RELIABILITY OF DAIRY SIRE SURVEYS IN PRODUCTION RECORDED HERDS

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SUMMARY

The results of production surveys of small numbers of daughters of Australian Illawarra Shorthorn and Jersey sires have been used to classify sires into the categories of raising, maintaining and lowering herd production.

In recorded commercial herds, production was raised or maintained by 73% of all sires surveyed. Results from the two breeds were similar.

The accuracy of preliminary surveys was determined by comparing the preliminary and intermediate stages of 1,024 surveys of sires used in commercial herds, and 237 surveys in purebred herds. The comparison indicated that 92·5% of the surveys in commercial herds showed only small changes. In purebred herds, 88·6% of Australian Illawarra Shorthorn and 90·6% of Jersey sire surveys showed only small changes. Significant positive correlation coefficients between preliminary and intermediate stages were shown.

It is concluded that production records obtained for a normal completed lactation of each of 10 daughters are sufficient to assess a sire's capacity to transmit production characteristics.

I. INTRODUCTION

Sire surveying is now regarded as an integral part of production recording by herd recording authorities in all the Australian States. In Queensland the average size of production recorded herds is 45 milking cows. A herd sire has an average working lifetime of 3 years (Clark 1953); thus the productive potential of herds will depend largely on the availability and accuracy of preliminary surveys of sires.

Herd production recording in Australia was intensified in 1948, and concurrently more emphasis was placed on the surveying of sires. Early work was confined to bulls used in purebred herds (Pegg 1950; Scott 1952). Subsequently, surveys were made on bulls used in commercial herds (Bradbury and Edey 1955).

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Age correction factors for Queensland conditions developed by Clark (1951) enabled maturity equivalent productions to be used. The method was modified further to compare a sire's daughters with other cows in the herd on a "maturity equivalent" basis (Clark 1959).

The New Zealand workers Ward and Campbell (1940), Castle (1952) and Searle (1959) were in the forefront in developing survey techniques. Their methods have been used in developing techniques for making surveys on bulls in both commercial and purebred herds in Queensland.

II. METHODS

Sire surveys which have been analysed herein were prepared by methods described by Pegg (1959) and Clark (1961).

It should be noted that, as daughters of purebred bulls may be present in several herds, the preparation of their surveys incorporates the use of "weighting". Differences in production between the "expected daughter average" and "actual daughter average" are weighted in individual herds according to the following formula:—

$$\text{Weight} = \frac{\text{Number of Other Cows} \times \text{Number of Daughters}}{\text{Number of Other Cows} + \text{Number of Daughters}}$$

The sum of weighted differences divided by the "effective number" of daughters then provides the total differences in production. This is adjusted according to the number of daughters and lactations to provide the sire's "rating".

In this study, data were prepared by categorizing surveys according to their ratings. The following categories have been applied:—

Raising	—	Rating of +5 lb fat or more
Maintaining	—	Rating of +4 to —4 lb fat
Lowering	—	Rating of —5 lb fat or less.

Strictly, all ratings with positive signs should indicate that sires are raising production, and *vice versa* for ratings with negative signs. The "maintaining" category has been extended beyond 0 to allow for small influences which occurred in the earliest stages at which surveys were made.

Surveys used in this analysis were prepared in stages according to the number of lactations available for individual daughters. When one normal lactation was completed by at least 10 daughters of a sire, the first stage of the survey—preliminary—was reached. The survey was extended to the intermediate stage when at least 8 of the original daughters completed a further lactation. When three or more lactations were available for 6 daughters of a sire, the survey was compiled in the final stage.

III. RESULTS AND DISCUSSION

(a) Categories of Survey—Commercial Herds

Table 1 sets out the categories of surveys of 1,878 sires which were used in commercial herds. It may be noted that 36·5% of all sires were raising production, 36·5% were classified in the maintaining category and 27·0% were lowering the production of herds in which they were used. In all categories, results for the 4-year period were constant. A range of 34·1 to 39·4% may be noted in the raising category, while the range for the lowering category was 24·7 to 29·0%.

