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# Age Distribution in N.Z. Pedigree Cattle

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TEN years ago pedigree sires were estimated to comprise 60 per cent. of the bulls used in the New Zealand dairy industry (N.Z. Dairy Board, 1943). This percentage has probably increased during the intervening decade and emphasises the growing importance of pedigree herds which supply bulls to the dairy industry. There is, however, a lack of information concerning the methods of selective breeding practised in these pedigree herds. With a growing service from organisations concerned with raising the average production of New Zealand dairy cattle such deficiencies in our knowledge are serious. Advice to farmers to purchase proven sires or the pedigree sons of proven sires from dams of high life-time production loses much in effectiveness if such animals are not procurable. This position obtains in New Zealand at present and it is imperative that reasons for the absence of a high proportion of proven sires in pedigree herds be elucidated. Is widespread progeny testing impractical, or do the majority of breeders fail to appreciate the usefulness of adequate progeny testing as more reliable estimates of breeding worth than pedigree?

Precise information will probably never become available from a pedigree system composed of independent units varying in duration, size, and popularity, and owned by men with widely divergent views on the importance of various selection criteria. However, since age is closely associated with the potential amount of information relating to individual performance, some indications of these methods may be obtained from a study of the age of the parents of registered animals. In addition, such a study can provide estimates of generation intervals in pedigree populations which in turn permit assessments of annual rates of improvement.

The data studied have been obtained from the 1948 herd books of the Ayrshire, Friesian and Jersey breed societies. The month and year in which registered bull and heifer calves were born together with the registered numbers of their parents have been listed, and, from the appropriate herd books, the age of each parent at the birth of its registered offspring calculated to the nearest month. All bull calves registered in the Ayrshire and Friesian herd books and the first male registration in each of the two columns on every page of the Jersey herd book (a sample of approximately one in twenty), together with every fifth heifer registered in the Ayrshire and Friesian herd books and the first heifer registration on every page of the Jersey herd book (a sample of approximately one in 40), have been studied. The data thus consist of six groups each containing between four and seven hundred observations.

## The generation interval in N.Z. pedigree cattle.

The average interval between the birth of each parent and its offspring in each of three dairy breeds is shown in Table I. The differences between breeds are small and for all practical purposes the average length of a generation in the pedigree sections in the dairy breeds of importance in New Zealand may be taken as 5 years. This estimate, while of some use, is not as informative as the separate components of the breed averages—the sire-son, sire-daughter, dam-son and dam-daughter intervals. The average length of these intervals is also

shown in Table I and within each breed they may be arranged in order of descending magnitude as follows:—

dam-son interval  
dam-daughter interval.  
sire-son interval  
sire-daughter interval.

Direct comparisons of these intervals within breeds suggest that in general, more attention is paid to records of performances among certain classes of parents than others. Since these average intervals might arise from various forms of distribution, more definite information may be obtained from a study of the distributions of the parent-offspring intervals and from this derived a guide to the overall methods of performance-breeding practised.

#### **Sire-offspring and Dam-offspring intervals.**

In Fig. I registered bull and heifer calves of each breed have been separately distributed according to the interval between their birth and that of each parent. Sires of both bull and heifer registrations are significantly ( $P$ . less than 0.01) younger than their mates in the three breed samples. The differences between the average ages of the parents of registered bull calves are 1.38, 1.39 and 1.57 years for the Ayrshires, Friesians and Jerseys respectively. Between the parents of registered heifer calves the comparable differences are 0.92, 0.69 and 1.08 years for the three breeds in the same order. These significant differences, however, are partly accounted for by the longer breeding life of female stock and, since the information which accrues after a dam is ten years of age seldom affects previous estimates of her breeding worth, a fairer comparison of the age differences between sires and dams is obtained by considering only those less than ten years of age. The significant differences remain, except between the parents of registered Jersey heifers, though the differences in this sample follow the general pattern.

