed conventional dairy progeny testing guidelines, with at least 20 daughters per bull being tested each year (Alexander *et al.* 1985).

The only change from conventional progeny testing has been that the bulls have been screened for tick resistance prior to inclusion in progeny testing teams (Utech *et al.* 1978).

The bulls are not screened for heat resistance as all progeny are evaluated in Queensland or in the Northern Territory under natural conditions of high temperatures (greater than 30° C during the summer months).

Since 1982, all AFS bulls have been evaluated annually by the Australian Dairy Herd Improvement Scheme (ADHIS) using BLUP (Best Linear Unbiased Production) methodology (Jones 1985).

In 1985 a multiple ovulation and embryo transfer (MOET) programme, based on the theory developed by Nicholas and Smith (1983) was established at the Warrill View Animal Genetics Centre.

In this programme approximately 100 heifers per year are mated to calve at about 2 years of age. Twenty to twenty-five of these heifers are selected each year, with selection based on the heifer's own production, plus the production of its full and half-sisters and the production of its dam.

These 20 to 25 heifers are then treated with hormones to produce multiple ovulations. Up to five female and five male progeny per year will be produced from each of the selected females.

Young bulls will be selected on their full and half-sister's production plus their dam's production.

AFS cows outside of the MOET programme will be monitored and cows with appropriately high Australian Breeding Values (ABVs) will be introduced into the MOET programme. This should help reduce the level of inbreeding which otherwise might increase in the programme.