TABLE 1
CATEGORIES OF SURVEYS IN COMMERCIAL HERDS

Year	No. of Surveys	Raising (%)	Maintaining (%)	Lowering (%)
1959–60	386	37·8	34·9	27·2
1960–61	428	34·5	38·0	27·3
1961–62	513	34·1	36·8	29·0
1962–63	551	39·4	35·9	24·7
Total surveys and mean percentages	1,878	36·5	36·5	27·0

When breed of sire is considered in Table 2, a similar pattern is evident in the various categories for Australian Illawarra Shorthorn and Jersey sires. Variations in the case of Guernsey, Ayrshire and Friesian sires appear to be associated with the smaller numbers included.

TABLE 2
CATEGORIES OF SURVEYS IN COMMERCIAL HERDS ACCORDING TO BREED

Breed	No. of Surveys	Raising (%)	Maintaining (%)	Lowering (%)
A.I.S.	827	39·2	32·4	28·4
Jersey	778	32·0	40·0	28·0
Guernsey ..	126	39·7	42·1	18·3
Ayrshire	72	34·7	41·7	23·6
Friesian	75	50·6	30·7	18·7

(b) Changes in Categories of Surveys

In order to demonstrate the reliability of preliminary surveys, the changes in categories of 1,024 surveys prepared in two stages were examined. The results, tabulated in Table 3, indicate that 49·3% of all surveys remain in the same category in the intermediate stage as they did in the preliminary stage. Small changes occur in 43·3% of other cases, while 3·6% of the surveys changed from raising to lowering and 3·9% from lowering to raising. Changes from the maintaining category were frequently small, as this category contained the

results with ratings between -4 lb and $+4$ lb fat. It may be concluded that $92 \cdot 6\%$ of the surveys compiled in the preliminary stage showed little change in rating, as more lactations were completed and more reliable surveys were prepared in the intermediate stage.

A correlation coefficient of $r = \cdot 42$ $(P < 0 \cdot 01)$ was obtained when the results of the preliminary surveys were compared with those in the intermediate stage.

TABLE 3

CHANGES IN CATEGORIES OF SURVEYS IN COMMERCIAL HERDS

—	Remain Same	Raising to Maintaining (%)	Maintaining to Raising (%)	Maintaining to Lowering (%)	Lowering to Maintaining (%)	Raising to Lowering (%)	Lowering to Raising (%)
No.	505	104	99	107	132	37	40
Percentage ..	49·3	10·2	9·7	10·4	13·0	3·6	3·9

(c) Changes in Categories of Surveys—Purebred Herds

In the case of purebred herds, a large number of sire surveys have been completed in the preliminary stage only, because daughters of sires are purchased frequently by owners of non-recording herds. In order to provide comparisons, the 131 surveys of A.I.S. and 106 of Jersey sires which had been completed in two stages during the 1959-63 period were examined. The results given in Table 4 indicate that the surveys are less reliable than those made in commercial herds. Extreme changes were evident in $11 \cdot 4\%$ of A.I.S. and $9 \cdot 4\%$ of Jersey surveys. Although the number of surveys examined was small, it is indicated that the surveys of A.I.S. sires were slightly less reliable than those of Jersey or other sires used in commercial herds.

TABLE 4

CHANGES IN CATEGORIES OF SURVEYS IN PUREBRED HERDS

Breed	Remain Same	Raising to Maintaining (%)	Maintaining to Raising (%)	Maintaining to Lowering (%)	Lowering to Maintaining (%)	Raising to Lowering (%)	Lowering to Raising (%)
A.I.S. ..	44·3	8·4	16·0	10·7	9·2	7·6	3·8
Jersey ..	56·6	9·4	11·2	4·7	8·5	4·7	4·7

Significant $(P < 0 \cdot 01)$ correlation coefficients of $r = \cdot 35$ in the case of A.I.S. and $r = \cdot 36$ in the case of Jersey were calculated when the two stages of the surveys were considered.

(d) General

The results of the above analyses show that the sire survey techniques in use give a reliable assessment of the ability of bulls to transmit high or low production to their offspring. Although the accuracy of surveys is governed by the number of records available, it has been demonstrated that those completed in the preliminary stage may be used extensively.

IV. ACKNOWLEDGEMENTS

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