TWENTY YEARS OF GENETIC PROGRESS IN AUSTRALIAN HOLSTEINS

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SUMMARY
Australian Holsteins have made significant genetic progress for production traits and profit over the last 20 years. In that time the breeding direction has changed with more profit based breeding goals replacing simple selection for the yield traits fat and protein.
Keywords: Holstein, genetic trends, Australian Breeding Values (ABV's), Australian Dairy Herd Improvement Scheme (ADHIS), APR (Australian Profit Ranking)

INTRODUCTION

The Holstein is the most numerous of the dairy breeds in Australia, accounting for 80% of the herd-recorded population of dairy cows in Australia in 2001/2002. The Australian Holstein traces back to Friesian cattle imported in the early 1900's from Europe and since then, to cattle imported from North America and New Zealand. However the majority of Australian Holsteins would trace back to cattle from other breeds (mainly Jersey) with the use of semen and crossbreeding as the mechanism for breed change in the last 40 years.

The objective of the review was to investigate genetic trends in the Australian Holstein population and relate these trends to changes in breeding direction and the introduction of genetic material from other Holstein populations.

MATERIALS AND METHODS

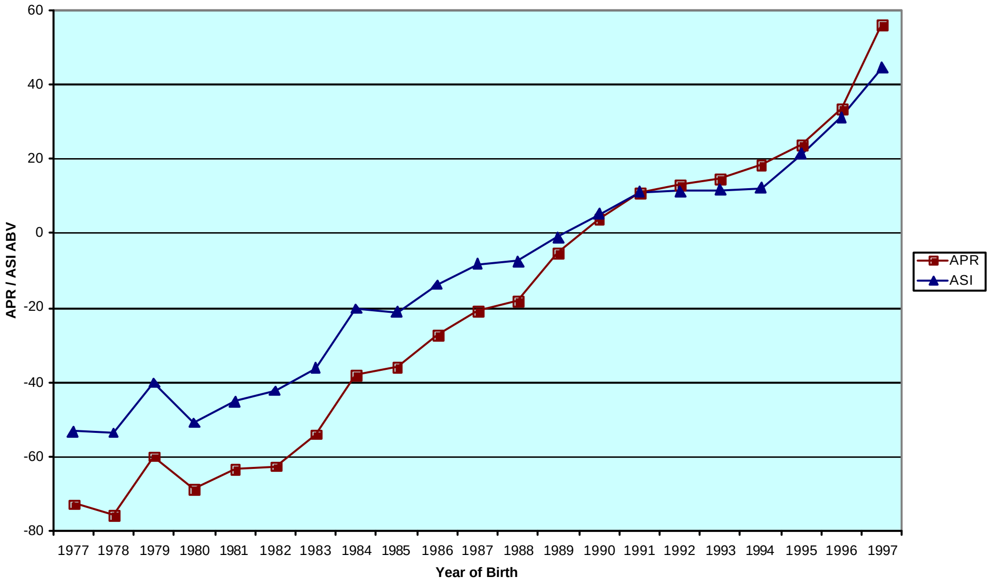
The August 2002 Australian Breeding Values (ABV's) as calculated by the Australian Dairy Herd Improvement Scheme (ADHIS) were the basis of the analysis. All bulls with birth dates post 1977 were extracted from the data set. The primary NASIS (National AB Sire Identification Scheme) code was then used to identify bulls that had semen collected and were progeny tested in Australia (as opposed to semen that was imported into Australia after a bull was progeny tested in another country.

RESULTS AND DISCUSSION

Genetic gain for production and profit has been significant and consistent over the last 20 years in Australian Holsteins.

Australian Profit Ranking (APR) and Australian Selection Index (ASI). The APR was introduced by ADHIS in 2001 and is a profit based index using production, conformation and workability traits to predict the profitability of a bull's offspring. The APR formula is: ASI + (3.9 x Survival Index) + (1.2 x Milking Speed) + (2.0 x Temperament) – (0.34 x Cell Count ABV) – (0.26 x liveweight ABV). The ASI is the forerunner to the APR and is now the major component of the APR. APR is a production index with the following formula: APR = (3.8 x protein ABV) + (09 x fat ABV) – (0.048 x milk ABV). *Figure 1* shows the change in these two indices since 1982 (bulls born in 1977). Both indices are expressed in dollars.

Figure 1. Genetic Progress for APR and ASI in Australian Holsteins.



