(2) Vector β corresponds to the vector of fixed effects. ⇒ Example: herd as fixed effect.
In the data set there are two herds, hence the vector β is of length 2

$$\beta = \begin{bmatrix} \beta_{herd1} \\ \beta_{herd2} \end{bmatrix}$$

β_{herd1} → 'average' influence of herd 1 on WWG
β_{herd2} → 'average' influence of herd 2 on WWG

unknown and has to be estimated from the data. What is known from the data set is which animal is in which herd. And this information will be used to construct the design matrix X

(3) Vector u of breeding values. The vector u contains breeding values for all animals given in the data set. Hence, also for those animals without observations but with offspring in the data set.

Example:

$$u = \begin{bmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \\ u_6 \end{bmatrix}$$

(Example NA stands for 'not available' and is the encoding for a missing data point)