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Genetic and Economic Evaluation of Alternative Breeding Objectives for Adoption in the Smallholder Indigenous Chicken Improvement Programme

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Abstract

The aim of this study was to genetically and economically evaluate the breeding objectives for adoption in the smallholder indigenous chicken (IC) breeding programme in Kenya. A closed three-tier nucleus breeding programme with three breeding objectives targeting within breed selection was simulated. The breeding objectives differed based on the end marketable products. They included IC dual-purpose (ICD) representing the smallholder IC producers' breeding goal for both eggs and meat production, IC layer (ICL), and broiler (ICB) simulating alternative breeding objectives for IC egg and meat pure lines, respectively. A flock size of 48,000 breeding hens with 1%, 29% and 70% in nucleus, multiplier and commercial flock, respectively, was modelled using deterministic approach to assess the genetic and economic merit of each breeding objective. The results indicated that cocks were the main contributors of genetic gains compared to hens reflecting their ability to transmit superior genes faster within the population than hens. The genetic response after one round of selection for individual traits differed between the breeding objectives. The highest genetic gains for egg number (2.71 eggs) and growth traits (average daily gain, 1.74 g, and live weight at 16 weeks, 58.0 g) were realised in ICL and ICB, respectively. The genetic responses for age at first egg were desirable in all the breeding objectives while that for fertility and hatchability were only favourable in ICD and ICL. Faecal egg count had low but desirable response to selection compared to antibody response which had negative genetic gains. The ICD reported the highest increase in feed intake (0.19 g d⁻¹) while ICL had the least (0.12 g d⁻¹). The ICB was the most profitable breeding objective while ICL was the least. The alternative breeding objectives ICL and ICB were found to be superior in genetic improvement for egg production and growth traits, respectively, compared to smallholder farmers breeding objective (ICD). Adoption of the breeding objective targeting improvement of IC for meat production was recommended. However, this must be accompanied by improving the production environment realise high profitability.

Keywords: Breeding programme, three-tier nucleus breeding, dual-purpose, layer, broiler, Kenya