MEASUREMENT IN DAIRY CATTLE IMPROVEMENT

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PRESENT SITUATION

Measurement in dairy cattle improvement in Australia dates from early visual appraisal of cows and bulls by pure breeders in their attempts to improve conformation and thus the "acceptable" type of beast for dairying purposes.

This practice followed trends in other parts of the world at that time and was based on the belief that breeding aimed at producing the ideal cow on visual appearance would automatically also derive the ideal cow for production.

This belief still persists in some breeding circles.

1. Measurement for Individual Farmer Use

Organized objective measurement aimed at dairy cattle improvement in commercial herds commenced in the 1920's in Australia with the recording of milk yields of individual cows, and subsequently the chemical analysis of milk samples for milkfat content by the Babcock test, based on acid separation of the fatty portion. The proportion of dairy cows production recorded and tested climbed to a peak of about 30% of the total during the early 1970's. Currently it is estimated that of approximately 2 million dairy cows in Australia about 25% would be under "herd test", the term used for measuring and analysing individual cow milk yields. More than half of these cows are in Victorian herds which are serviced by herd testing centres handling from 8,000 to 30,000 cows, and farmer associations testing 2,000 to 2,500 cows with an on-farm tester employed by the cow owners. Increasing costs of herd testing have forced the rapid development of integrated herd improvement service centres (herd testing plus artificial breeding, and led to the introduction in Victoria of the method of "farmer collection" of milk samples, vis-a-vis sampling on the farm by a paid herd recorder. Milk samples collected and identified by the farmer are transported to a herd test centre for weighing, sub-sampling, testing and recording.

All dairy cows in Victoria, whether registered pure-bred or unregistered, unlike some other States, are recorded within the one system, although the basic herd testing rules used by all States are similar, following an agreement in 1964.

Dairy herd testing involves periodical metering of individual cow's milk yields during a 24-hour period, normally at an evening and the following morning's milking.

The metering device commonly used collects about 1/40th of the milk flow. This volume is measured for each cow and a sub-sample taken for testing for milkfat and occasionally for other milk components such as protein. Metering and volume measurement is similar throughout Australia, however, the systems for measuring milk vary from the original Babcock to electro-chemical and infra-red instruments, the latter operating on the photo-cell principle, and capable of analysing for different milk components

simultaneously at relatively high speeds. The development of this automated measuring equipment came none too soon for the Australian Industry.

The accepted practical testing frequency for accuracy is monthly with the ideal lactation composed of 10 tests over 300 days. Other systems of testing used in Australia include A.M. and P.M. milkings recorded on alternate months, bi-monthly (every two months) and spot testing (two times per lactation). Length of lactation of individual cows is measured in days from calving date to the date of the testing visit at which she is recorded as dry. Production for a lactation is calculated as the sum of the daily production at each test multiplied by the number of days since the previous test or the aggregate of the means of successive daily production recordings multiplied by the interval in days between each pair of successive test records.

Lifetime production is also calculated.

Production records derived from these standardized herd testing systems can be used to compare cows within herds and to a limited extent, between herds where management and environment are similar.

Production recording results are processed by computer in all States. In Victoria farmers receive a monthly report which lists:

* Identity number of cow,
* Name of cow,
* Calving date,
* Sire number,
* Daily production - milk, fat percent, fat kg,
* Lactation to date in days, milk, and fat kg and fat percent,
* Production Index (P.I.) and number of test measurements used in the P.I. calculation.

The Production Index was introduced to Victorian farmers in 1978 as an aid to management, especially in relation to breeding and culling decisions. The P.I. is a within herd ranking of cows on production after adjustment for differences in breed, stage of lactation, month of calving, age and location. The herd mean P.I. is expressed as 100.

An annual production summary is prepared for each recorded herd.

2. Importance of Animal Identification

An essential requirement of dairy herd testing is individual identification of all animals. The preferred technique in all States is by ear tattoo although a combination of tattooing and eartags has become accepted. Identity numbers allotted to each cow in Victoria carry Shire and herd identification in addition to the individual identity.

Additional identification requirements for registered pure-bred stock include photographs and ear tattoos of herd book numbers.

improvement in the program is then restricted by the small size of its active breeding mass and the spread of this improvement throughout the breed population as a whole is delayed.

