Abstract

In developing countries minimal and erratic performance and pedigree recording impede implementation of large-sized breeding programs. Small-sized nucleus programs offer an alternative but rely on their economic performance for their viability. We investigated the economic performance of 2 alternative small-sized dairy nucleus programs [i.e., progeny testing (PT) and genomic selection (GS)] over a 20-yr investment period. The nucleus was made up of 453 male and 360 female animals distributed in 8 non-overlapping age classes. Each year 10 active sires and 100 elite dams were selected. Populations of commercial recorded cows (CRC) of sizes 12,592 and 25,184 were used to produce test daughters in PT or to create a reference population in GS, respectively. Economic performance was defined as gross margins, calculated as discounted revenues minus discounted costs following a single generation of selection. Revenues were calculated as cumulative discounted expressions (CDE, kg) × 0.32 (€/kg of milk) × 100,000 (size commercial population). Genetic superiorities, deterministically simulated using pseudo-BLUP index and CDE, were determined using gene flow. Costs were for one generation of selection. Results show that GS schemes had higher cumulated genetic gain in the commercial cow population and higher gross margins compared with PT schemes. Gross margins were between 3.2- and 5.2-fold higher for GS, depending on size of the CRC population. The increase in gross margin was mostly due to a decreased generation interval and lower running costs in GS schemes. In PT schemes many bulls are culled before selection. We therefore also compared 2 schemes in which semen was stored instead of keeping live bulls. As expected, semen storage resulted in an increase in gross margins in PT schemes, but gross margins remained lower than those of GS schemes. We conclude that implementation of small-sized GS breeding schemes can be economically viable for developing countries.