
# Genetic parameter – coefficient of heritability

**Modul no. 1: Animal Breeding**

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# Genetic parameters

- Coefficient of heritability ($h^2$)
- Coefficient of repetability ($w^2$)
- Genetic correlations ($r_G$)

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# Coefficient of heritability

- We are interested in :
  - To what extent is heredity involved in the manifestation of a quantitative trait
  - How far each trait is heritable

- This explains the heritability coefficient

Expresses:

The proportion of genetic variability to phenotypic variability

$$h^2 = \frac{\sigma_G^2}{\sigma_P^2}$$

- To what extent is genetic similarity of related individuals (genetic similarity is determined by kinship) accompanied by phenotypic similarity?



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# Coefficient of heritability

In a broader sense of the word

$$h^2 = \frac{\sigma_G^2}{\sigma_P^2}$$

In the narrower sense of the word

$$h^2 = \frac{\sigma_a^2}{\sigma_P^2}$$

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# Coefficient of heritability

Heredity coefficient values:

$<0; h^2; 1> ; 0 \leq h^2 \geq 1$

$$h^2 = \frac{\sigma_G^2}{\sigma_P^2}$$

$$h^2 = 0 \qquad h^2 = \frac{0}{1} \qquad \sigma^2{}_P = \sigma^2{}_E$$

$$h^2 = 1 \qquad h^2 = \frac{1}{1} \qquad \sigma^2{}_P = \sigma^2{}_G$$

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# Coefficient of heritability

$h^2 = 0$

- Clones

$h^2 = 1$

- Laboratory conditions, qualitative traits

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# Coefficient of heritability

$h^2 = 0$

- Clones

$h^2 = 1$

- Laboratory conditions, qualitative traits

Three classes of quantitative traits:

| | | |
|---|---|---|
| - low heritability: | $h^2 \leq 0.3$ | partial reproductive traits; fitness |
| - moderately heritability: | $h^2 = 0.3 – 0.6$ | partial productive traits |
| - hight heritability: | $h^2 \geq 0.6$ | partial slaughter traits |

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# Estimation heritability coefficient

- From the similarity of parents and offspring
  - Using the regression (correlation) coefficient
  - Using selection procedures (experiments)
    - realized heritability
    - comparison of offspring from better and worse parents
- From the similarity of sibs
  - Analysis of full sibs
  - Analysis of half sibs
  - Combined analysis of full sibs and half-sibs
  - Analysis of identical twins
- From the repeatability of traits
- From the similarity of bilaterally occurring traits on the same individual