Within each of the five restricted samples in which significant differences were established, significance derives mainly from the large deviations from the expected distributions of sires and dams two and three years of age at the birth of their offspring. In these same samples the first three or four age-classes in each of the dam-son and dam-daughter interval distributions do not show wide differences. This suggests a reluctance among a proportion of breeders to register the progeny of young dams, a reluctance which is least evident among Jersey heifer registrations.

On the other hand, the distributions of the sire-son intervals and the sire-daughter intervals show a rapid decline after the first two age-classes. These distributions suggest that the majority of breeders consider details of sire performance of minor importance and that sires are selected on pedigree as yearling or two-year old bulls, used for one or two mating seasons and then the bulk of them lost to the pedigree industry long before adequate progeny test details could be available. This may be due in part to the large number of small pedigree herds in New Zealand and accentuated by many breeders preferring young unused bulls with promising pedigrees to similar bulls which have already had one or two years service in other breeders' herds.

More satisfactory explanations may be advanced but the fact remains that in the three main dairying breeds in New Zealand almost half the bulls registered in the 1948 herd-books were by yearling or two-year old sires. Further, nearly 75% of the registered bull calves were by sires for which even the most inadequate progeny test details could not have been available.

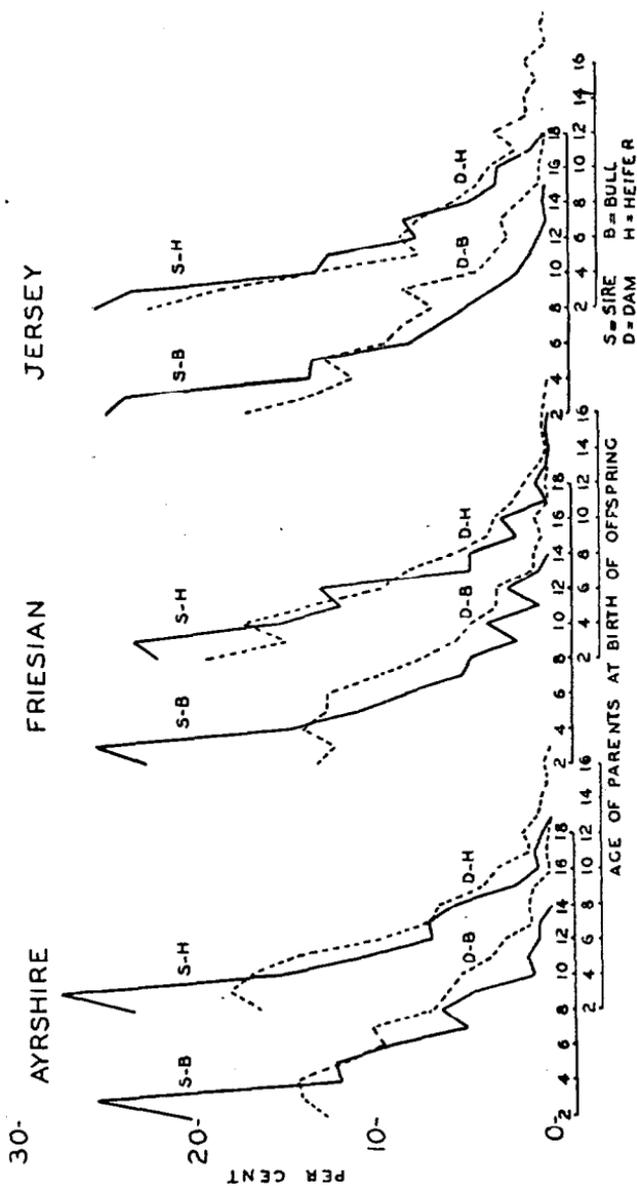


FIG. 1 DISTRIBUTIONS OF PARENT-OFFSPRING INTERVALS IN THE 1948 HERD BOOKS

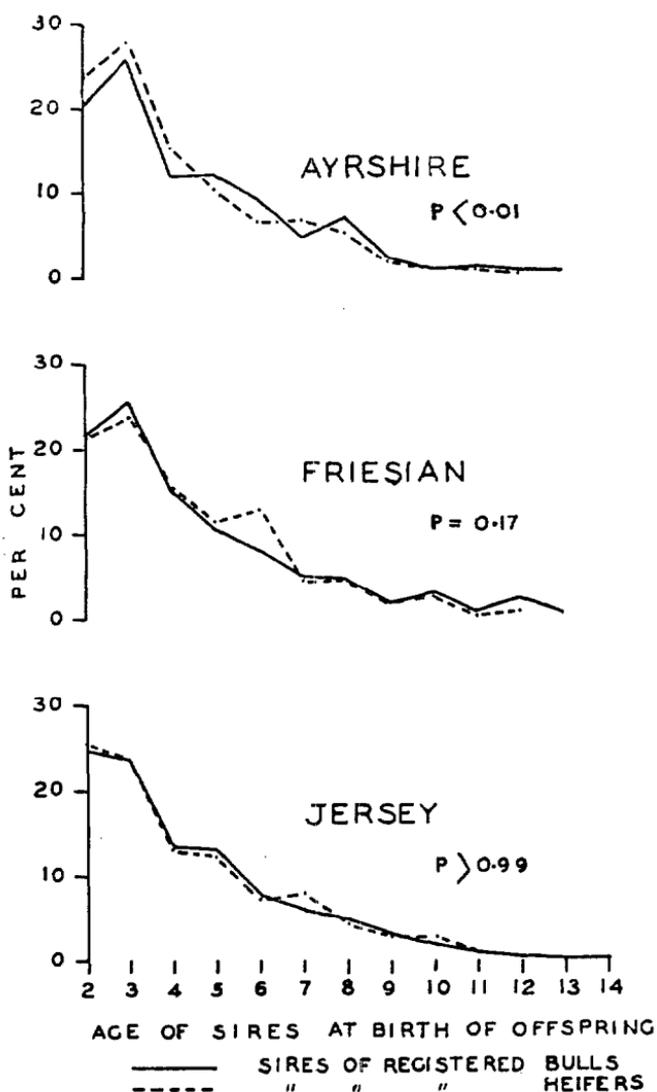


