**Application:** Retaining ewes aged more than 7 years results in reduced lamb output due to increase barrenness and reduced litter size.

**Introduction:** Ewe genotype is a key determinant of ewe productivity (Hanrahan 2001, Keady and Hanrahan 2019). Keady (2014) reported that the mean cost of producing a replacement ewe, when joined for the first time at ~19 months, equated to approximately 25% of the value of her lifetime lamb-carcass output. Currently, 66% of lowland ewes in Ireland have been sired by one of the two main terminal sire breeds (Suffolk and Texel) (Keady et al 2019), both of which have inherently low productivity (Hanrahan 2001). The Belclare breed was developed from a range of genetic resources (Hanrahan 1989), has a litter size of approximately 2.2 under typical on-farm management conditions, and represents the sire of 9.5% of ewes in lowland flocks (Keady et al. 2019). The aim of the current study was to determine the effects of ewe age on productivity and on the performance of their progeny, using ewes from 3 genotypes which differ in prolificacy.

**Material and methods:** The study involved performance records between joining to lamb at 2 years of age until lambing at 8 years for a total of 424 ewes [157 Belclare (B), 114 B×Suffolk (B×S), 153 >75%S (S); 2 cohorts]. Ewes only left the flock when culled for physical reasons (e.g., udder and mouth issues, poor body condition) or they died. A random 50% of each genetic group had been joined at ~7 months and 86% of those lambed at 1 year. Oestrus was synchronized using progesterone-impregnated sponges. Ewes were joined with Charollais rams. All ewes were shorn at housing (early December) and offered grass silage *ad libitum* until lambing. A concentrate supplement was offered during the final 6 or 7 weeks of pregnancy; the level depended on forage feed value and expected litter size (ultrasonic scanning). Ewes rearing singles or twins received no concentrate supplementation post lambing while those rearing triplets received concentrate (0.5 kg/d) for 5 weeks, and their lambs had access to concentrate (up to 300 g/head daily) until weaning. Lambs were managed as a single flock post weaning and were all slaughtered prior to the end of the grazing season. Data were analysed using the MIXED and GLIMMIX procedures of SAS, as appropriate.

**Results:** For the Belclare, B×S and >75%S ewes, lambs reared/ewe-joined averaged 1.62, 1.70 and 1.34 (SE ≈ 0.045), respectively, with a significant heterosis effect; the effect of ewe age was quadratic (P < 0.001) (Figure 1). There was no interaction between ewe-age effects and genotype. There were significant curvilinear age effects on ewe fertility (lambed or not; P < 0.01) and litter size (P < 0.001) (Figure 1), and these age effects exhibited interactions with the heterosis effect on these traits. There was a marked increase in the incidence of ewes that failed to lamb after 6 years of age (0.08, 0.10, 0.06, 0.08, 0.07, 0.12 and 0.24 for 2, 3, 4, 5, 6, 7 and 8 year old ewes, respectively; SE ≈ 0.016 up to age 6, 0.032 at age 7 and 0.061 at age 8), mainly due to an increase in incidence of barren ewes. Mean age at exit from the flock was 4.6, 4.9 and 4.8 years (SE = 0.17) for B, BxS and >75%S, respectively. There were significant (P < 0.01) curvilinear effects of ewe age for BCS. Body condition score post mating, at lambing, 5 weeks post lambing and at weaning increased until 4, 5, 3 and 3 years, respectively, (Figure 2) and then declined. Ewe BW at post mating, lambing and 5 weeks post lambing increased as ewes aged from 2 to 7 years, but decreased at 8 years.

There were significant (P < 0.01) curvilinear effects of ewe age on: lamb BW at birth and weaning, ADG from birth to weaning and birth to slaughter, and age at slaughter. Lamb growth rate from birth to weaning and birth to slaughter increased until ewe age 6 and 8, respectively; (for ages 2, 3, 4, 5, 6, 7 and 8 ADG from birth to weaning was 253, 294, 284, 282, 310, 306 and 291 (SE ≈ 3.4) g/d and from birth to slaughter was 221, 256, 269, 262, 280, 280 and 284 (SE ≈ 3.5) g/d, respectively) while age at slaughter averaged 207, 183, 175, 179, 172,171 and 167 (SE ≈ 2.6) d, respectively.

**Conclusions:** Whilst ewe BW increased until 7 years, BCS declined from a younger age. The decline in the number of lambs reared per ewe joined at 7 and 8 years was due to increased barrenness and reduced litter size but the balance of causes varied among the genotypes.

**References:** Hanrahan, J.P. 1989. Proceedings of the 40th European Association for Animal Production, Dublin, Ireland, 27–31.

Hanrahan, J.P. 2001. End of Project Reports: Sheep Series No. 13; Teagasc, Sheep Research Centre: Galway, Ireland, 2001; ISBN 1-84170-197-1.

Keady, T.W.J. and Hanrahan, J.P. 2019. Animal, 12, 722–732.

Keady, T.W.J., Hanrahan, J.P., Hession, D.V., Moran, B., Kendall, N.R. and Hanrahan, K. 2019. Advances in Animal Biosciences, 10, 22.

Figure 1. Effect of ewe age on litter size, number of lambs reared per ewe joined (B = Belclare, S = Suffolk) (vertical bars = SE)

Figure 2. Effect of age on ewe body condition score at post mating, lambing, 5 weeks post lambing and weaning (vertical bars = SE)