In particular, I am concerned at the lack of participation by the average breeder of registered dairy cattle in the Herd Recording and Artificial Breeding aspects of Herd Improvement. In Victoria the percentage of usage of these services is very low. In fact some people do not production-record their registered cows. I believe it should be a requirement of registration. The industry expects future generations of bulls to come from this sector. I will not be happy in my efforts in this work until I can see a vastly improved situation in relation to replacement stock for herds. They should all (apart from young bulls under progeny test) be from sires whose daughters have shown his worth in production and the other traits required for top performance in the commercial dairy farm operation. Producers of registered cattle (dairy) should get on with the business of breeding cows to produce the next crop of bulls. The emphasis, as I see it, has switched from the male to the female with breeders possibly receiving royalties for cows that produce bulls, and/or bulls that qualify to standards required for insemination service. While on the matter of registered cattle, I would suggest that all breed societies should make provision for the upgrading of cattle and allow for registration on reaching purity.

Other anomalies worth mentioning include the lack of a uniform system of stock identification throughout Australia. While current investigations are aimed at correcting the situation for AB sires, the bulk of the nation's dairy stock remain under different State systems.

Identification errors caused by the manual recording systems currently used, while minor in degree, could be reduced by more automation of data capture.

Automation of measurement and recording techniques should also assist in reducing costs in the relatively labour intensive herd testing systems.

Measurement in itself poses problems in that dairy cattle improvement can only be obtained by measuring several characters of which production, while usually the most important, is linked to other characters. Establishment of indexes to incorporate measurement of several characters may simplify progress.

FUTURE DEVELOPMENTS

Rapid development in computing and data handling technology open the way for new initiatives in measurement in dairy cattle improvement, and for the provision of services which add precision to farmers' herd management programs.

The growing bank of herd records provides a data source for research to accurately measure parameters for dairy cattle improvement and to apply increased accuracy to key aspects, such as sire assessment and the identification of elite or superior cows for production and dairy type.

In addition to monthly production reporting, farmers can look forward to receiving information which will assist them in making decisions on farm production and financial management. Services which are being developed include collection and analysis of oestrus (heat detection) and mating information from individual herds to provide data on:

3. Measurement for Industry Use

Cow production measurement is the basic data source for assessing the merit of sires used in artificial breeding (primary use) and bulls used for natural mating (secondary use). Sires are assessed for production merit on the mean performance of their daughters.

Organized progeny testing of bulls has taken place in Victoria since 1960 with breed teams of up to 35 bulls per year. Up to 50 daughters per bull are involved, based on a contemporary comparison system.

Similar approaches to AB sire assessment are practised in Queensland, New South Wales and Tasmania.

Production recording results are used to identify superior cows for contract mating. Records form the data base for preparation of annual statistics and for genetic and related areas of research.

Objective measurement of bull fertility is also possible where AI is practised and non-return rates are compiled.

Subjective assessment has an important place in dairy cattle improvement, particularly where the assessment is of functional type characters which directly affect production performance.

The prime example of this would be in sire proving schemes where daughters of sires under test, in addition to being assessed, are herd tested, by the herd-owners involved, for such characters as ease of milking, temperament, udder shape, teat position and length. They may be further assessed by herd-owners and/or other independent judges, on structural characters such as jaws, feet, legs and pelvic capacity. Such assessments are usually made by a simple points score, or good/bad rating system, and are sometimes based on daughter/dam or daughter/herdmate comparison.

Pure breed societies place great store in this method of assessment and build up a "Classification Score" based on comparison with an "ideal animal".

EXISTING PROBLEMS

The current penetration of herd improvement service is low.

In Australia in 1977/78 the estimated use of herd recording and artificial breeding services was

Herds under herd test	18.2%
Cows herd tested	18.8%
Herds using AB	35.0%
Cows inseminated	20.8%

In 1977/78 in Victoria 34.3% of herd recorded cows (6.1% of total cows) were sired by AI. Herd recorded and AI sired registered cows represented 2.3% of the herd recorded population, 17% of recorded registered cows and 0.4% of total cows. As well as reducing the management advantages to individual farmers the low level of penetration of these services places severe limits on the "active breeding mass" of females available for inclusion in AB breeding programs. For each breed involved, the rate of genetic

* Herd reproductive performance and the effectiveness of the herd mating program.
* Some indicators of causes of low herd fertility.
* Predicted herd calving patterns.
* Estimates of feed requirements for the herd from drying-off to point of peak production after calving.
* Estimates of expected cash income from milk each month.

In addition analysis of mating information provides industry with data on reproductive performance of sires used in artificial breeding and enables the efficiency of farmers inseminating their own cows and AI technicians to be monitored.

Recent developments include the introduction of somatic cell counting services by Government bodies and farmer co-operatives. Bulk herd and individual cow milk cell counts are measured on automatic electronic equipment. With follow-up laboratory service and technical advice, farmers will be able to improve production through more effective control of mastitis.

Developments such as direct linking of milk-testing and somatic cell counting equipment to a computer plus the analysis of herd mating data offer the potential to provide a range of services which will add greater certainty to farmers' decisions on the management and performance of their dairy herds.

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