

THE ACCURACY OF ESTIMATION OF A DAIRY COW'S PRODUCTION OF MILK AND BUTTERFAT.

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SUMMARY.

Calculated milk productions for 89 Jersey cows based on yield recordings made at weekly, fortnightly and monthly intervals were compared with actual production.

Butterfat productions for 53 lactations were calculated from yield and test records made at weekly and monthly intervals and compared with actual butterfat yields.

The results indicated that in experiments involving the production of a small number of cows, the shortest recording interval that could be used to ensure a reasonable degree of accuracy would be one week. A longer interval would be suitable where a larger number of cows was involved and the recordings averaged, as the plus errors would then tend to cancel out the minus errors.

INTRODUCTION.

In the course of experimental work involving an estimation of the production response of dairy cows to various treatments, it was found that quite a considerable error appeared to exist when the lactation records were computed from milk weighings and butterfat tests made at monthly intervals. In order to test the accuracy of this and other methods, the records obtained at monthly, fortnightly and weekly intervals were compared with the actual production figures.

METHOD.

The production figures studied were obtained from the Jersey herd at Kairi Regional Experiment Station, on the Atherton Tableland in northern Queensland, during the period June 1950 to October 1953. The records of all cows which had been lactating for 130 days or more were included.

On the Station the actual milk production of the cows is obtained by weighing the milk produced at each milking. The butterfat content of the milk is measured once weekly and estimations of milk production were made by multiplying the number of pounds of milk produced on testing days by 7, also by 14. The monthly figures were obtained by multiplying the test figure in the second week of every month by 30. Estimations based on weekly, fortnightly and monthly tests were then compared with actual production.

In addition, the milk production was estimated on a monthly basis, but corrections were applied to account for the date of calving and the date of cessation of lactation and also for the amount by which the actual testing interval differed from 30 days. This is referred to by us as the adjusted monthly production.

The cows were milked twice daily throughout the period during which the records were obtained.

RESULTS.

Eighty-nine lactations were used in the comparison of weekly, fortnightly, monthly and adjusted monthly milk productions with the actual milk production. The comparisons were made on a basis of average percentage difference in yield, average percentage error and frequency of errors greater than $\pm 10\%$. The results of these comparisons are shown in Table 1.

Table 1.
COMPARISON OF WEEKLY, FORTNIGHTLY, MONTHLY AND ADJUSTED MONTHLY MILK PRODUCTIONS WITH ACTUAL MILK PRODUCTION.

Milk Production Recorded.	Av. Milk Yield. (lb.)	Av. Percentage Difference from Actual Production.	Av. Percentage Error (Disregarding Sign).	Frequency of Errors Larger than $\pm 10\%$.
Daily (Actual production) ..	4,164	—	—	—
Weekly	4,160	$-0.24 \pm 1.37^*$	1.6	None
Fortnightly	4,164	$+0.05 \pm 2.28$	2.5	1 in 89
Monthly	4,007	-3.68 ± 5.45	6.8	1 in 5
Monthly (Adjusted)	4,193	$+0.39 \pm 3.10$	3.9	1 in 32

* Standard error of the average percentage difference.

The range of difference from the actual milk production was as follows:—

Weekly	— 213 lb. to + 327 lb.
Fortnightly	— 418 lb. to + 363 lb.
Monthly	— 900 lb. to + 628 lb.
Adjusted monthly	— 477 lb. to + 445 lb.

Unfortunately, it was not possible to compare the butterfat production on all the lactations; only 53 records were available. Since the butterfat percentage was only calculated weekly, a comparison has been made of the butterfat production calculated on the basis of weekly weighing and testing and monthly weighing and testing.

The comparisons were made on a basis of variability, average percentage difference in yield, average percentage error and frequency of errors greater than $\pm 10\%$. The relative variability of the estimations was calculated by the ratios of their mean squares. The results are summarised in Table 2.

Table 2.
COMPARISON OF MONTHLY AND WEEKLY WEIGHINGS AND TESTS FOR BUTTERFAT PRODUCTION.

—	Relative Variability of Records (percentage of weekly).	Av. Percentage Difference from Weekly Records.	Av. Percentage Error (Disregarding Sign).	Frequency of Error Larger than $\pm 10\%$.
Butterfat Production (Monthly tests)	119.0	$-5.5 \pm 7.89^*$	9.7	1 in 3
Butterfat Percentage (Monthly tests)	115.0	-0.7 ± 3.97	4.6	1 in 9

* Standard error of the average percentage difference.

The average butterfat production per lactation based on monthly recording was 192 lb., while that based on a weekly recording was 202 lb. The average butterfat percentage for all cows for their whole lactations based on monthly recording was 4.72%, compared with 4.76% based on weekly recording. The range of differences for production based on monthly and weekly recordings was from - 64 lb. to + 32 lb. for butterfat production and from -0.91% to +0.48% for butterfat percentage.

The average difference between milk production based on monthly recording and actual milk production was highly significant. Average differences between adjusted monthly or fortnightly or weekly milk production and actual milk production were not significant. The difference between butterfat percentage based on monthly and weekly recordings was not significant, but the difference between butterfat production based on monthly and weekly recordings was highly significant.

DISCUSSION AND CONCLUSIONS.

It is evident that there may be a considerable discrepancy between estimated production based on monthly recording and actual production. On correcting for actual lactation length and recording intervals the discrepancy is lessened somewhat, but there is still a considerable error. Fortnightly recording lessens the discrepancy further, particularly with respect to the frequency of errors larger than $\pm 10\%$, while weekly recording lessens it still further.

Recording at weekly intervals would be quite suitable for milk secretion studies, such as the effect of various methods of feeding on milk production and composition where small numbers of cows are involved. Where large numbers of cows are included in an experiment and the degree of expected response is greater than 10%, fortnightly recording should be quite satisfactory.

Monthly recording for milk and butterfat yield should not be condemned on this evidence; it is, notwithstanding, a most useful method of providing data for constructive breeding in dairy cattle. Its accuracy would be considerably enhanced in this regard if due consideration was given to reducing the variation in recording intervals, and if allowance was made for calving and drying-off dates.

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