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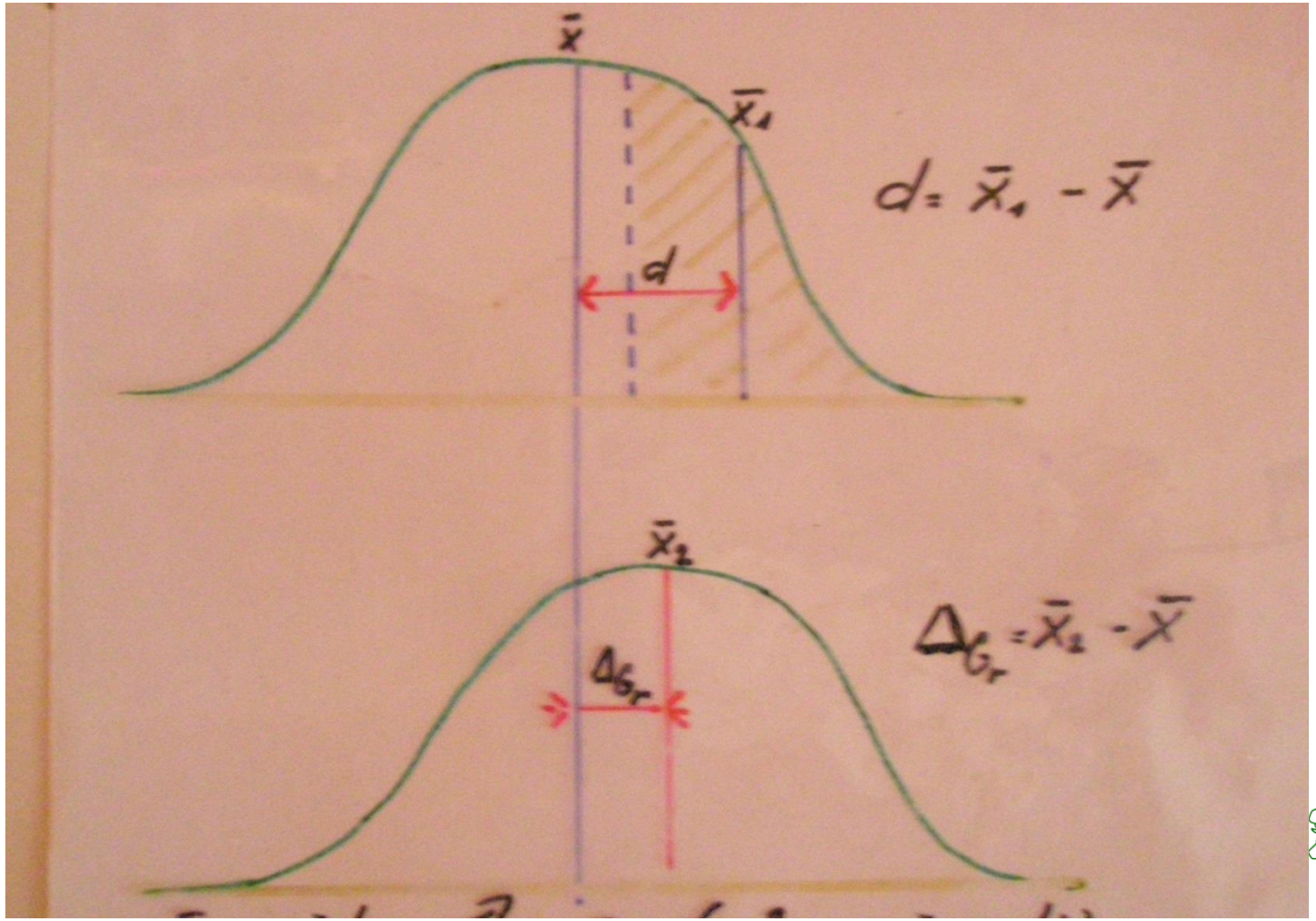
# $\hat{h}^2$ … Using realized genetic gain (realized heritability)



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# Meaning

- The amount of $h^2$ determines the procedure for estimating the BV and the selection method
- The height of $h^2$ determines breeding methods



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# Meaning

- The amount of $h^2$ determines the procedure for estimating the BV and the selection method
- The height of $h^2$ determines breeding methods

- Similarity of genotype and phenotype
- Similarity in performance between parent-offspring
- Estimation of offspring performance
- Estimation of individual and specific heterosis (crossing effects in general)

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# Presentation of partial quantitative trait and value of $h^2$

| Trait | Species | $h^2$ |
|---|---|---|
| **Reproduction** | | |
| Milk yield | cattle | **0.25** |
| Number of offsprings | pig | **0.16** |
| Gestation length | pig | **0.09** |
| Eggs production | hen | **0.28** |
| | | |
| **Fattening** | | |
| Average daily gain | cattle | **0.42** |
| Average daily gain | pig | **0.45** |
| Feed conversion | pig | **0.39** |
| | | |
| **Slaughter value** | | |
| The weight of the meat on the rear part | cattle | **0.86** |
| Cattle | cattle | **0.62** |
| Weight of boneless leg meat | pig | **0.78** |
| Height of back bacon | pig | **0.73** |



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# Thank you for your attations!

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