FIG. 2. BULL AND HEIFER CALVES REGISTERED IN 1948 DISTRIBUTED ACCORDING TO AGE OF SIRE

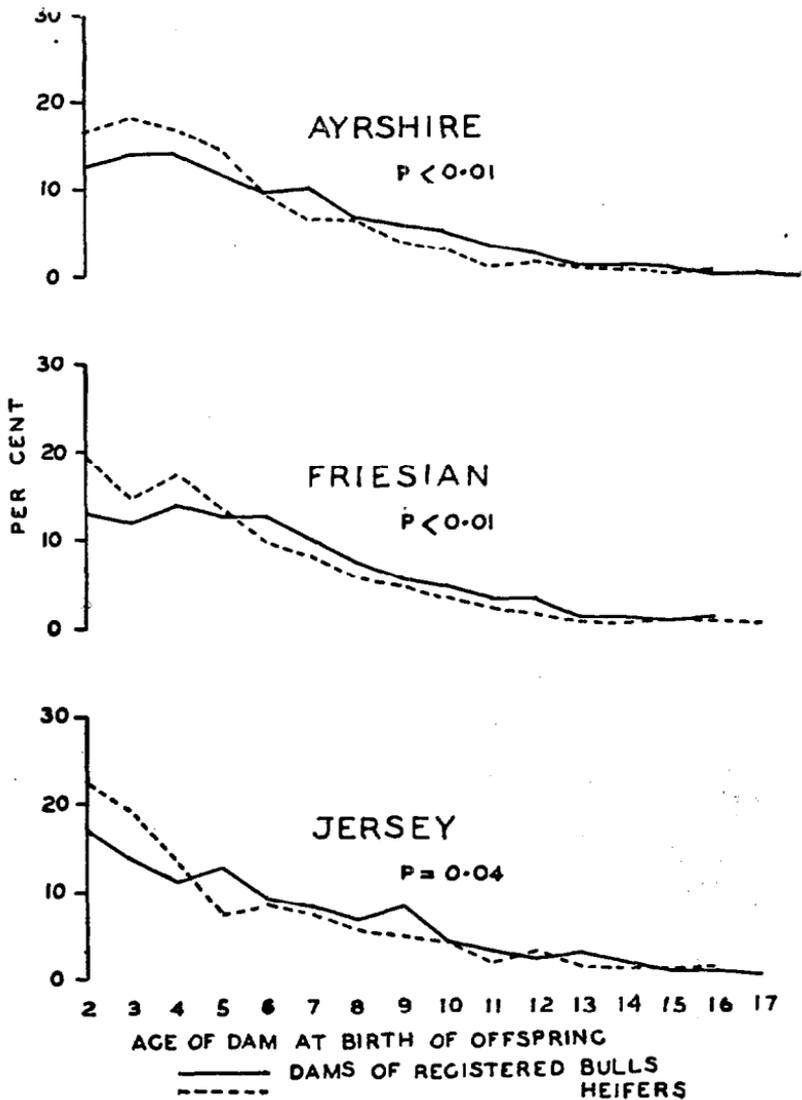


FIG. 3. BULL AND HEIFER REGISTRATIONS IN 1948  
DISTRIBUTED ACCORDING TO AGE OF DAM

Additional evidence of the reliance upon pedigree rather than performance in the selection of animals to sire registered bull calves may be derived from a comparison of the distributions of the sire-son and sire-daughter intervals.

#### **Sire-son and Sire-daughter intervals.**

In Fig. 2 are shown the distributions within each breed of the registered bull and heifer calves, according to the ages of their sires. The mean differences of 0.41, 0.11 and 0.01 years between the Ayrshire, Friesian, and Jersey means are respectively significant only in the case of the Ayrshire data. Since the ratio of bulls to heifers registered in 1948 was 1 : 3.5 in the Ayrshire, 1 : 3.8 in the Friesian and 1 : 1.8 in the Jersey breed, the failure of the differences between the sire-son and sire-daughter intervals to attain significance in two of the three breeds is remarkable. If sire performance was considered important, one would expect the less numerous bull registrations to be sired predominantly by older bulls. That such was not the case was not due to the lack of old bulls.

In the Ayrshire breed for example the number of registered heifers by sires more than 5½ years old at the birth of their offspring (i.e. old enough for preliminary progeny test details to have been available when mated), was 80% of the total number of bull calves registered; in the Jersey bred they approximated 50%, while in the Friesian breed, bulls 5½ years of age or more sired more registered heifers than there were bull calves registered. Within the Ayrshire and Friesian breeds, where the ratio of bull to heifer registrations is wide, bull registrations could