Over this period the average APR of an Australian progeny tested bull has risen by $129. This translates to a difference between the average bull born in 1977 and 1997 of $64.50 per daughter per lactation. The production component of the profit (ASI) has increased by $97.00 while the non-production traits account for the balance ($32.00).

Prior to 1994, selection was predominately for protein and fat yield with a tendency to select more heavily for protein. Genetic gain for ASI since 1994 has been dramatic. A gain of $32.00 was made in this period, which is the equivalent of the gain made for ASI for the 10 years prior to 1994.

Figure 2 Shows the change in contribution to APR (profit) from the non-production traits over this period.

Figure 2. Contribution to Profit from Non-Production Traits.

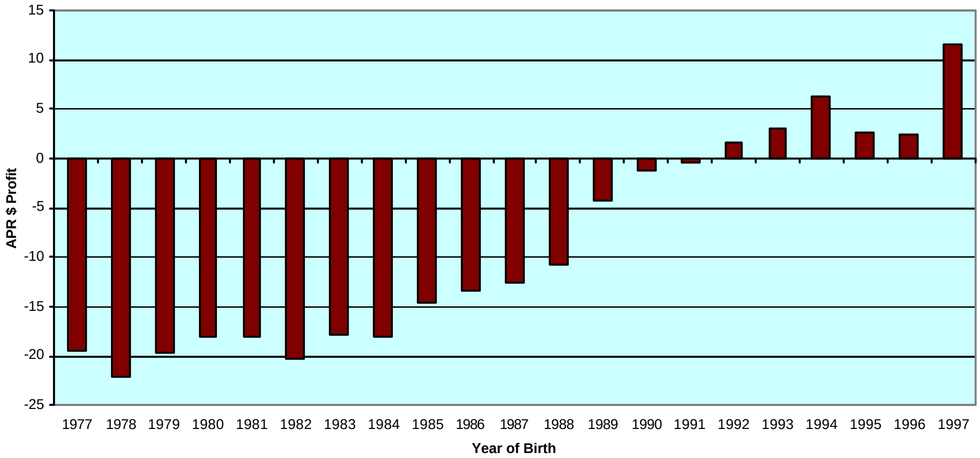


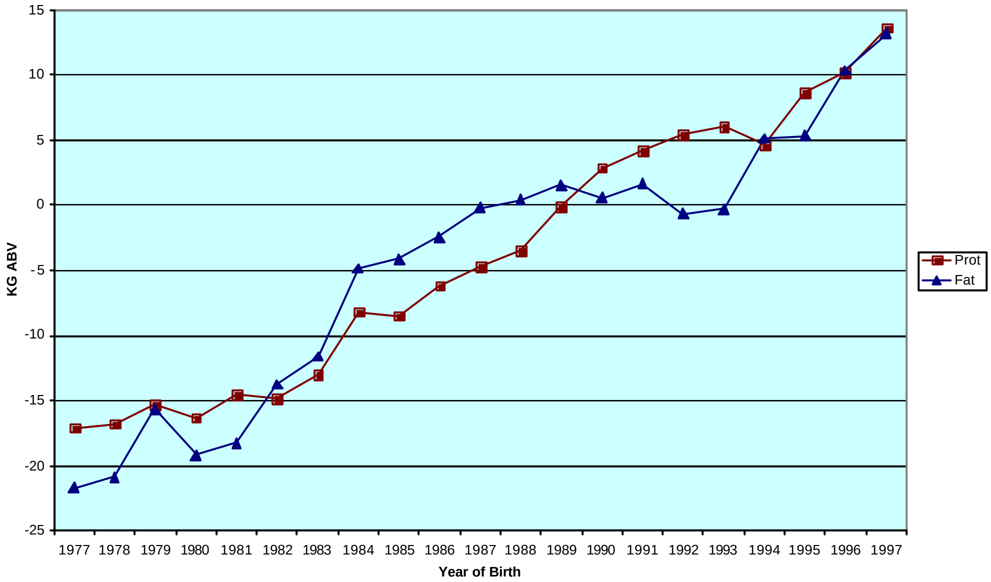
Figure 2 reveals that there was little genetic progress for the non-production traits between 1977 and 1984. During this time selection was primarily for production traits with selection for non-production traits performed after the bulls received a proof. During this period bulls were sired predominately by domestic sires with the percentage of North American Holstein blood on average less than 50%. In the mid eighties we start to see a greater influence of the higher type North American populations (Canada and the USA) with semen more readily available from these populations and many of the progeny test bulls with 2 to 3 generations of “Holstein” breeding.

