APPLICATION OF RISK-RATED PROFIT MODEL FUNCTION IN ESTIMATION OF ECONOMIC VALUES FOR INDIGENOUS CHICKEN BREEDING

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Objective

To derive economic values for traits of economic importance for indigenous chicken using risk-rated profit model function

Introduction

Development of breeding objectives is the first step in genetic improvement as it defines the direction of selection and genetic merits of performance traits. It involves identification of traits of economic importance and estimation of their economic values. Although traits of economic importance to producers, marketers and consumers for indigenous chicken (IC) in Kenya have been identified, their economic values (EV) have not been estimated. Risk-rated profit model function was used to estimate the EV for IC breeding.

Methodology

Model description -The study employed the bio-economic model developed by Okeno et al. (2011).The model considered three production systems namely; free range system (FRS), semi-intensive system (SIS) and intensive system (IS). Traits considered in the model were, egg number (EN), average daily gain (ADG), live weight at 21 weeks (LW), mature weight (MW), fertility (FER), hatchability (HA), broodiness (BRD), survival rate (SR), feed intake (FI) and egg weight (EW). The economic values for these traits were derived based on a fixed-flock size and fixed-feed resource production circumstances

Fixed-flock size - Represented a situation where chicken population could not be increased because of other production constraints apart from feeds. The EV under this production circumstance was estimated as:

$$EVr_{fixed-flock} = \Delta P_r / \Delta g$$

where ΔP_r and Δg are marginal changes in risk-rated profits and genetic merit of a trait respectively, after an increase in the genetic merit of a trait of interest by one unit. The risk-rated profit (P_r) was computed as:

$$P_r = \left\langle \mu_{po} \int (g,e) - e\mu_{pi} \right\rangle - \left\langle 0.5\lambda Var(\mu_{po} \int (g,e) - e\mu_{pi}) \right\rangle$$

where μ_{po} and μ_{pi} are the expected prices of output and inputs, respectively, g, the vector of genetic traits, e the vector of the inputs and λ the Arrow-Pratt coefficient of absolute risk aversion. The λ of 0.02 was used.

Fixed-feed resource - Represented a scenario where flock size could not be increased due to lack of feed resources. The EV were calculated as:

$$EVr_{fixed-feed} = \left(\Delta P_r / \Delta g \right) - \left(\frac{\Delta FI}{\Delta g} \times P_r / FI \right)$$

where FI and ΔFI are the feed intake per hen per year before genetic improvement and marginal change in feed intake per hen after genetic improvement, respectively

Results

Table 1. Traditional (EV_t) and risk-rated (Ev_r) economic values in Kenya Shillings (KSh) per hen per unit increase in genetic merit of traits in the breeding objective assuming fixed flock size in the three production systems

Traits	Free range system		Semi-intensive system		Intensive system	
	EV_t	EV_r	EV_t	EV_r	EV_t	EV_r
Egg number	10.64	9.08	9.89	8.97	9.78	8.87
Egg weight	-0.004	-0.003	-0.005	-0.004	-0.06	-0.05
Broodiness	-1.48	-1.33	-2.96	-2.01	-7.40	-6.66
Survival rate	19.38	17.41	16.13	14.22	9.00	7.85
Average daily gain	29.86	26.73	24.54	23.09	19.29	18.46
Live weight	86.11	77.49	82.32	74.09	79.40	73.46
Mature weight	-42.94	-38.65	-70.28	-63.26	-95.91	-83.42
Fertility	19.23	17.31	15.66	14.08	10.06	9.05
Hatchability	16.63	14.97	13.53	12.17	8.70	7.83
Feed intake	-0.25	-0.22	-2.42	-2.08	-6.85	-6.17

- Traditional economic values are higher than risk-rated economic values
- FRS has higher economic values than SIS and IS
- Economic values for EN, SR, ADG, LW, FER and HA were positive whilst those for EW, BRD, MW and FI were negative

Table 2. Traditional (EV_t) and risk-rated (Ev_r) economic values in Kenya Shillings (KSh) per hen per unit increase in genetic merit of traits in the breeding objective assuming fixed-feed resource production circumstance in the three production systems

Traits	Free range system		Semi-intensive system		Intensive system	
	EV_t	EV_r	EV_t	EV_r	EV_t	EV_r
Egg number	11.41	10.72	10.63	9.86	10.40	9.07
Egg weight	-0.002	-0.002	-0.005	-0.004	-0.04	-0.04
Average daily gain	41.70	38.80	33.50	28.91	21.38	19.21
Live weight	88.25	87.66	86.51	82.31	81.41	74.01
Mature weight	-40.59	-38.29	-69.92	-62.89	-92.07	-79.97

- The economic values were higher than those under fixed-flock size
- Economic value for LW was the highest while that for MW remained negative

Conclusion

- Improvement of EN, SR, ADG, LW, FER and HA would have a positive impact on profitability of IC production
- Risk-rated economic values should be used to develop breeding objective for genetic improvement of IC

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