almost be restricted to the sons of sires which could have daughters in production and the present demand for pedigree bulls of these breeds maintained. Since these sires have been deliberately retained within the pedigree section of the industry, they must possess qualities which commend them to breeders, and, though many may ultimately have disappointing performances as judged by the production records of their daughters, at least the pedigrees of their offspring would contain worthwhile information rather than the herd-book number which at present is the sole distinction of so many of the sires of registered bulls.

Within the Jersey breed there appears little immediate likelihood of meeting the present demand for pedigree bulls from the aged portion of the industry unless some far reaching changes take place. A wide coverage of pedigree herds by artificial insemination would probably be the most effective antidote but more support from breeders and more good bulls than are at present made available, would be needed. Alternatively, if breeders could be persuaded that the devil they know in the form of an old bull is probably as good as the devil they don't—the yearling bull—then considerable improvement in respect of pedigree details could be effected. The decline in sire fertility with age, though steady, is by no means great (Milk Marketing Board, 1950) and the small sacrifice entailed would be more than compensated for by the quality of the information provided. A third possibility, and the one most likely to occur if present trends are continued, is the expansion of pedigree numbers accompanied by a widening of the ratio of bulls to heifers registered. A strong demand from commercial farmers for the sons of progeny tested bulls may then accomplish what the more direct approaches to pedigree breeders have so far failed to do.