1992 marked the first year that the contribution to profit from the non-production traits was positive. Selection for the APR by Australia’s major AI centres should ensure that the contribution to the APR from the non-production traits would increase with time.

Today, most bulls that are progeny tested in Australia have numerous generations of Holstein breeding with many bulls sired by successful Australian tested sires with pedigrees incorporating North American, European and domestic genetics.

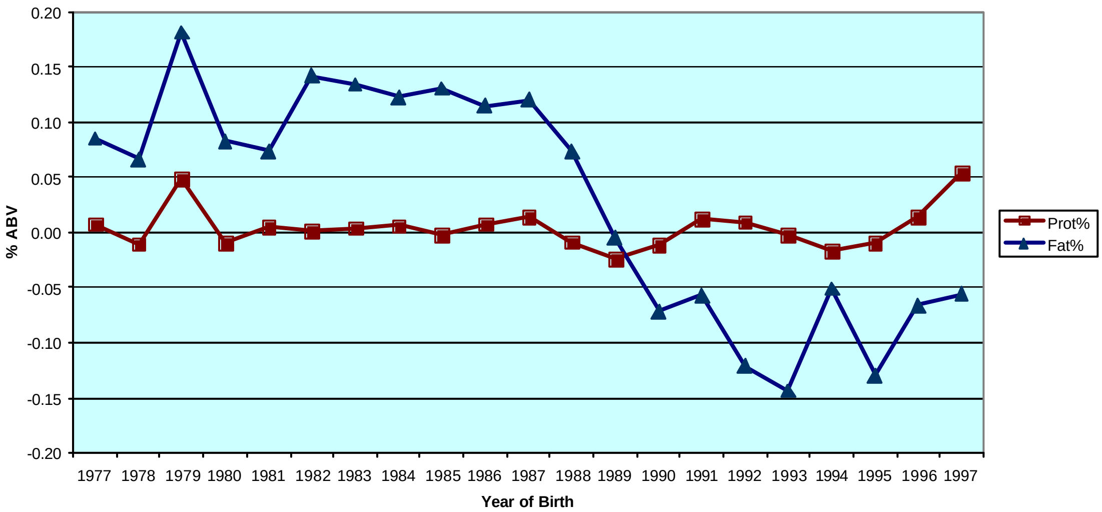
Protein and Fat Yield. The breeding direction of the Australian Holstein population has changed a number of times in the last 20 years: an initial emphasis on fat, then fat + protein, then protein for a short period followed by the ASI. Over that time, fat and protein yield has increased steadily. The availability of US semen in Australia coincided with a shift to more protein-oriented selection in 1988/89. This single trait selection had a detrimental effect on fat yield for the period until 1993 when Genetics Australia used a prototype ASI to select their bulls. Genetics Australia accounts for around half of the bulls that are progeny tested in Australia each year. There was no corresponding increase in protein yield and in fact there was as much genetic gain for protein in the 10 years prior to 1987 as there was for the 10 years after. In 1996, the industry as a whole adopted the ASI as it's breeding goal until 2000 when it was superseded by the APR. *Figure 3* shows the genetic trend for protein and fat yield.

Figure 3. Genetic Progress for Protein and Fatin Australian Holsteins.



Protein and Fat %. *Figure 4* shows the trends for protein and fat %. There has been little genetic change in the protein % ABV over the last 20 years. Phenotypically we have seen change in the national population largely due to breed mix changes (increased "Holsteinization") and feeding for yield of protein and fat rather than percentages. In recent times we have seen a slight increase in protein % possibly due to selection of young sires using the ASI/APR. The picture for fat % is very different. The introduction of higher milk flow US genes in the mid to late eighties saw a rapid decline in the fat %, which also, since the introduction of ASI/APR selection has now seemed to stabilise.

Figure 4. Genetic Progress for Protein and Fat % in Australian Holsteins.



Profit based breeding goals, tailored to the specific needs of an individual country's farmers, are fast becoming the norm worldwide. For Australian farmers, the APR is now providing a profit focus for their breeding programs. With the recent inclusion of daughter fertility and Cell Count into the APR (and the possible future incorporation of direct and maternal calving-ease), the APR selection index should lead the breed towards meeting the needs of Australian dairy farmers in the future.

REFERENCES

ADHIS. (2002) "Australian Dairy Herd Improvement Report 2001/2001"