ORAL

Technical Session 13

Exploring Current and Future Needs for the Livestock Science and Farming Community

How does rate of genetic gain impact economic optimum productive life?

Newton Jo*[1], Goddard Michael[2], Nieuwhof Gert[3], Ho Phuong[4], Khansefid Majid[1], Haile-Mariam Mekonnen[1]

[1] Agriculture Victoria and School of Applied Systems Biology, La Trobe University, [2] Agriculture Victoria and University of Melbourne, [3] DataGene, [4] Agriculture Victoria

Understanding the drivers of economic optimum productive life in dairy herds is important. Previous research suggested the increased rate of genetic gain due to genomics has reduced optimal productive life by several months. We hypothesis that given the rate of genetic gain in Australian Holstein herds is up to $142/cow/year (0.8 standard deviations index units; SD index), the impact of genetic gain on optimal productive life may be greater than previously stated. This study aims to test this hypothesis.

Summary statistics of the rate of genetic progress for Australian Holsteins (born 2019-2023) were calculated across and within herds using data obtained from DataGene. Microsoft Excel was used to deterministically model a dairy herd from lactations 1 to 10, alongside key financial inputs. Five-year average farm financial data (n = 1190 herd-years) were compiled and used as model input. Opportunity costs considered were cost of rearing replacements minus cow salvage value, reduced profit of lactation 1 and 2 animals, reduced profit and higher costs in lactations 6+, loss of income from calves needed as replacements. Adjustments reflecting that voluntary culling each lactation increases superiority of older animals and genetic gain increases profit potential of young animals were also modelled. Optimum productive life was the point where profit (earnings before interest and tax, EBIT, $/cow/year) was maximised. Sensitivity analyses were undertaken of key parameters.

Economic optimum productive life occurred at 3.6, 3.4, 3.4, 3.2 and 3.1 lactations at genetic gain of $0, $15, $40, $65 and $100/cow/year, respectively. For all rates of genetic gain, EBIT changed by less than $11/cow/year when voluntary culling was varied ±4% of where optimum productive life occurred. As part of this work, we looked at the individual impact opportunity costs and adjustments had on EBIT. At Australia's average replacement rate (0.24) and genetic gain ($40, 0.22 SD index), genetic gain had most influence on EBIT adjustments. While at $15/cow/year genetic progress, it had the fourth largest influence. While rate of genetic progress and sensitivity analyses of key input influenced optimum productive life, at most ½ lactation variation was seen. This suggests a range of voluntary culling rates for which productive life is nearly optimised. Considering across herd variation, not just national averages, helps ensure conclusions are relevant to widest audience possible.