#### **Dam-son and Dam-daughter intervals.**

Despite the gloomy situation so far depicted all is not wrong in the pedigree sections of the main New Zealand breeds of dairy cattle. The distributions of registered bull and heifer calves according to the age of their dams is shown in Fig. 3. The mean differences of 0.37, 0.81 and 0.50 years for the Ayrshire, Friesian, and Jersey samples re-

spectively, are significant in each case and indicate a general policy of registering bull calves from dams with potentially more performance records than those from which registered heifer calves are saved.

Remembering that estimates of a dam's phenotype in respect of milk production improve with the number of lactations, although but little after the third (Donald and El Itriby, 1947), the large proportion of registered bulls saved from dams which could not have completed more than two lactations when it was decided to rear and probably to register their male calves is disturbing. Approximately 40% of the bulls registered in each breed in 1948 were from dams in this category. By the time these young bulls were used the amount of maternal information may have increased but, since dams over 5 years of age gave birth to almost twice as many registered heifers than there were registered bulls in the 1948 Ayrshire and Friesian herd books, and almost as many in the Jersey herd book, there seems little justification for registering the sons of so many two and three year-old dams. As with the sires, one is forced to conclude that information other than that relating to production performance remains a major consideration in the choice of dams of registrations.

#### REFERENCES:

- Donald, H. P., and A. A. El Itriby (1947). The age-distribution of pedigree cattle and factors affecting it. *Emp. J., Exp. Agr.* 15, 119.  
 Milk Marketing Board (1950). Report of the Production Division. 32.  
 N.Z. Dairy Board (1943). 19th Annual Report, 10.

TABLE I.

THE PARENT-OFFSPRING INTERVALS AND AVERAGE GENERATION LENGTH IN AYRSHIRE, FRIESIAN AND JERSEY PEDIGREE CATTLE REGISTERED IN THE 1948 HERD BOOKS.

Parent-offspring relationship	Interval (Years)		
	Ayrshire	Friesian	Jersey
Sire-Son interval	4.61)	4.49)	4.29)
	) 5.30	) 5.18	) 5.08
Dam-Son interval	5.99)	5.88)	5.86)
Sire-Daughter interval	4.20)	4.38)	4.28)
	) 4.66	) 4.72	) 4.82
Dam-Daughter interval	5.12)	5.07)	5.36)
Generation length	4.98	4.96	4.95

## Discussion

Mr. LAWRY: Would it not be preferable for the outstanding herds to register all their bull calves irrespective of the age of the dams rather than a few bulls out of old dams to be registered from many herds?

Dr. STEWART: If the herds were outstanding because of genuine hereditary superiority then I think we could not afford to waste the bulls out of young dams. But it is difficult to know how much of the difference between herds is due to genetic causes—the only estimate with which I am familiar is that of 30% (Rendel and Robertson) and I assume that they obtained this figure from herds in which the environmental differences were not extreme. Until more definite information is available I am of the opinion that as far as selection on the dam's side is concerned the top cows in the average herds are likely to have a higher breeding value than the bottom cows in the outstanding herds.

Mr. WARD: I wish to offer my congratulations to the speaker on a novel way of examining breeding trends. Should a similar analysis be conducted in 1955 the comparison would be interesting. I do agree with Mr. Lawry concerning the desirability of saving all bulls from the genetically superior herds. There is one question I would like to ask: Jersey and Friesian per cow productions of butterfat are about the same in New Zealand. Yet a higher proportion of Friesian bulls attain Merit status. Might this not be due to the much wider ratio of bull to heifer registrations in the Friesian breed?

Dr. STEWART: If the daughters of surveyed bulls in each breed have the same level of production and a greater proportion of Friesian bulls are classified as Merit, then must there not also be a greater proportion of poorer Friesian bulls surveyed?

Mr. LAWRY: How are we going to persuade breeders to retain their older bulls?

Dr. STEWART: I think the only way is by endeavouring to make the commercial farmer appreciate the value of the progeny test. When he starts paying premiums for the sons of proven bulls then I think the breeder will attempt to fulfill the demand.