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The association between herd size, herd expansion and breeding policy, reproduction and production performance of spring calving Irish dairy herds

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Introduction There are an increasing number of farmers in Ireland seeking to expand the scale of their dairy enterprises. Herd size in Ireland is small (95% of herds have less than 100 cows) but has increased from an average of 30 cows in 1994 to 55 currently. The removal of milk quotas in 2013 is expected to speed up expansion as production moves to areas of competitive advantage. Expanding a herd presents choices in terms of growing organically or sourcing non-homebred animals, as well as challenges as a result of managing more cows and the associated requirements for infrastructure and labour. The objective of this study was to characterise seasonal calving herds according to size and rate of expansion, to determine trends in sourcing new animals, breeding policy, reproduction and production performance.

Materials and methods Performance data from milk recording herds comprising 1,628,738 lactation records (n = 36,964 herd-years) for the years 2004 to 2008 inclusive, were obtained from the Irish Cattle Breeding Federation database. Only herds with at least 20 cows, present for all five years of the study period and which had >80% of cows calving between 15th December and 30th June, inclusive, were retained (775,795 lactations from 2,555 herds). Herds were classified into three groups based on herd size and three groups based on annual rate of expansion. Linear robust regression was fitted to the annual herd size of each herd separately using PROC ROBUSTREG (SAS, 2004). The intercept (i.e. herd size in the year 2004) and a linear rate of change in herd size for each herd were retained. Herd size, predicted from the regression, was categorised into Small (n = 843), Medium (n = 868) and Large (n = 844) based on predicted herd size in 2006 (i.e., the middle year of the study period). Median (5th and 95th percentile) herd size was 38 (26 and 46), 54 (47 and 62) and 79 (64 and 137) cows for Small, Medium and Large herds, respectively. If the linear regression coefficient was not different (P<0.05) from zero (n=1585) herds were coded as not expanding (Nil). Herds with a regression coefficient greater (P<0.05) than zero were divided into two even groups, each of 485 herds (Slow, increasing at an average rate of 3 cows/year; Rapid, increasing at an average rate of 8 cows/year). Multilevel hierarchical linear and non-linear models were fitted in ASREML (Gilmour *et al.*, 2009) with herd, and cow within herd, as random effects. Year was included in the model as a fixed effect as well as herd size and rate of expansion and their interactions.

Results There was no difference (P>0.05) in fat yield, protein yield and fat percent between herds differing in the rate of expansion. However, an association (P<0.001) existed between 305-day milk yield and rate of expansion (Nil 6307 litres, Slow 6242 litres, Rapid 6199 litres, SED 41.3, P<0.01). Expanding herds had greater (P<0.001) milk protein percent than herds that were not expanding. There were no associations between herd size and milk production traits except for protein percentage, which increased (P<0.05) with increasing herd size. Average parity number of the cows in a herd decreased as rate of expansion increased (Nil 3.0, Slow 2.9, Rapid 2.6 years, SED 0.002, P<0.001), but was not associated with herd-size. Relative to herds that were not expanding, the odds of a slow or rapidly expanding herd having a greater proportion of homebred animals was 0.89 (95% CI: 0.74 to 1.07, NS) and 0.44 (95% CI: 0.36 to 0.53, P<0.05). Relative to small herds, the odds of a medium or large herd having a higher proportion of homebred animals was 1.5 (95% CI: 1.34 to 1.90) and 2.7 (95% CI: 2.23 to 3.20). Holstein-Friesian was the predominant dairy breed of calves born to cows in herds of all herd sizes and expansion categories (73%, 76%, 77% for Small, Medium and Large herds, respectively and 74%, 74% and 77% for Nil, Slowly and Rapidly expanding herds, respectively). The proportion of beef calves born decreased (P<0.001) as herd size and rate of expansion increased (34, 29, 27%, se=1.0 for small, medium and large herds, respectively and 34%, 32% and 25% for Nil, Slowly and Rapidly expanding herds, respectively). The proportion of Jersey mated to Holstein-Friesian or purebred Jersey calves was very low (< 1%) for all herd sizes and rates of expansion, but the proportion of crossbred calves increased with increasing rate of expansion. Calving interval was longest for small and Nil expanding herds. Animals in larger and expanding herds calved for the first time at a younger age relative to smaller or non-expanding herds (804, 791, 776 days, se=3.1 for Small, Medium and Large herds, respectively and 797, 786 and 788 days, se=3.6 for Nil, Slowly and Rapidly expanding herds, respectively). There was a negative association between herd size and proportion of cows calving in the first 56 days of the calving season. A greater (P<0.01) percentage of calves were born to AI in medium sized herds compared to small or large herds.

Conclusions Rapidly expanding herds are increasing cow numbers by buying in more non-homebred cattle. The proportion of dairy sires used in their breeding program is increasing and there is more crossbreeding, albeit at a low rate. Similarly large herds are using more dairy sires and fewer beef sires. Both large and expanding herds are calving heifers at a younger age. Expansion and herd size is resulting in few production differences, although the larger herds had higher milk protein percentage.

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References

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