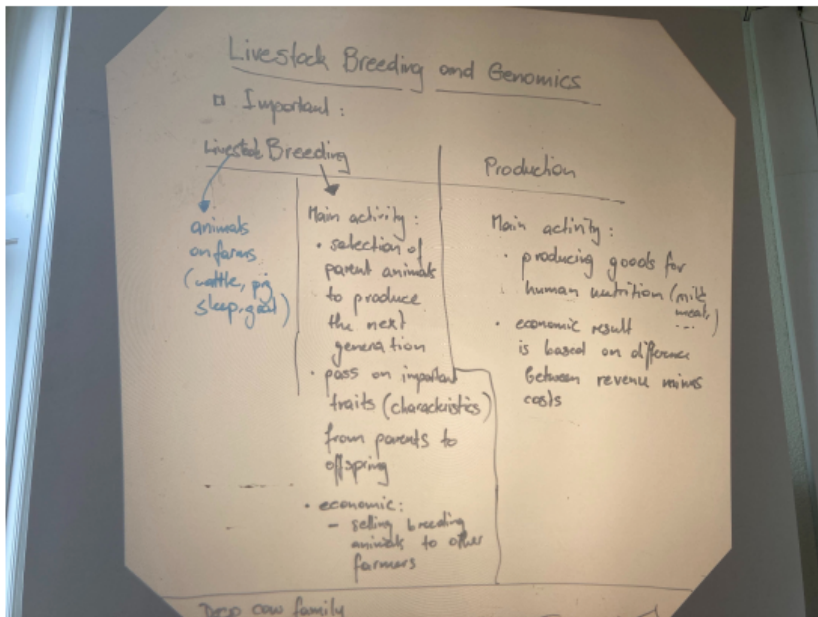


Overhead Pictures

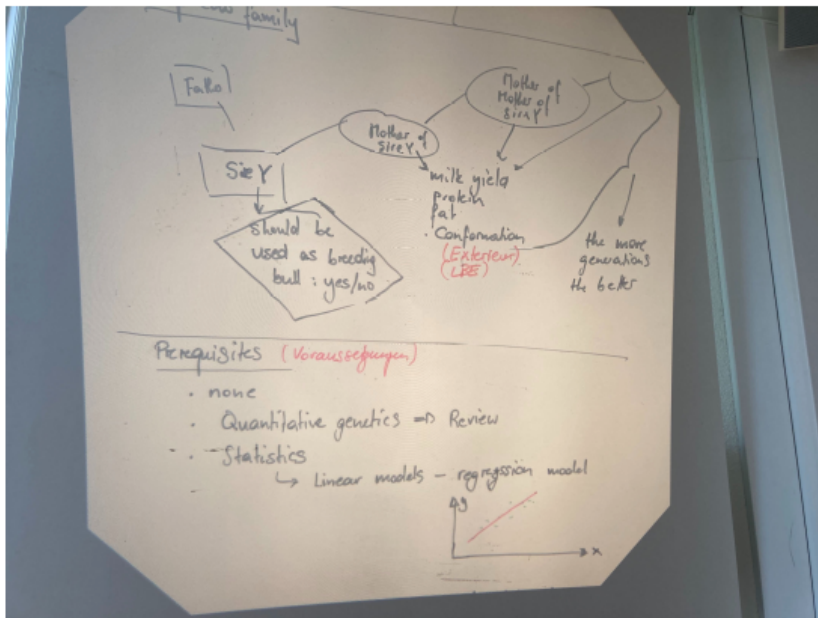
Peter von Rohr

9/18/2020

Breeding and Production



Deep Cow Families



Prerequisites

- Linear Algebra: vectors / matrices / systems of equations
- Vectors and matrices are use for a simple formulation / description of systems of equations.

- System of equation: Matrix A of ^{coefficients} known
vector x of unknowns
vector b of known

$$A \cdot x = b$$

- Applied to genetic evaluation:
vector x contains: (1) unknown effects of the environment (farm, age, sex, ...)

(2) unknown breeding values

↓
predictions

$$x = \begin{bmatrix} \text{environmental effects} \\ \text{unknown breeding values for every animal in that population} \end{bmatrix}$$

Breeding

A = Matrix of known coefficients,
basically associates the factors in
 x to the observations

b = vector of functions of observations
(traits)

Computations are all done in R :

• How to define a vector in R :

$$b \leftarrow c(1, 15, 20, \dots)$$

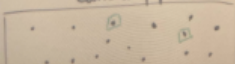
• Matrix in R :

$$A \leftarrow \text{matrix}(c(10, 12, -3, \dots), \text{nrow} = 2, \dots)$$

Scientific Meaning of Breeding

a Tools of selection and mating to "improve"
a given livestock population.

Current population

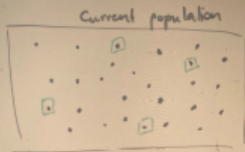


1. No random
mating
 \rightarrow planned,

Breeding II

Scientific Meaning of Breeding

a Tools of selection and mating to "improve" a given Livestock population.



1. No random mating
→ planned matings of parents to produce the next generation

→ Question: which animals from current population should be parents?

□ animals should be parents

→ How do I find the □-animals?

Answer: selection: Select, based on certain criteria or characteristics (traits) the □-parent animals.

Important for selection process:

Breeding III

- Important for selection process:

! Observed or measured traits (phenotypes) are not passed from parents to offspring!

But based on genetics:

Parents pass a random sample of their alleles to their offspring

⇒ Therefore parents must be selected based on the value of the sample of alleles

↓
unknown ⇒ estimate
⇒ estimated breeding value

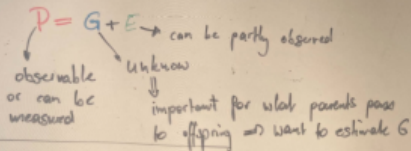
-
- Observed or measured characteristics (traits) are called phenotypes (P)
 - According to our genetic model that we use, phenotypes can be decomposed into a genetic part (G) and into an environmental part (E)

$$P = G + E \rightarrow \text{can be partly observed}$$

↓ unknown

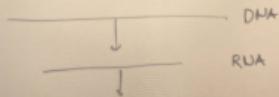
Decomposition of P

- Observed or measured characteristics (traits) are called **phenotypes (P)** value
- According to our genetic model that we use, phenotypes can be decomposed into a genetic part (G) and into an environmental part (E)



Why is every P determined by a G -component?

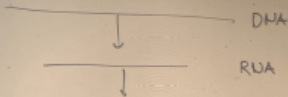
Because of the Central Dogma of Molecular Biology



Protein → phenotypes are to protein

to offspring → DNA → RNA
Why is every P determined by a G-component?

Because of the Central Dogma of Molecular Biology



Protein → phenotypes are to protein