Trait improvement and monetary returns in alternative closed and open nucleus breeding programmes for Boran cattle reared in semi-arid tropics

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Abstract

This paper aimed at evaluating closed and open nucleus schemes for Boran cattle based on genetic and economic merits of three alternative breeding programmes; 1) breeding programme closed to the members of the Boran Cattle Breeders Society aimed at improving growth (ENTIRE), 2) expanded breeding programme managed by the ENTIRE but incorporating the trait preferences of low-input farmers aimed at improving growth and adaptation (EXPO) and 3) breeding programme for the low-input farmers aimed at improving adaptation, growth and milk production (LOW). Within ENTIRE, two options were considered; option 1 included breeding objectives and selection criteria derived from the recommendation for ENTIRE (ENTIRE1) and option 2 included breeding objectives and selection criteria derived from the recommendation for the EXPO breeding programme but without extra recording for packed cell volume (ENTIRE2). Sensitivity analysis of the programmes to changes in nucleus size (5%, 10% and 25%), gene contribution to commercial herds (25%, 50% and 70%) and degree of opening the nucleus (10%, 20% and 30%) were performed. The ENTIRE1 within closed nucleus programme obtained overall monetary genetic gain of US$1.161 and profit amounting to US$5.36 and for ENTIRE2, the monetary genetic gain and profit rose to US$2.01 and US$11.10, respectively. The open nucleus posted higher values than the closed nucleus for monetary genetic gain (US$1.46) for ENTIRE1 but had a lower profit (US$5.02). This was a general trend in the alternative programmes. Moving from ENTIRE (growth) to EXPO (growth and adaptation) resulted in the drop in sale weight gain by almost 2 kg, but a gain of 20% in packed cell volume. The LOW posted a negative gain for milk yield of −1.1 kg. Restrictions on growth and adaptation on the breeding objective allowed for moderate positive gains in milk. The nucleus size of 25%, genetic contribution to commercial herds of 70% and degree of opening the nucleus of 10% were most profitable. When extra recording for packed cell volume was applied in the commercial herds in EXPO, no additional benefits accrued. The trade-offs for ENTIRE due to incorporation of adaptation traits as well as the feasibility of the alternative breeding programmes are critically discussed.