Potential response from selection schemes based on progeny testing and genomic selection for the Chilean dairy cattle under pastoral systems: a deterministic simulation

Felipe Lembeye, Nicolás López-Villalobos and Héctor Uribe

SUPPLEMENTARY FILE

Selection Index Methodology

Selection criterion

$$I = \sum_{i=1}^{m} b_i x_i = \mathbf{x}'\mathbf{b}$$

$\mathbf{x}'$ = row vector of m known and adjusted phenotypic values of measured traits.

$\mathbf{b}$ = row vector of m weight coefficients to be estimated.

Selection Objective

$$H = \sum_{i=1}^{n} v_i g_i = \mathbf{g}'\mathbf{v}$$

$\mathbf{g}'$ = row vector of unknown true breeding values of the n traits included in H.

$\mathbf{v}$ =row vector of the corresponding n known relative economic values.

Selection criterion coefficients

$$\mathbf{b} = \mathbf{P^{-1}Gv}$$

$\mathbf{G}$ = genetic (co)variances matrix.

$\mathbf{P^{-1}}$ = inverse phenotypic (co)variances matrix,

Derivation of co(variance) matrices in bull and cows pathways of selection.

$\sigma^2_{P\,i}$ =Phenotypic variance.

$\sigma^2_{G\,i}$ =Genetic variance.

$\sigma_{P\,ij}$= Phenotypic covariance.

$\sigma_{G\,ij}$= Genetic covariance.

n= number of records per animal (own performance in cow pathways, performance of daughters in bull path).

r= repeatability.

p= number of animals in progeny group.

k= relationship among animals in progeny groups (half-siblings=0.25).

a= relationship among animals in progeny groups and animals to evaluate (bull to daughter =0.5).

Derivation of phenotypic and genetic (co)variances in cow pathways:

Elements in matrix **P**

$\sigma^2_{P\,ii} = \left[r + \frac{1-r}{n}\right] \times \sigma^2_{P\,ii}$,

$\sigma_{P\,ij} = \frac{\sigma_{P\,ij} + (n-1) \times \sigma_{G\,ij}}{n}$

Elements in matrix **G**

$\sigma^2_{G\,ii} = \sigma^2_{G\,ii}$,

$\sigma_{G\,ij} = \sigma_{G\,ij}$

Derivation of phenotypic and genetic (co)variances in bull pathways:

Elements in matrix **P**

$\sigma^2_{P\,ii} = \frac{[r+(1-\frac{r}{n})]+(p-1)k \times h_i^2}{p} \times \sigma^2_{P\,ii}$,

$\sigma_{P\,ij} = \frac{[\sigma_{P\,ij}+(n-1)\times\frac{\sigma_{G\,ij}}{n}+k\times\sigma_{G\,ij}]}{p}$

Elements in matrix **G**

$\sigma^2_{G\,ii} = \sigma^2_{G\,ii} \times a$,

$\sigma_{G\,ij} = \sigma_{G\,ij} \times a$