Topic 3: Selection effect
Practical example

Hello, and welcome to another video from the Animal Breeding module, where we will be looking at practical examples for the Selection Effect, or Genetic Gain.
We have to estimate the level of selection effect for two different breeding strategies when we have a dairy cattle population of 30,000 heifers available each year. From these cows we select for further breeding: 18 000 cows as cow mother or 1 500 cows as bull mother. We know the following population parameters for milk production σ P = 600 kg, h2 = 0,25. We have to estimate the level of the estimated selection effect for both strategies and compare them.
To predict the selection effect, we use the formula given here. The only information we don't have at the moment is the value of the selection intensity. The other two parameters heritability coefficient and phenotypic standard deviation were specified in the example. In order to estimate the selection intensity we need to know the value of the proportion of selection. And since we are selecting 18000 individuals out of 30000 individuals, the sekection poportion takes the value of 0.6. The tabulated value of the selection intensity corresponds to 0.6439.
If the value of the selection intensity is added to the formula, we obtain the value of the expected selection effect in such a selected population, which is equal to 96.59 kg of milk per lactation.
In the second example, when we select bull mothers, it is obvious that the number of bull mothers should be lower because due to artificial insemination, and lower number of sires and therefore their mothers are needed to ensure reproduction. In the case of bull mothers, the selection proportion is only 5%. The value of the selection intensity found in the tables is 2.0628.
When all values are included into the above formula, the expected selection effect is 309.42 kg of milk per lactation. Because we select a smaller number of better individuals, the selection intensity reaches higher values than in the previous case and therefore the selection effect has a higher value.
We have to estimate the level of selection effect for a planned strategi, when breeders are considering whether to set up a performance test station for selection of bulls mothers. In this station test, it would be possible to increase the coefficient of heritability for milk production to h2 = 0.49 by standardizing environmental conditions. Genetic variability would be the same in both the field and station tests (σA = 300 kg). The breeders will select 3000 individuals for the test each year. Also in the station test, 1500 bulls mother would need to be selected each year for further breeding.

In this case, we use the following formulas to estimate the level of the selection effect. When data on genetic variance and breeding value accuracy were provided in the example. To estimate the selection effect, we still need to find the value of the selection intensity.
The intensity of selection is again obtained using the tables and the value of the proportion of selection. The breeders include 3000 cows in the test and select 1500 future bulls mothers. The proportion of selections is therefore 50%. This corresponds to a selection intensity value of 0.7979. When all the values are added to the relationship, we obtain a selection effect value of 167.56 kg.
The table here shows all estimates of selection effects. The highest selection effect is obtained from the field test when selecting bull mothers. Due to highest level of selection intensity. The second highest selection effect is estimated for the test station, where we obtain the highest value of the coefficient of heritability, but we do not obtain a high value of selection intensity.

The lowest expected selection effect would be estimated for the selection of cow mothers, which showed the lowest value of selection intensity and a lower value of heritability coefficient.
Thank you for your attention and I look forward to seeing you again at the next video.