

Livestock Breeding and Genomics I+II

Syllabus

Birgit Gredler and Peter von Rohr

August 25, 2015

General Information

Lecturers B. Gredler (BG), P. von Rohr (PvR)
Date Fr 09-12
Location LFW C 11

Dates

Part Dates
I 18.09., 25.09., 02.10., 16.10., 23.10., 30.10., 06.11.,
 13.11.
II 20.11., 27.11., 04.12., 11.12., 18.12.

No lecture on 09.10.

Exam: 18.12.

Topics

Part	Topic	Date	Lecturer
I	Selection index (various sources of information, one trait, multiple traits)	18.09., 25.09.	BG, PvR
I	Relationship matrix and its inverse	02.10.	PvR
I	Correction of fixed effects	16.10., 23.10.	PvR
I	BLUP: one trait, repeated observations, multiple traits, economic indices	30.10., 06.11.	BG
I	Introduction to methods for the estimation of variance components	06.11., 13.11.	PvR
II	Linkage disequilibrium	20.11.	BG
II	Genomic selection and estimation of breeding values	27.11., 04.12.	BG
II	Genomewide association studies	11.12.	BG

Weekly Schedule

Week	Date	Topic	Lecturer
1	18.09	Introduction to the course, Selection index	BG, PvR
2	25.09	Selection index multiple traits	PvR
3	02.10	Relationship matrix and its inverse	PvR
4	09.10	No lecture	
5	16.10	Correction of fixed effects	PvR
6	23.10	Anova	PvR
7	30.10	Variance components estimation	PvR
8	06.11	Variance components part II BLUP one trait	PvR BG
9	13.11	BLUP multiple traits, economic indices	BG
10	20.11	Linkage disequilibrium	BG
11	27.11	Genomic selection	BG
12	04.12	Genomic selection	BG
13	11.12	Genomewide association studies	BG
14	18.12	Exam	BG, PvR

Website

The course website is available at:

<http://charlotte-ngs.github.io/LivestockBreedingAndGenomics/>. Slides and exercises will be made available to the students on that site.

Goals

Part I

The students are able to estimate breeding values for the most common population structures using the selection index. They are able to set up design matrices, the relationship matrix and its inverse as well as the Mixed Model equations to estimate BLUP breeding values for smaller examples.

Part II

The students are able to interpret and apply linkage disequilibrium. They are able to discuss the principles of genomic selection, genome wide association studies and breeding value estimation.

Literature

A basic introduction on animal breeding at the bachelors level is presented by Willam and Simianer [6]. Burdon [2] provides further understanding of animal

breeding.

A standard introduction to quantitative Genetics is given in [3]. Götz, Schüler and Swalve [1] translated that introduction into German.

Lynch and Walsh [4] explain the basics of quantitative genetics in great detail in the first volume of their two volume series on genetics and evolution.

Mrode and Thompson [5] put linear models and their application in animal breeding at the center of their book.

References

- [1] *Grundlagen der quantitativen Genetik*. Ulmer, 1 edition, 2002.
- [2] Richard M. Bourdon. *Understanding Animal Breeding*. Prentice Hall, 2 edition, 1999.
- [3] D. S. Falconer and T. F. C Mackay. *Introduction to Quantitative Genetics*. Benjamin Cummings, Longman, Essex, 4 edition, 1996.
- [4] Michael Lynch and Walsh Bruce. *Genetics and Analysis of Quantitative Traits*. Sinauer Associates, 1 edition, 1998.
- [5] R. A Mrode and R. Thompson. *Linear models for the prediction of animal breeding values*. CABI, 2005.
- [6] Alfons Willam and Henner Simianer. *Tierzucht*. Ulmer, 1 edition, 2011.