

Exercises Day 2

Part 1

Exercise 1 Multiple Trait Breeding Value Accuracy

Use the program *mtindex.xlsx* (2Traits sheet) to explore the effect of information from correlated traits.

Start with equal variance (1.0) , equal genetic parameters - heritability (0.25), genetic correlation = 0.5 and phenotypic correlation = 0.1.

Consider the information available per trait:

- Limited information: record on sires and record on dam
- Moderate information: record on own, sire, dam, 25 half sibs
- Much information: record on own, sire, dam, 25 half sibs, 25 progeny records

Assuming equal information available for each trait, compare for each of these cases single trait accuracy versus multiple trait accuracy, i.e. the accuracy of estimating the EBV for a trait, using information on both traits.

Also, write down the correlation between the EBVs for the two traits.

Repeat the exercise with genetic correlation = 0.5 and phenotypic correlation = 0.5.

Repeat the exercise with genetic correlation = 0.5 and phenotypic correlation = -0.5.

Assume now unequal heritability, with h^2 of first trait = 0.5, and of second trait = 0.1,

Genetic correlation = 0.5 and phenotypic correlation = -0.1.

Consider the cases

Trait 1 has limited information, trait 2 has much information

Trait 1 has much information, trait 2 has limited information

Can you think of some cases in breeding programs where the EBV of a trait leans heavily on a correlated trait? Consider the correlation between EBVs in that case, and its effect on selection response.

Note that for the purpose of this exercise, to mimic the cases with different amounts of information available for each trait, you can simply vary the progeny number, corresponding to the same single trait accuracy. You can use that in the next exercise.

However, for a proper comparison of breeding programs, information on parents and sibs is not equivalent to information on progeny! Why not?

Exercise 2 Multiple Trait Selection Response

Use the program *mtindex.xlsx* (*MilkFeed* sheet) to explore the effect of information from correlated traits on selection response. Not only information, but also selection emphasis (economic weights) can now be varied.

Case A

Use the case study

	μ	σ_p	h^2
Milk (kg/day)	25	2.5	.3
Feed intake (kg/day)	20	2.0	.2

$r_g = .70$ $r_p = 0.40$

Compare the trait response in the following cases.

Economic values for milk and feed intake are \$0.20/kg and -\$0.20/kg, respectively.

Bulls are selected for milk production typically based on 50 progeny. Feed intake is much more expensive to measure.

How can a breeder achieve improvement in milk production without the cows eating more. There are two possible options (at least). Compare and contrast these options.

Case B

Use the case study

	μ	σ_p	h^2
Milk (kg/lac)	8,000	800	.3
Fertility(%)	70	46	.03

$r_g = -.25$ $r_p = -.01$

How can a breeder achieve improvement in milk production without reducing the fertility of their cows. Discuss again two possible options (at least). Compare and contrast these options.

Now use *mtindexEllipse.xls*, and repeat cases A and B. How does this change your opinion?

Part 2

Exercise 4 Multiple Trait Selection Response, Desired gains

Go back to the cases of Exercise 2, case A and case B

Use *mtindex_desgains.xlsm*

Determine the economic value that will cause no change in feed intake, while increasing milk production

Make a curve showing the response in milk production versus the economic value for feed intake. Discuss a best approach, in terms of economic weight and/or trait measurement.

Discuss the potential value of genomic selection, where the value of genomic selection can be mimicked by the information on 20 progeny for milk production, and 10 progeny for feed intake.

Repeat the same exercise for fertility

Exercise 3 Use of crossbred information in genetic evaluation

purebred information	1 own
	20 half sibs

crossbred information	20 half sibs
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Use a correlation between purebred information and crossbred information (= breeding objective) of 0.7. Assume equal heritabilities for pure- and crossbred performance.

Determine response to selection, using the *mtindex.xlsm* program.

Check how sensitive the index is to the assumptions about the true genetic correlation between pure- and crossbred performance. Compare the expected response with the actual and the optimal response.

Part 3

Exercise 1 Two-stage Selection

Use the spreadsheet '2-Stage Selection Example.xls' to find the proportions selected that maximize gain in the breeding goal per \$ cost.

Load this scenario into *SelAction* – choose 'Discrete Generations' '2-stage selection' and open file 'Day 3 Two stage selection example.ds2'. Use it to evaluate different scenarios, e.g.

- BLUP selection or adding information on half or full sibs
- Feed intake testing of only males, with different proportions evaluated
- Feed intake testing of sibs.